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GPAT EXAM

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GPAT MANTRA

GATE/GPAT Previous Year Solved Question Papers

With **DETAILED EXPLANATION**

1988 - 2025

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PREFACE

It is a great pleasure to present 3rd edition of **"GPAT MANTRA: PREVIOUS YEAR SOLVED QUESTION PAPERS WITH DETAILED EXPLANATION"** book to all of you, in which last 38 previous year question paper has been compiled

The Salient Features of the Book are:

- **This smart book contains complete theoretical explanations (in hard copy) and video explanations of GPAT question papers from 2017 to 2025.**
- **Book contains e-PDF explanations of GATE/GPAT papers from 1988 to 2016 (See the 2nd Page of this book to get how to access this).**
- **Proper Explanation with reference of standard books including page number**
- **Subject wise separation of each year paper**
- **Made concept easy by using diagram, Flow chart, Table and Coloured 3D images**
- **Student will find this book very interesting with Mnemonics and Tricks**
- **Also beneficial for Drug Inspector, Pharmacists and other Pharma competitive examinations**

Importance of PYQ (Previous year question paper) in GPAT Exam

- **To know the exam pattern and to understand the question pattern.**
- **To understand important topics that shouldn't be skipped.**
- **To learn repeated theme based questions which were often asked in this exam.**
- **For self assessment and get an idea of your level of preparation.**

We have tried our best to avoid an printing/typographic errors. However, despite our efforts, some might have crept inadvertently. We will be thankful, if these are brought to our notice by simply dropping a mail in our official mail id **gdclive037@gmail.com**. We are always open to constructive criticism and timely suggestions from all starts of the profession.

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to all our contributors for their invaluable contributions to this book. Your dedication, expertise, and effort have played a crucial role in making this resource comprehensive, insightful, and beneficial for aspiring pharmacy professionals.

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Author's

EVOLUTION OF GATE/GPAT EXAM

Graduate Pharmacy Aptitude Test (GPAT) is a National Level Entrance Examination for entry into M. Pharma Programme.

This Test facilitates institutions to select suitable Pharmacy Graduates for admission into the Masters (M.Pharma) Program. The GPAT is a three hours Computer Based Online Test. A few scholarships and other financial assistance in the field of Pharmacy are also given on the basis of GPAT Scores.

1988-2009 (GATE PHARMACY)

Exam Mode : Offline
Conducted by : PCI, IIT
Syllabus : Specified
Questions : Theoretical & MCQ type
Depend upon year of exam

2010-2012 (GPAT)

Exam Mode : Offline
Conducted by : MS, University, Baroda
Syllabus : Specified
Question asked : 150 with 0.25 negative marking

2013-2018 (GPAT)

Exam Mode : Online
Conducted by : AICTE
Syllabus : Specified
Question asked : 125 with 0.25 negative marking

2019 - 2023 (GPAT)

Exam Mode : Online
Conducted by : NTA
Syllabus : Specified
Question asked : 125 with 0.25 negative mark

2024-Now (GPAT)

Exam Mode : Online
Conducted by : NBEMS
Syllabus : Specified
Question asked : 125 with 0.25 negative marking

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SCAN ME!

CURRENT GPAT EXAM PATTERN

These instructions should be followed by candidates while appearing in the Online Mode examination. This will familiarise candidates with the pattern /procedure of the examination.

The medium of Question Paper shall be in English only.

GPAT is an online computer-based test of 3 hours duration with 125 objective type questions.

1. Each question carries 04 (four) marks.
2. For each correct response candidate will get 04 (four) marks.
3. For each incorrect response 01 (one) mark will be deducted from the total score.

- The clock will be set at the server. The countdown timer in the top right corner of screen will display the remaining time available for you to complete the examination. When the timer reaches zero, the examination will end by itself. You will not be required to end or submit your examination.
- According to NBEMS, the GPAT question paper will be divided into five time-bound sections (A, B, C, D, and E). Each section will have 25 questions and 36 minutes allotted per section .
- The question palette displayed on the right side of screen will show the status of each question using one of the following symbols

- The flaged question simply indicates that you would like to look at the question again.
- If a question is answered than flaged will not be considered in the evaluation.

Navigating to a question

To answer a question do the following

- Click on the question number in the question palette to go to that question directly
- Select an answer for a multiple choice type question. Click on Save and next to save your answer for the current question and then go to next question.
- Click on Flagged and Next to save your answer for the current question, mark it for review and then go to next question.
- Caution: Note that if the answer you will not save and you navigate to another question directly by clicking on its question number that will not be marked.

You can view all the questions by clicking on the question paper button. Note that the options for multiple choice type question will not be shown

Previous Year Paper

GPAT-2025

PY-PHARMACEUTICAL SCIENCE

Multiple Choice Questions

125 QUE

Video Explanation

SCAN ME!

PHARMACEUTICS

1. **What is the USP prescribed maximum concentration limit for Benzalkonium chloride to be used as preservative in parenteral formulations**

(a) 0.05% (b) 0.005% (c) 0.01% (d) 0.001%

2. **Which of the following is the correctly matched pair**

P. True density	(i) Reciprocal of bulk density
Q. Granule density	(ii) Graduated cylinder method
R. Bulk density	(iii) Helium pycnometer
S. Bulkiness	(iv) Mercury displacement method

(a) P(i), Q(ii), R(iv), S(iii) (b) P(iii), Q(iv), R(ii), S(i)

(c) P(i), Q(ii), R(iii), S(iv) (d) P(iii), Q(ii), R(iv), S(i)

3. **Rheogram of which system does not start from the origin**

(a) Pseudoplastic systems (b) Dilatant systems

(c) Newtonian systems (d) Plastic systems

4. **In supercritical fluid extraction, critical temperature (tc) and critical pressure (pc) for CO_2 are**

(a) 31°C and 54 atm (b) 51°C and 54 atm (c) 31°C and 74 atm (d) 51°C and 74 atm

5. **Which of the following diluent is incompatible with primary amines**

(a) Lactose (b) Mannitol

(c) Microcrystalline Cellulose (d) Dextrose

6. **When the highest dose of a drug is soluble in 250 ml or less of an aqueous medium over the pH range from 1 to 6.8 at 37°C and the extent of absorption in humans is expected to be more than or equal to 85 % of the administered dose, the drug is said to be classified in which of the BCS Class**

(a) Class III (b) Class II (c) Class IV (d) Class I

7. **Which is an example of continuous shelf moving bed dryer**

(a) Vacuum Tumble Dryer (b) Tray Dryer

(c) Spray Dryer (d) Turbo Tray Dryer

8. **Which among the following is a class-II methods for tonicity adjustment**

(a) White Vincent method (b) Molecular concentration method

(c) Cryoscopic method (d) Sodium chloride equivalent method

43. What is the fasting physiological pH value in the jejunum

(a) 4.8 ± 0.4 (b) 6.8 ± 0.4 (c) 3.2 ± 0.4 (d) 8.6 ± 0.4

44. Furosemide inhibits

(a) The Na^+/K^+ co-transporter in the distal nephron and collecting tubules

(b) The Na^+/Cl^- co-transporter in the distal convoluted tubule

(c) The Na^+ channel controlled by aldosterone's protein mediator

(d) The $Na^+/K^+/2Cl^-$ co-transporter in the ascending loop of Henle

45. Which of the following is a peroxisome proliferator-activated receptor gamma agonist

(a) Acarbose (b) Metformin (c) Sulphonyl ureas (d) Pioglitazone

46. Select the proper sequence from start of contraction regarding skeletal muscle contraction

A. Release of calcium from sarcoplasmic reticulum after change in potential

B. Stimulation of motor end plate with acetylcholine

C. Troponin binds with calcium causing expose of binding sites for myosin

D. Actin and myosin crossbridge leads to power stroke

(a) BCDA (b) BACD (c) ABCD (d) BCAD

47. Match the following

Pancreatic islet cells type	Secretory Product
1. Alpha (α) cell	a. Glucagon
2. Beta (β) cell	b. Somatostatin
3. Delta (δ) cell	c. Gastrin
4. G cell	d. Proinsulin

(a) 1-a, 2-d, 3-b, 4-c (b) 1-d, 2-a, 3-c, 4-b (c) 1-a, 2-d, 3-c, 4-b (d) 1-a, 2-b, 3-c, 4-d

48. Match the following

CLASS	ANTIARRHYTHMIC DRUGS
1. Class I	a. Disopyramide
2. Class-II	b. Metoprolol
3. Class-III	c. Amiodarone
4. Class-IV	d. Verapamil

(a) 1-a, 2-b, 3-c, 4-d (b) 1-d, 2-b, 3-c, 4-a (c) 1-d, 2-c, 3-b, 4-a (d) 1-a, 2-c, 3-b, 4-d

49. Which of the following drugs when given with warfarin induces hepatic P450 enzymes

(a) Amiodarone (b) Ciprofloxacin (c) Carbamazepine (d) Metronidazole

50. BPaLM regimen is a combination of following drugs

(a) Bedaquiline, Pretomanid, Linezolid and Moxifloxacin

(b) Bedaquiline, Pyrazinamide, Linezolid and Moxifloxacin

(c) Bedaquiline, Pyrazinamide, Levofloxacin and Moxifloxacin

(d) Bedaquiline, Pretomanid, Linezolid and Montelukast

51. Match the following

CLASS	DRUG
1. Alkylating agent	a. Mechlorethamine
2. Platinum analog	b. Cisplatin
3. Antimetabolite	c. 5-Fluorouracil
4. Growth factor receptor inhibitor	d. Cetuximab

(a) 1-a, 2-b, 3-c, 4-d (b) 1-b, 2-a, 3-c, 4-d (c) 1-b, 2-a, 3-d, 4-c (d) 1-a, 2-b, 3-d, 4-c

OTHER SUBJECTS

118. Which of following test is distribution free, i.e., does not require any assumption to be made about population following normal or any other distribution

(a) Fischer LSD test (b) ANOVA (c) Kruskal Wallis test (d) Student t-test

119. Which statistical test is appropriate for comparing the means of two independent groups

(a) ANOVA (b) Paired t-Test (c) Pooled t-Test (d) Sample t-Test

120. Glycogenic amino acids entered in TCA cycle except [DROPPED QUESTION]

(a) Glutamate (b) Alanine (c) Aspartate (d) Glycine

121. Albinism is due to complete or partial absence of the following enzyme

(a) Hydroxylase (b) Tyrosinase (c) Pyurvase (d) β-hydroxylase

122. Which of the following is used for the evaluation of disinfectants

(a) Draves test (b) VDRL test (c) Chick Martin test (d) Widal test

123. Match the following with the type of causative agents

DISEASE	CAUSATIVE AGENTS
P. Tuberculosis	i. Bacteria
Q. Diphtheria	ii. Viral
R. Yellow fever	iii. Toxoid
S. Malaria	iv. Protozoa

(a) P(i), Q(ii), R(iii), S(iv) (b) P(i), Q(iii), R(ii), S(iv)
(c) P(iv), Q(iii), R(ii), S(i) (d) P(ii), Q(iii), R(iv), S(i)

124. Oral vaccines such as Dukoral® and Shanchol™ , provide protection against

(a) Pneumonia (b) Ebola virus (c) Cholera (d) Polio

125. Which parasitic worm is responsible for causing lymphatic filariasis

(a) *Brugia malayi* (b) *Ancylostoma duodenale*
(c) *Necator americanus* (d) *Onchocerca volvulus*

ANSWER KEY GPAT-2025

1-c	2-b	3-d	4-c	5-a	6-d	7-d	8-a	9-d	10-a
11-b	12-c	13-b	14-b	15-c	16-c	17-c	18-b	19-d	20-c
21-d	22-c	23-a	24-b	25-d	26-c	27-b	28-c	29-a	30-b
31-d	32-a	33-a	34-c	35-a	36-c	37-d	38-a	39-d	40-d
41-c	42-b	43-b	44-d	45-d	46-b	47-a	48-a	49-c	50-a
51-a	52-d	53-b	54-b	55-d	56-d	57-b	58-c	59-d	60-c
61-d	62-*	63-a	64-d	65-b	66-c	67-b	68-a	69-b	70-a
71-c	72-d	73-c	74-c	75-c	76-d	77-d	78-b	79-b	80-d
81-b	82-a	83-d	84-c	85-c	86-a	87-*	88-d	89-d	90-b
91-b	92-a	93-a	94-c	95-*	96-c	97-c	98-a	99-c	100-d
101-b	102-a	103-b	104-b	105-a	106-c	107-b	108-b	109-d	110-d
111-c	112-*	113-d	114-d	115-c	116-c	117-d	118-c	119-c	120-*
121-b	122-c	123-b	124-c	125-a					

ANSWER & EXPLANATION

1. Ans (c)

USP prescribed maximum concentration limit for Benzalkonium chloride in parenteral formulations is 0.01%

❑ **PRESERVATIVE USED IN PARENTERAL FORMULATIONS**

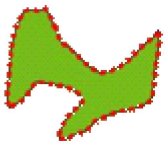
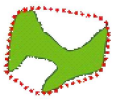
CLASS	AGENTS	CONC.
Quaternary ammonium compounds	**Benzalkonium chloride**	**0.01**
	Benzethonium chloride	0.01
Alcohols	Benzyl alcohols	1-2
	Chlorobutanol	0.5
	Cresol	0.3
	Phenol	0.5
Esters	Methyl Paraben	0.01-0.18
	Propyl Paraben	0.005-0.035
Mercurials	Phenyl mercuric nitrate/ acetate	0.001
	Thimerosal	0.001

Reference: Lachman Lieberman's The Theory and Practice of Industrial Pharmacy, Roop K Khar, 4th edition, Page no. 641

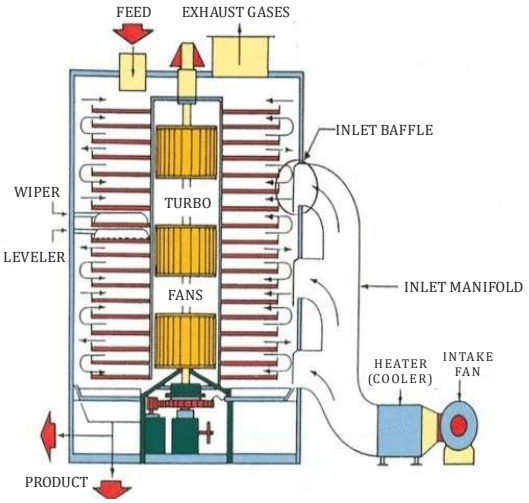
2. Ans (b)

❑ **DERIVED PROPERTIES OF POWDERS**

✓ **DENSITY**

TRUE DENSITY 	• The material itself, **exclusive** of the **voids and intraparticle pores** larger than **molecular or atomic dimensions** in the **crystal lattices.** • A pharmaceutical powder true density is greater than the granule density. $\frac{\text{Weight of powder}}{\text{True volume of powder}}$ Determined by • **Gas displacement method (He, N is used)** • Liquid displacement method • **Helium pycnometer** is used to determine.
GRANULE DENSITY 	• The ratio of the mass of the granular powder and the volume occupied by the granular material with its intraparticle spaces. • Mercury is suitable because it fills the voids, but fails to penetrate the internal porese of the particles. $\frac{\text{Granule weight}}{\text{Granule volume}}$ • Determined by **Mercury displacement method.**

- Heated air is circulated over the trays by turbo-type fans mounted in the center of the stack. Wet mass fed through the roof of the dryer is leveled by a stationary wiper.
- After about seven-eighths of a revolution, the material being dried is pushed through radial slots onto the tray below, where it is again spread and leveled.
- The transfer of mass from one shelf to the next is complete after one revolution.
- The same procedure continues throughout the height of the dryer until the dried material is discharged at the bottom.
- Because the turbo-tray dryer continuously exposes new surfaces to the air, drying rates are considerably faster than for tunnel dryers.



Reference: Lachman Lieberman's The Theory and Practice of Industrial Pharmacy, Roop K Khar, 4th edition, Page no. 101

8. Ans (a)

❑ **METHODS OF ADJUSTING TONICITY AND pH**

- In the **class I methods,** sodium chloride or some other substance is added to the solution of the drug to lower the freezing point of the solution to -0.52°C and thus make it isotonic with body fluids. Under this class are included the **cryoscopic method** and the **sodium chloride equivalent method.**
- In the **class II methods,** water is added to the drug in a sufficient amount to form an isotonic solution. The preparation is then brought to its final volume with an isotonic or a buffered isotonic dilution solution. Included in this class are the **White-Vincent method** and the **Sprowls method.**

Class I Method	Cryoscopic Method, Sodium Chloride Equivalent Method,
Class II Method	**White–Vincent Method**, The Sprowls Method

Reference: Martin's Physical Pharmacy and Pharmaceutical Science, Patrick J. Sinko, 6th edition, Page no.179

9. Ans (d)

$$\varepsilon_{intraparticle} = \left[1 - \frac{\rho_{g(granule\ density)}}{\rho_{p(True\ density)}}\right]$$

$$\varepsilon_{intraparticle} = \left[1 - \frac{2.350}{3.560}\right]$$

$$\varepsilon_{intraparticle} = [1 - 0.6601]$$

$$= 0.3399$$

$$= 0.34$$

Reference: Physical Pharmaceutics-II, C.V.S. Subramanyam, 2nd Edition, Page no. 312

10. Ans (a)

❑ **REQUIRED FOR THE MANUFACTURE OF VARIOUS CATEGORIES OF UNANI SYSTEM OF MEDICINES**

Category of Medicine	Minimum manufacturing space required
Arq.	100 sq. feet
Habb (Pills) and tablets.	100 sq. feet
Sufoof (Powder)	200 sq. feet
Marham, Zimad (Ointment)	100 sq. feet

Qurs (Tab.)	100 sq. feet
Kushta	100 sq. feet
Murabba	100 sq. feet
Sharbat and Joshanda	100 sq. feet

Reference: https://cdsco.gov.in/opencms/export/sites/CDSCO_WEB/Pdfdocuments/acts_rules/2016DrugsandCosmeticsAct1940Rules1945.pdf

11. Ans (b)

The **iron content in gelatin** used for **soft gelatin capsule shell manufacturing** should **not exceed 15 parts per million (PPM)**.

❑ **COMPOSITION OF SOFT GELATIN CAPSULE**

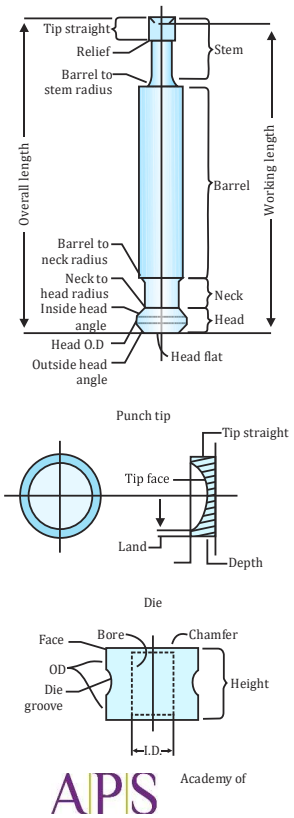
Gelatin	• Major component of capsule • Bloom strength – 150 to 250 g • Viscosity – 25 to 45 millipoise • **Iron – NMT 15 ppm**
Plasticizer	• Increases plasticity of the capsule shell. • SGC made elastic or plastic like, by addition of Sorbitol, Glycerin, PEG
Preservatives	• Prevent microbial contamination in the formulation. • Methyl paraben: Propyl paraben (4:1), Cholesterol
Opacifiers	Used to make the capsule opaque Titanium dioxide (TiO_2)
Fumaric acid	Increases acid solubility & reduce aldehyde tanning of gelatin
Sulfur dioxide (SO_2)	Used to prevent decomposition of gelatin.
Formaldehyde (Formalin)	Retard dissolution of gelatin shell.

Reference: Lachman Lieberman's The Theory and Practice of Industrial Pharmacy, Roop K Khar, 4th edition, Page no. 548

12. Ans (c)

❑ **COMPRESSION MACHINE TOOLING**

- The size and shape of a tablet as well as certain identification markings are deter mined by the compression machine tooling.
- Each tooling set consists of a die and upper and lower punches. Since each tablet is formed by a tooling set, the tooling must meet many requirements to satisfy the needs of dosage uniformity, production efficiency, and aesthetic appearance.
- Company names or symbols, trade names, dosage strength, or National Drug Code (NDC) numbers can be cut or engraved into a punch face, or the punches may be scored, to produce uniquely embossed or engraved tablets.
- Even though tooling design would appear to be limitless, certain practical aspects do limit design implementation. Because of the movement of tooling during a compression operation, certain tablet shapes or contour configurations perform better than others.
- Manufacturing specifications for tooling have been standardized by the Industrial Pharmaceutical
- Technology Section of the **Academy of Pharmaceutical Sciences in its Stan dard Specifications of Tabletting Tools**



Reference: Lachman Lieberman's The Theory and Practice of Industrial Pharmacy, Roop K Khar, 4th edition, Page no. 477

25. Ans (d)

Clausius–Clapeyron Equation	• The relationship between the **vapor pressure** and the **absolute temperature** of a liquid is expressed by the **Clausius–Clapeyron equation.** $\text{Log}\frac{P_2}{P_1} = \frac{\Delta H_v (T_2 - T_1)}{2.303 R T_1 T_2}$ • Where, P_1 and P_2 are the vapour pressure at absolute temperature. • T_1, T_2 and ΔH_v is the molar heat of vaporization.

Reference: Martin's Physical Pharmacy and Pharmaceutical Science, Patrick J. Sinko, 6th edition, Page no. 28

26. Ans (c)

❑ **EXAMPLES OF TRANSDERMAL DRUG DELIVERY SYSTEM**

Drugs	Marketed TDDS	Uses
Nitroglycerin	NITRO-DUR , TRANSDERM-NITRO, **NITRODISC**	Angina
Clonidine	CATAPRES -TTS	Antihypertensive
Ethinylestradiol and Norelgestromin	ORTHO-EVRA	Contraception
Fentanyl	DURAGESIC	Analgesia
Lidocaine	LIDODERM	Analgesia of post herpetic neuralgia (PHN)
Nicotine	HABITROL, NICODERM–CQ, NICOTROL, PROSTEP	Smoking cessation
Estradiol	ALORA, CLIMARA, ESCLIM, ESTRADERM, FEMPATCH, VIVELLE, VIVELLE-DOT	Hormone replacement
Estradiol + Norethindrone	COMBIPATCH	Hormone replacement
Oxybutynin	OXYTROL	Overactive bladder (antispasmodic)
Scopolamine	TRANSDERM SCOP	Motion Sickness
Lidocaine + Epinephrine	LIDOSITE	Dermal anesthesia

Reference: Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems, Loyd V. Allen and Howard C. Ansel, 10th edition, Page no. 352

27. Ans (b)

❑ **SCHEDULES TO THE RULES**

SCHEDULES	SIGNIFICANCE
F_3	Standards of sterilized umbilical tapes
FF	Standards for ophthalmic preparations
V	Standards for patent and proprietary medicines
Y	Requirements and guidelines for permission to import and / or manufacture of new drugs for sale or to undertake Clinical Trials

Reference: A Textbook of Forensic Pharmacy, N K Jain, 8th edition, Page no. 54 and 56

43. Ans (b)

Average pH values in healthy humans in the fasted and fed states at various sites in the upper GI tract

LOCATION	AVERAGE pH-FASTED STATE	AVERAGE pH-FED STATE
Stomach	1.3	4.9
Duodenum	6.5	5.4
Jejunum	6.6	5.2-6.0
Ileum	7.4	7.5

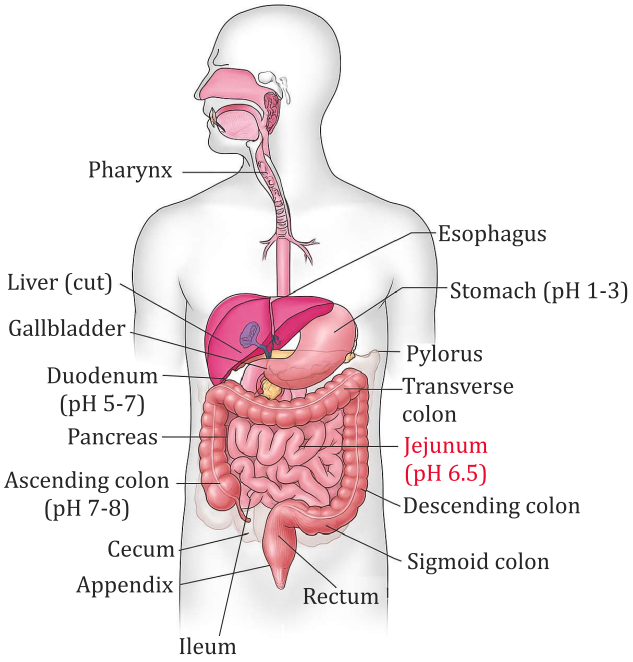


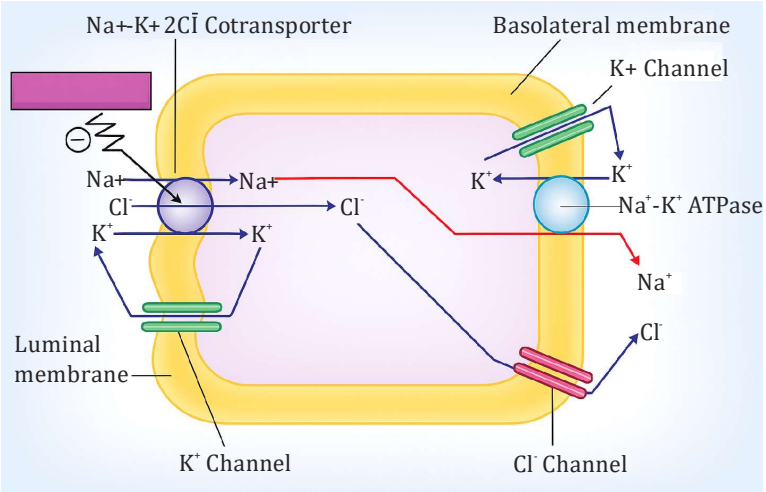
Fig:- Human Digestive System

References: The Theory and Practice of Industrial Pharmacy, Lachman/Lieberman's, 4th edition, Page no. 189/Martin's Physical Pharmacy and Pharmaceutical Science, Patrick J. Sinko, 6th edition, Page no. 564

44. Ans (d)

❑ **MECHANISM OF ACTION OF FUROSEMIDE**

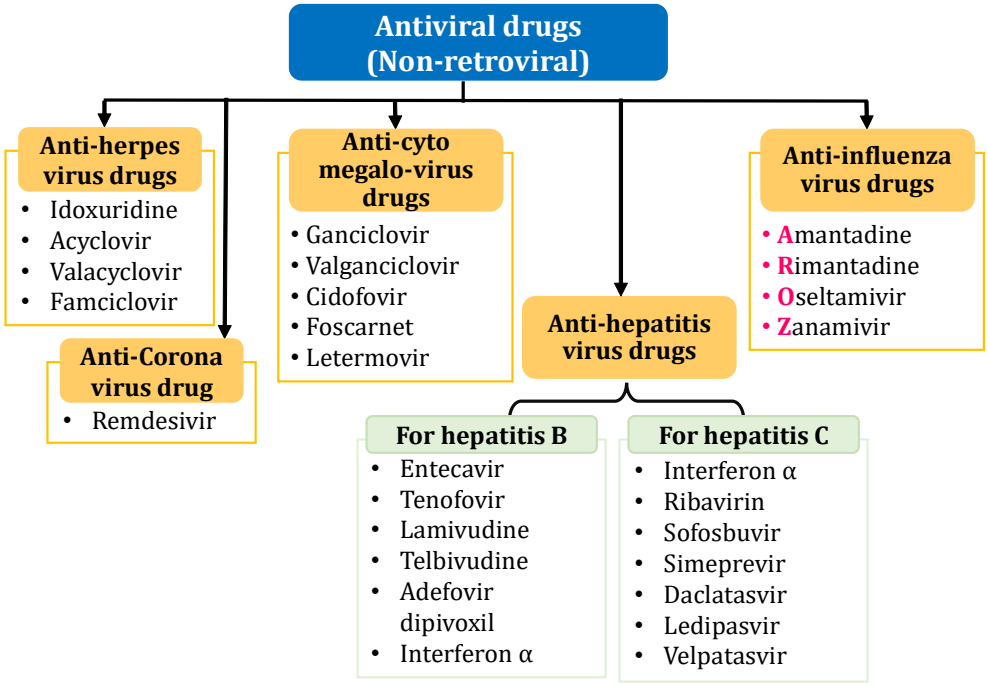
- The major site of action is the thick ascending limb of loop of Henle (TAL), therefore, called loop diuretics.
- **Furosemide inhibits Na^+- K^+-$2Cl^-$ cotransport.**



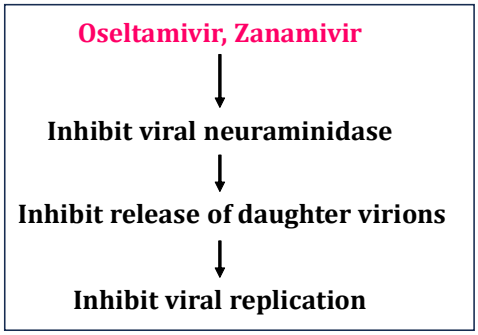
Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 626

67. Ans. (b)

❑ **ANTI-INFLUENZA VIRUS DRUGS**



- **Drugs: -** Amantadine, Rimantadine, Oseltamivir, Zanamivir
- Oseltamivir, Zanamivir act by inhibiting **Neuraminidase enzyme.**



Reference: Essentials of Medical pharmacology, KD Tripathi, 8th edition, Page no. 853

68. Ans. (a)

❑ **AGONIST AND ANTAGONIST OF 5-HT**

Agonist	**$5HT_1$**	**$5HT_{1A}$**	**Buspirone** [Partial agonist] (Anti-anxiety drug)
		$5HT_{1B/1D}$	**Sumatriptan** (Used in migraine)
	$5HT_3$	**2-methyl 5HT**	
	$5HT_4$	**Metoclopramide, Cisapride, Renzapride**	
Antagonist	**$5HT_{2A}$**	**Ketanserin** (Antihypertensive), **Cyproheptadine**	
	$5HT_{2A/2C}$	**Clozapine**, **Methysergide** (Used in migraine)	
	$5HT_3$	**Ondansetron, Granisetron** (Choice for chemotherapy induced vomiting)	

Reference: Essentials of Medical pharmacology, KD Tripathi, 8th edition, Page no. 190

69. Ans. (b)

❑ **ADVERSE EFFECT OF AMPHOTERICIN B**

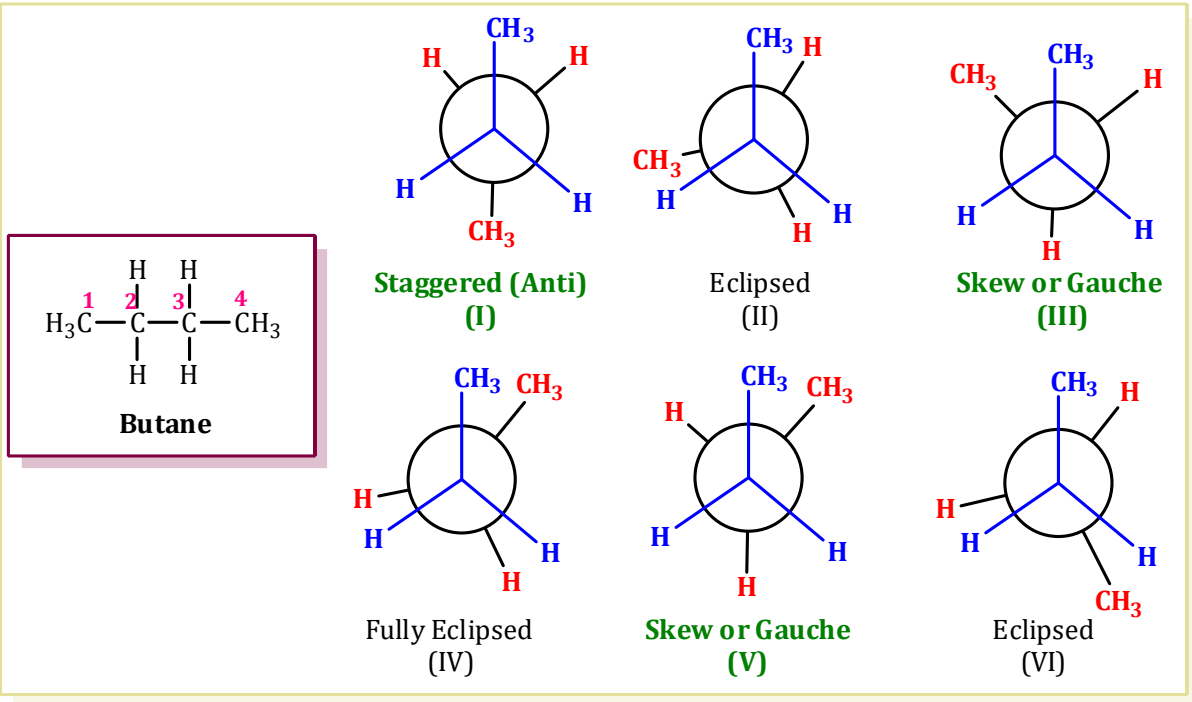
- Amphotericin B is a **"POLYENE ANTIBIOTICS"**

82. Ans (a)

"n-Butane exists in one anti and two gauche conformational isomers."

❒ **CONFORMATIONS OF BUTANE**

- n-Butane molecule can be considered as a dimethyl derivative of ethane in which one H-atom of each carbon is replaced by a methyl group as shown below:



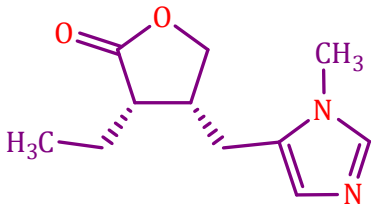
Reference: G.R.B. Organic Chemistry for Competitions, Dr O. P. Tandon and Dr A. K. Virmani, 2nd edition, Page no. 148

83. Ans (d)

❖ **Pilocarpine**

Pilocarpine is an alkaloid obtained from the dried leaflets of *Pilocarpus jaborandi* and *Pilocarpus microphyllus* in which it occurs to the extent of about 0.5% together with other alkaloids. Pilocarpine is a nonselective agonist on the muscarinic receptors.

✓ **Chemical Name: (3S,4R)-3-Ethyl-4-[(1-methyl-1H-imidazol-5-yl) methyl]-dihydrofuran-2(3H)-one**



(3S,4R)-3-Ethyl-4-((1-methyl-1H-imidazol-5-yl) methyl)dihydrofuran-2(3H)-one

✓ **Physical Properties:** It is a white or almost white crystalline powder or colourless crystals, hygroscopic, very soluble in water and in alcohol.

Reference: Medicinal and Pharmaceutical Chemistry, Harkishan Singh & V.K. kapoor, Revised 3rd Edition, Pg.no. 227

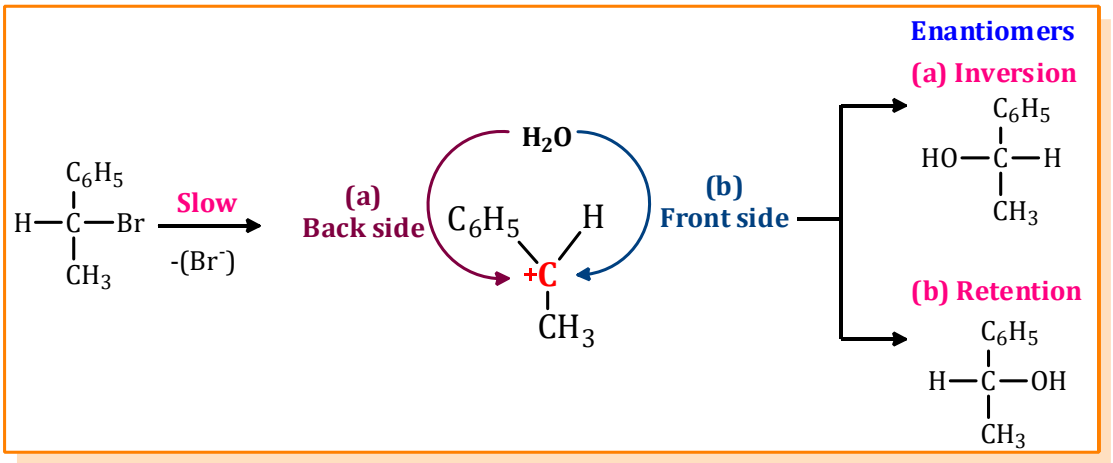
Volhard's method	Silver ion is titrated thiocyanate in as acidic solution. Titrant – $AgNO_3$, NH_4SCN, KSCN **$AgNO_3 + NaCl \rightarrow AgCl$** **$AgNO_3 + NH_4SCN \rightarrow AgSCN + NH_4NO_3$**	Ferric Ammonium Sulphate	Red colored complex
Fajan's method	Halide ions precipitate with silver ions to form silver halide. After all halide ions react with silver, the excess silver ions adsorb the indicator onto the surface of the precipitate, causing a color change that signals the endpoint.	**Acidic dyes:** Eosin Dichlorofluorescein. **Basic dyes:** Rhodamine, Rose Bengal	Color change due to adsorption of indicator on precipitate

Reference: Fundamental of Analytical chemistry, 9th edition, Precipitation titration Pg. no. 400

106. Ans (c)

❒ **S_N1 And S_N2 REACTION**

- In example of 1-bromo-1-phenylethane [$C_6H_5CH(Br)CH_3$], the S_N1 reaction involves racemisation plus inversion.



Note

✓ S_N1 reaction, **retention as well as inversion is** observed,

✓ S_N2 **complete inversion takes place (where chiral carbon exist).**

❒ **DISTINCTION BETWEEN S_N^2 AND S_N^1 REACTIONS**

S. NO.	FACTORS	S_N^2 REACTIONS	S_N^1 REACTIONS
1.	**Number of steps**	One	Two
2.	**Reaction rate and order**	**Second order**	**First order**
3.	**Molecularity**	Bimolecular	Unimolecular
4.	**Reacting nucleophile**	The nucleophile attacks the carbon of the substrate exclusively from the back side.	The nucleophile can attack the carbon of the substrate both on the back and front sides although the back-side attack predominates.
5.	**Stereo- chemistry**	Complete inversion of configuration take place.	Inversion and retention, takes place.
6.	**Reactivityorder of alkylhalides**	Methyl >1°>2°>3° (I > Br > Cl > F)	3° > 2° > 1° >methyl halide. (I > Br > Cl > F)
7.	**Rearrangement**	No rearranged product is formed.	Rearranged products can be formed.

Previous Year Paper

GPAT-2024

PY-PHARMACEUTICAL SCIENCE

Multiple Choice Questions

125 QUE

Video Explanation

SCAN ME!

PHARMACEUTICS

1. **Coating of Eudragit NE40D on tablets is done to prepare**
   (a) Buccal tablets (b) Sublingual tablets (c) CR tablets (d) IR tablets
2. **Examples of BCS class III drugs are**
   (a) Taxol, Ellagic acid, Aspirin
   (b) Chloroquine, Diltiazem, Metoprolol
   (c) Acyclovir, Atenolol, Captopril
   (d) Aspirin, Paracetamol, Amoxycillin
3. **Schedule T of Drugs and Cosmetics Rules, 1945 deals with**
   (a) GMP for Homeopathy medicine
   (b) GMP for ASU drugs
   (c) GLP and requirement of premises and equipments
   (d) GMP for Pharmaceutical product
4. **During compression of tablets, dwell time is**
   (a) Time it takes for the punches to eject tablet under the primary compression rollers
   (b) Time it takes for the punches to eject the tablets
   (c) Time it takes for the punches to stop moving vertically and to achieve maximum penetration in the die under the primary compression rollers
   (d) Time it takes for the punches to punch tablet
5. **Which of the following is NOT a method for solubility enhancement**
   (a) Crystallization (b) Co-solvency (c) Hydrotropy (d) Salt formation
6. **The bloom strength is directly proportional to**
   (a) Density
   (b) Viscosity
   (c) Measure of the strength and stiffness of the gelatin
   (d) Molecular weight
7. **Size of a pilot plant batch is**
   (a) $1/10^{th}$ of marketing batch
   (b) $1/5^{th}$ of marketing batch
   (c) $1/5^{th}$ of production batch
   (d) $1/10^{th}$ of production batch
8. **Nitrostat® is an example of**
   (a) Effervescent tablet
   (b) Bolus tablet
   (c) CR tablet
   (d) Sublingual tablet

22. Which of the following equipment measures weight variation using reflected energy

(a) Rotofill (b) Vericap-1200 (c) Rotoweigh (d) Rotosort

23. Which among the following is an example of high shear mixer

(a) Sigma blade mixer (b) Turbine mixer

(c) Jet mixer (d) Nauta mixer

24. The term of a patent granted under Indian Patent's Act is

(a) 40 Years (b) 10 Years (c) 30 Years (d) 20 Years

25. This given equation represents which law

$$E=K_k \ln \frac{d_1}{d_2}$$

(a) Rittinger's law (b) Kick's law (c) Fick's law (d) Bond's law

26. Which of the following is a correct expression of average particle size with value of p= 1 i.e; index related to the size of an individual particle and frequency index (f=2)

[DROPPED QUESTION]

$$d_{ln}=\frac{\sum nd^2}{\sum nd^3} \quad d_{ln}=\frac{\sum nd^3}{\sum nd^2} \quad d_{sl}=\frac{\sum nd^2}{\sum nd^3} \quad d_{sl}=\frac{\sum nd^3}{\sum nd^2}$$

A B C D

(a) D (b) C (c) B (d) A

27. In Michaelis-Menten equation when K_m=C

(a) Indicates zero-order process

(b) The rate process occurs at a constant rate

(c) Equation becomes identical to first order elimination of drug

(d) The rate of process is equal to half of maximum rate

28. Which of the following formula for calculating child dose is based on body weight

(a) Young's formula (b) Clark's formula

(c) Fried's formula (d) Dilling's formula

29. Which of the following is an example of physical incompatibility

(a) Error in dosage form (b) Alkaloidal incompatibility

(c) Drug interaction (d) Liquefaction

30. In drying process, which of the following parameters is same as the adiabatic saturation temperature

(a) Wet bulb temperature (b) Dew point

(c) Absolute humidity (d) Relative humidity

31. What should be the log P value for an ideal drug candidate for transdermal permeation

(a) Above 7 (b) 1-3 (c) 5-7 (d) Below 1

32. Which among the following is NOT the process of drug degradation

(a) Hydrolysis (b) Decarboxylation (c) Photolysis (d) Hemolysis

83. Plasma protein bound drugs are

(a) Pharmacodynamically inert

(b) Pharmacokinetically inert

(c) Pharmacodynamically active

(d) Pharmacokinetically and Pharmacodynamically inert

84. The short acting anticholinesterase drug is

(a) Neostigmine (b) Edrophonium (c) Echothiophate (d) Physostigmine

85. Two drugs producing the same clinical effects and safety profile when administered to patients are considered

(a) Minimum Effective Concentration (MEC)

(b) Therapeutic equivalent

(c) Minimum Toxic Concentration (MTC)

(d) Therapeutic window

86. Match the following antibodies with their CORRECT description

Antibody	Description
P. IgE	(I) Cross the placenta
Q. IgG	(II) Dominant antibody produced in immune responses
R. IgM	(III) It is found in the mother's milk
S. IgA	(IV) Responsible for autoimmune responses including allergies

(a) P-(IV), Q-(II), R-(III), S-(I) (b) P-(I), Q-(III), R-(II), S-(IV)

(c) P-(IV), Q-(I), R-(II), S-(III) (d) P-(I), Q-(II), R-(III), S-(IV)

87. Progressive loss of bone that occurs in osteoporosis is an example of

(a) Hypertrophy (b) Hyperplasia (c) Metaplasia (d) Atrophy

88. The visible coloured ring of the eye is called

(a) Lens (b) Iris (c) Cornea (d) Retina

89. Which of the following is a Partial Fatty acid oxidation (pFox) inhibitor

(a) Atosiban (b) Nicardipine (c) Trimetazidine (d) Verapamil

90. Outer Covering of the testes is

(a) *Tunica media* (b) *Tunica vaginalis* (c) *Tunica vasculosa* (d) *Tunica albuginea*

91. Sarcoma is the cancer of

(a) Epithelium (b) Plasma cells (c) Connective tissues (d) Glands

92. The Phase in which two identical copies of DNA are formed is

(a) G_1 phase (b) S phase (c) G_2 phase (d) M phase

93. Renin is released from

(a) Juxtaglomerular cells (JGCs) of kidney (b) Microglial cells

(c) Beta-cells of pancreas (d) Hepatocytes of liver

94. Which of the following cranial nerve is instrumental in motor function

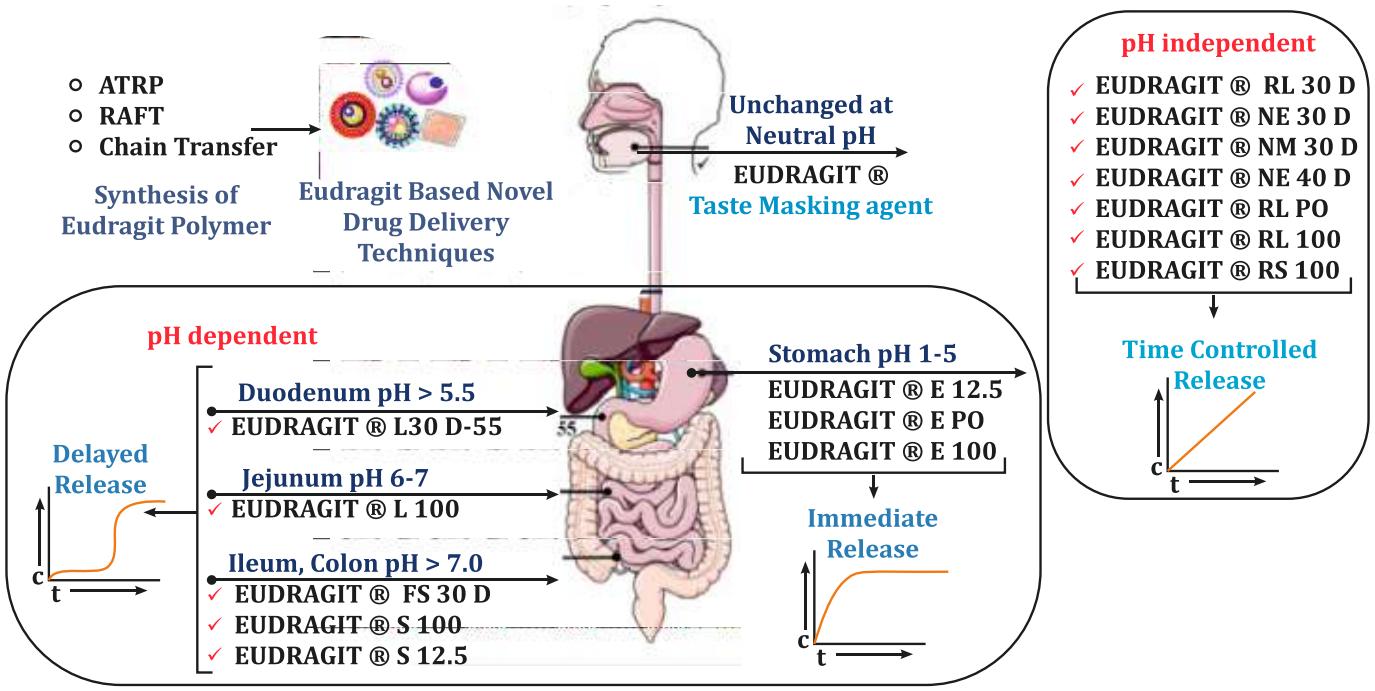
(a) Vestibulocochlear (b) Optic

(c) Accessory (d) Olfactory

ANSWER & EXPLANATION

1. Ans (c)

- **Eudragit** is a trademark of **polymethacrylate polymers** from **GmbH & Co.K.G Darmstadt, Germany.**
- A class of **artificial polymers** known as **polymethacrylates** are cationic and anionic neutral **derivatives of acrylic acid.**
- These polymers consist of different ratios of **dimethylaminoethyl methacrylate, methacrylic acid, and methacrylic acid esters.**
- **The most commonly used organic phase was a mixture of acetone and isopropanol (60:40).**
- **Ethyl acrylate-methyl methacrylate copolymer (Eudragit NE40D)** was evaluated as matrix material for preparing **controlled-release tablets** of **diclofenac sodium.**
- Eudragit NE40D is a type of polymer used for the coating of tablets to achieve **controlled release (CR).**
- **Reversible addition–fragmentation chain transfer (RAFT), Atom transfer radical polymerization (ATRP).**



- It forms a **water-insoluble but permeable film** on the surface of the tablet, which helps in the **slow release of the drug over an extended period.**

2. Ans (c)

❑ **BIOPHARMACEUTICAL CLASSIFICATION SYSTEM**

- Based on the **intestinal permeability and solubility and dissolution** of drugs, ***Amidon et al*** developed **Biopharmaceutics Classification System (BCS)** which classifies the drugs into one of the 4 groups

28. Ans (b)

❑ **ON THE BASIS OF AGE**

NAME	FORMULA'S	USED TO CALCULATE
Young's formula	Child dose = $\frac{\text{Age in years}}{12+\text{ Age in years}} \times$ Adult Dose	For children under 12 years of age
Dilling's formula	Child dose = $\frac{\text{Age in years}}{20} \times$ Adult Dose	Doses for children in between 4 to 20 years
Cowling's formula	Child dose = $\frac{\text{Age in years}}{24} \times$ Adult Dose	----
Fried's formula	Child dose = $\frac{\text{Age in months}}{150} \times$ Adult Dose	Children under age of one year
Bastedo's formula	Child dose = $\frac{\text{Age in years}+3}{30} \times$ Adult Dose	----

❑ **ON THE BASIS OF BODY WEIGHT**

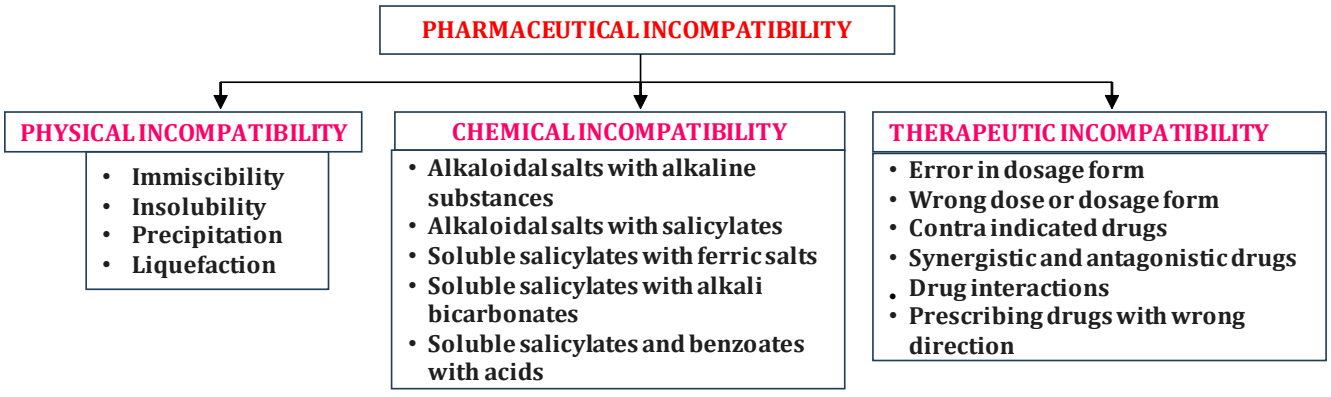
NAME	FORMULA'S	USED TO CALCULATE
Clark's formula	Child dose = $\frac{\text{Child weight in kg}}{70} \times$ Adult Dose Child dose = $\frac{\text{Child weight in pound}}{150} \times$ Adult Dose	Dose for the children according to body weight

❑ **ON THE BASIS OF SURFACE AREA**

NAME	FORMULA'S	USED TO CALCULATE
Catzel's formula	Child dose = $\frac{\text{B.S.A of child } (m^2)}{\text{B.S.A of adult } (1.73\ m^2)} \times$ Adult Dose	Dose for the children according to surface area

Reference: Dispensing Pharmacy, R M Mehta, 4th edition, Page no. 71

29. Ans (d)



Reference: Dispensing Pharmacy, R M Mehta, 4th edition, Page no. 323

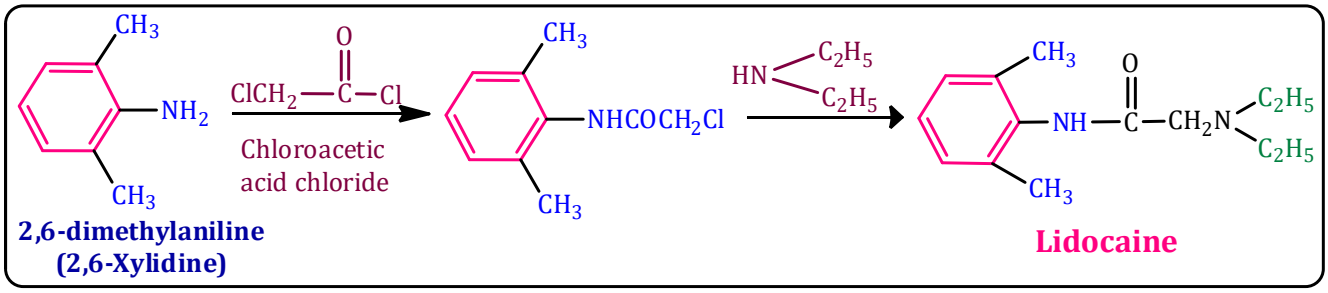
NUMBER OF PROTONS	NUMBER OF NEUTRONS	SPIN QUANTUM NUMBER, I	EXAMPLE
Even	Even	0	^{12}C, ^{16}O, ^{32}S
Odd	Even	1/2 , 3/2	^{1}H, ^{19}F, ^{31}P, ^{11}B, ^{35}Cl, ^{79}Br
Even	**Odd**	**1/2**	**^{13}C**
Odd	Odd	1	^{2}H, ^{14}H

Reference: Instrumental method of chemical analysis – I, BK Sharma, 26th edition, Page no. 620

35. Ans (b)

❑ **SYNTHESIS OF LIGNOCAINE**

The starting raw material for synthesis of lignocaine is 2,6-dimethylaniline (2,6-xylidine).

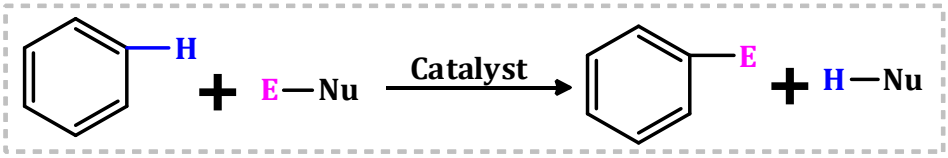


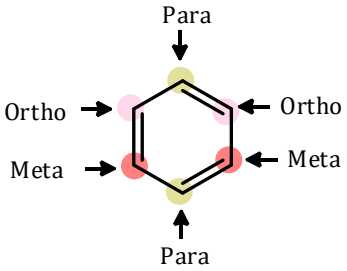
Reference: A Textbook of Medicinal Chemistry, Vol I, V. Alagarsamy 3rd edition, Page no. 186

36. Ans (b)

❑ **ELECTROPHILIC SUBSTITUTION**

- Electrophilic substitution involves, the attack by an electrophile. It is represented as S_E (S stands for substitution and E stands for electrophile).

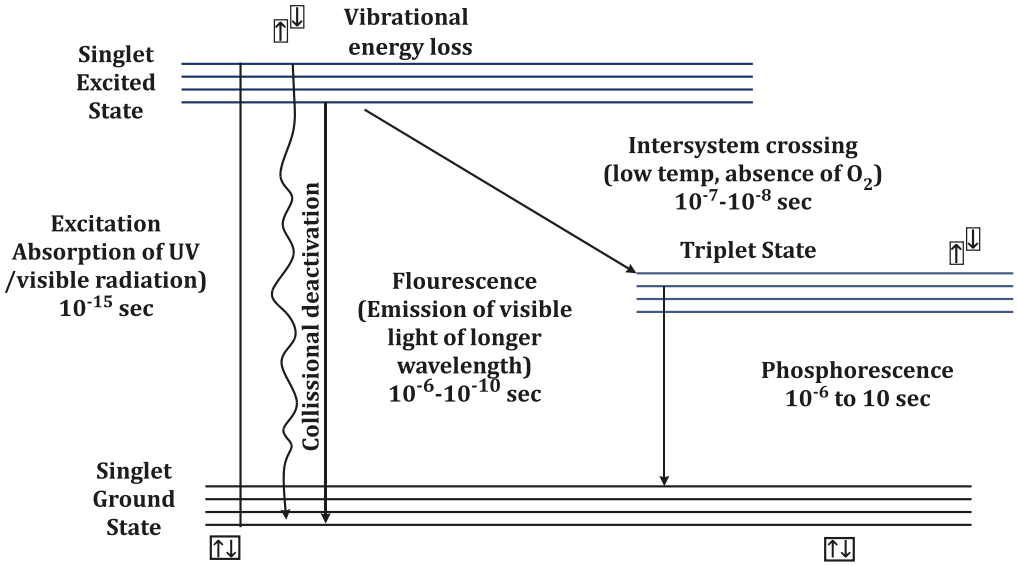




❐ **EFFECT OF SUBSTITUENTS ON ELECTROPHILIC AROMATIC SUBSTITUTION**

ORTHO-PARA DIRECTORS	META-DIRECTORS
Strongly activating **$-NH_2$, -NHR**, $-NR_2$, -OH, $-O^-$	**Moderately deactivating** $-C\equiv N$, $-SO_3H$, -COOH, -COOR, -CHO, -COR
Moderately activating $-NHCOCH_3$, -NHCOR, $-OCH_3$, -OR	**Strongly deactivating** $-NO_2$, $-\overset{+}{N}R_3$, $-CF_3$
Weakly activating $-CH_3$, $-C_2H_5$, -R, $-C_6H_5$, $-CH=CH_2$	**Weakly activating** $-\overset{+}{N}H_3$, $-\overset{+}{N}H_2R$
Weakly deactivating **-F**, -Cl, -Br, -I	**Weakly deactivating** $-CCl_3$

Reference: G.R.B. Organic Chemistry for Competitions, Dr O. P. Tandon and Dr A. K. Virmani, Page no. 894



Reference: Textbook of Pharmaceutical Analysis, Ravi Shankar, 5th edition, Page no. 3.3

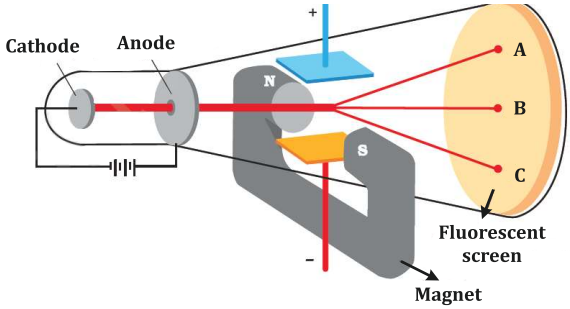
59. Ans (b)

❑ **CATHODE RAYS**

- **Cathode rays are not electromagnetic waves**; they are streams of electrons, which are particles with mass and charge.
- **Cathode rays** are streams of electrons observed in vacuum tubes.

❖ **They possess the following properties:**

- **Produce X-rays:** When cathode rays strike a material with high atomic number, they can produce X-rays.
- **Traveling in a tube:** Cathode rays travel through a vacuum tube from the cathode to the anode.
- Cathode rays are electromagnetic waves.

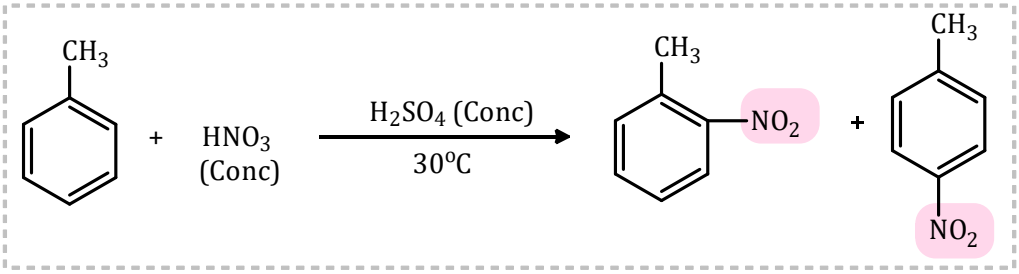


Reference: Instrumental method of chemical analysis – I, BK Sharma, Page no. 494

60. Ans (a)

❑ **NITRATION OF TOLUENE**

- Toluene forms a mixture of **ortho- and para-nitrotoluenes** when treated with a mixture of conc. HNO_3 and conc. H_2SO_4.



88. Ans (b)

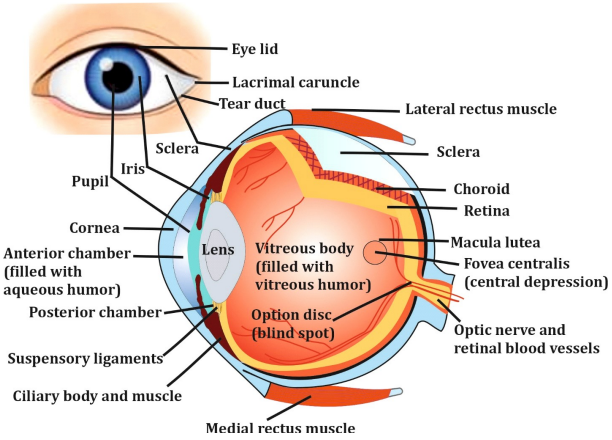
❑ **IRIS**

- The **visible colored ring of the eye** is called the iris.
- The iris is a **thin, double layered ring** of muscle tissue that surrounds the pupil and controls the amount of light that enters the eye.
- **Functions: -** Regulates pupil size, Determines eye color.

❖ **Lens:** Transparent, flexible structure behind iris, focuses light.

❖ **Cornea:** Transparent outer layer, covers iris and pupil.

❖ **Retina:** Innermost layer, converts light to electrical signals.



Reference: Anatomy and physiology, Ross and Wilson, 14th edition, Page no. 219 & 220

89. Ans (c)

❑ **TRIMETAZIDINE**

- This antianginal drug acts by non-haemodynamic mechanisms.
- There is no effect on determinants of myocardial O_2 consumption, such as HR and BP, both at rest as well as during exercise, but angina frequency is reduced and exercise capacity is increased.
- **Partial Fatty Acid Oxidation (pFOX) inhibitor**
- Shifts energy production from fatty acid oxidation to glucose oxidation

Mechanism of action

- Inhibits long-chain 3-ketoacyl CoA thiolase (3-KAT)
- Reduces fatty acid oxidation
- Increases glucose oxidation, improving myocardial efficiency

❖ **Atosiban:** Oxytocin receptor antagonist, used in preterm labor.

❖ **Nicardipine:** Calcium channel blocker, used in hypertension and angina.

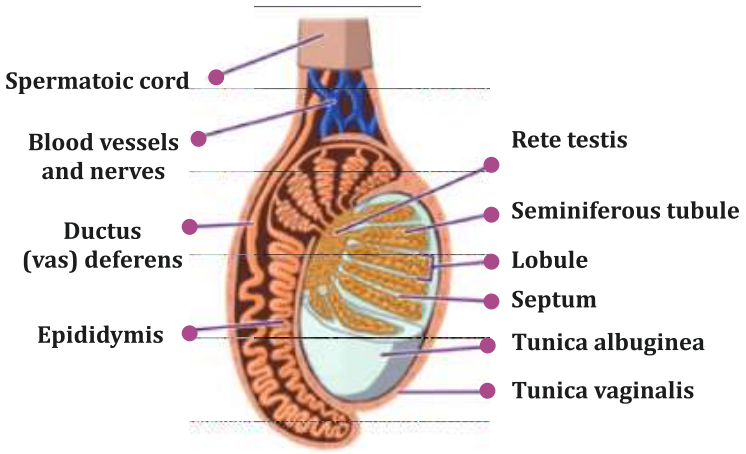
❖ **Verapamil:** Calcium channel blocker, used in hypertension, angina, and arrhythmias.

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 599

90. Ans (b)

❖ **Tunica vaginalis:** This is a double membrane, forming the **outer covering of the testes**, and is a downgrowth of the abdominal and pelvic peritoneum. During early fetal life, the testes develop in the lumbar region of the abdominal cavity just below the kidneys.

❖ **Tunica albuginea:** This is a fibrous covering **beneath the tunica vaginalis** that surrounds the testes. In growths form septa, dividing the glandular structure of the testes into lobules.



107. Ans (b)

DRUG	BIOLOGICAL SOURCE	CHEMICAL CONSTITUENT
Ginseng 	Dried roots of ***Panax ginseng*** (Korean ginseng), and other species of Panax like • ***Panax japonicus*** (Japanese Ginseng) • ***Panax notoginseng*** (Chinese ginseng) • ***Panax pseudoginseng*** (Himalayan Ginseng)	It contain mixture of several saponin glycosides, belonging to **triterpenoid group.** **Triterpenoids with their hydrolysis product:** 1. **Ginsenosides**→Dammarol (aglycone) 2. **Panaxosides** → Oleanolic acid (aglycone) + Panaxadiol + Panaxatriol 3. **Chikusetsu saponin**
Senega 	Dried root and rootstock of ***Polygala senega*** or ***Polygata senega var. latifolia.*** **Family:** Polygalaceae	**Senegin (4 %)** and **polygalic acid (5.5 %).**
Liquorice 	Yasti consists of dried, unpeeled, roots and stolons of ***Glycyrrhiza glabra.*** **Family:** Leguminosae	• Triterpenoid saponin: Glycyrrhizic (responsible for sweet taste). • Oleandane derivative **carbexolone** is prepared from glycyrrhiza.
Quallia 	Quillaia is the dried inner part of the bark of ***Quillaja saponaria.*** **Family:** Rosaceae	Glycosides on hydrolysis yield quillaic acid (sternutatory) and quillaia-sapotoxin (acrid taste).

Reference: Textbook of pharmacognosy, C. K. Kokate, 58th edition, page no. 9.53, 9.64,9.68,9.61

108. Ans (c)

Rancidity is the process by which fats and oils in food break down. Oils with high peroxide values (> 10 meq O_2/kg) are regarded unstable and easily become rancid

❑ **EVALUATION OF FIXED OILS AND FATS**

PARAMETERS	DESCRIPTION
Iodine value	• The iodine value is the number of parts of iodine absorbed by 100 parts by weight of the substance. • Measures the **unsaturation** level of fats.
Saponification value	Number of mg of potassium hydroxide required to neutralize the free acids in, and to hydrolysed the esters in, 1 g of the substance.
Hydroxyl value	Number of milligrams of potassium hydroxide required to neutralize the acid combined by acylation with 1g sample of fat or oil.
Acetyl value	Number of milligrams of potassium hydroxide required to neutralize the acetic acid obtained by the hydrolysis of the acetylated fat or other substance.
Unsaponifiable matter	It is the matter present in fats and oil, which after saponification by caustic alkali and subsequent extraction with an organic solvent, remains non-volatile on drying at 80°C. It includes sterols (phytosterol and cholesterol), oil soluble vitamins, hydrocarbons and higher alcohols.

Previous Year Paper

GPAT-2023
(SHIFT - I)
PY-PHARMACEUTICAL SCIENCE

Video Explanation SCAN ME!

Multiple Choice Questions 125 QUE

PHARMACEUTICS

1. **Which of the following terms is used to describe the "Partial or complete separation of the top or body crowns of a tablet from the main body of the tablet"**
   (a) Lamination (b) Capping (c) Picking (d) Mottling
2. **The law of relative lowering of vapour pressure was given by**
   (a) Raoult (b) Ostwald (c) Henry (d) Van't Hoff
3. **Dipole-dipole weak interactions are also called as**
   (a) London forces (b) Debye interactions
   (c) Electrovalent forces (d) Keesom forces
4. **Invert sugar is a product obtained by the hydrolysis of**
   (a) Maltose (b) Sucrose (c) Lactose (d) Dextrin
5. **The time taken at a fixed temperature or the radiation dose required to achieve a 90% reduction in viable bacterial cells is called**
   (a) F value (b) Z value (c) D value (d) T value
6. **In pharmacokinetic models, the term "Compartment" means**
   (a) Blood (b) Individual organ
   (c) Extracellular fluid (d) Hypothetical pool of tissue
7. **The most efficient heat exchange between the particles and flowing air occurs in the**
   (a) Tray dryer (b) Vacuum Dryer (c) Fluidized bed dryer (d) Rotary dryer
8. **The Drug Price Control Order (DPCO) is an order issued by the Government under the _____ which enables it to fix the prices of some essential bulk and their formulations**
   (a) Essential Commodities Act (b) Essential Commodities Amendment
   (c) Essential Commodities Accessories (d) Ethical Commodities Act
9. **According to IP and BP, very fine powder is one in which**
   (a) All particles pass through 120# sieve (b) 90% particles pass through 350# sieve
   (c) All particles pass through 350# sieve (d) 90% particles are of size < 10µm
10. **Which of the following pharmaceutical solvent has the highest dielectric constant, at 25 degree C**
    (a) Glycerin (b) Ethanol (c) Acetone (d) Phenol
11. **Kozeny Carman equation is used to determine the**
    (a) Surface area of the powder (b) Viscosity of a liquid
    (c) Surface tension of a liquid (d) Density of a liquid
12. **Which of the following emulsifiers has the highest HLB value**
    (a) Span 80 (b) Acacia (c) Tween 80 (d) Sodium lauryl sulfate

27. Match the following List I with List II with respect to most specific Activity / Property in formulation of disperse system

LIST I FORMULATION INGREDIENT		LIST II ACTIVITY / PROPERTY	
1.	Salts of d-glucuronic acid polypeptides and amino acids	[P]	Are pseudoplastic and plastic in nature
2.	Surfactants, both ionic and nonionic	[Q]	Form a multimolecular film around the dispersed droplets of oil in an o/w emulsion
3.	Magnesium aluminium silicate	[R]	Emulsifier belonging to the class of solid particles form W/O emulsion
4.	Structured vehicles	[S]	Emulsifier belonging to the class of solid particles and form O/W emulsion
		[T]	Have been used to bring about flocculation of suspended particles

Choose the correct answer from the options given below

(a) 1-[Q], 2-[T], 3-[S], 4-[P] (b) 1-[T], 2-[S], 3-[Q], 4-[P]
(c) 1-[T], 2-[S], 3-[R], 4-[P] (d) 1-[S], 2-[R], 3-[Q], 4-[P]

28. What is the percentage of alcohol in a mixture obtained by mixing 5 L of 25%, 3 L of 40% and 2 L of 15% alcohol

(a) 27.5% v/v (b) 30.5% v/v (c) 25.5% v/v (d) 26.5% v/v

29. For disguising the astringent and metallic taste of iron salts in children's mixture, the following flavoring agent is used

(a) Orange syrup and compound orange syrup (b) Lemon syrup
(c) Liquorice liquid extract (d) Aromatic water

30. A tablet excipient, whose function is to ensure that tablet formulation and ejection can occur with low friction between the solid and the die wall, is called

(a) Glidant (b) Lubricant (c) Anti-adhesive (d) Binder

31. Clathrates crystallize in the form of

(a) Channel type structure (b) Tetragonal type structure
(c) Cubic type lattice (d) Cage like lattice

32. Which of the following ointment bases is an "Absorption base"

(a) Yellow ointment USP (b) Hydrophilic petrolatum USP
(c) Hydrophilic ointment USP (d) PEG ointment NF

33. Which of the following surfactants is an Anionic surfactant

(a) Lecithin (b) Sorbitan esters (c) Benzalkonium chloride (d) Soaps

34. Which of the following formulations are "Pharmaceutically equivalent"

Match List I with List II

INGREDIENT		FUNCTION		TABLET A	TABLET B	TABLET C	TABLET D
P	Acetaminophen	I	Drug	300mg	--	300mg	300mg
Q	Aspirin	II	Drug	--	300mg	--	--
R	Lactose	III	Filler	100mg	100mg	--	100mg
S	Avicel	IV	Filler	--	--	100mg	--
	Starch		Disintegrant	50mg	50mg	--	50mg
	Avicel		Disintegrant	--	--	50mg	--
	Mag stearate		Lubricant	2mg	2mg	2mg	2mg
	Gelatin		Binder	10mg	10mg	10mg	10mg

Choose the correct answer from the options given below

(a) P and Q (b) Q and R (c) P and R (d) Q and S

104. Which of the following is a Tetracycline antidepressant that has additional Dopamine D_2 receptor blocking and neuroleptic properties as well as a greater tendency to cause seizures in overdose [DROPPED QUESTION]

(a) Dothiepin (b) Doxepin (c) Trazodone (d) Amoxapine

PHARMACOGNOSY

105. Which one is the right sequence of the intermediates in the biosynthesis of opium alkaloids

I. Tyrosine II. Reticuline III. Codeine IV. Morphine V. Thebaine

Choose the CORRECT answer from the options given below

(a) I, II, III, IV, V (b) I, II, V, III, IV (c) I, II, V, IV, III (d) I, II, IV, V, III

106. Arrange the following intermediates in the synthesis of isoprenoids in the right sequence

I. Squalene II. Farnesyl PP III. Geranyl PP IV. Acetyl CoA V. Mevalonate

Choose the CORRECT answer from the options given below

(a) IV, II, III, I, V (b) IV, V, III, II, I (c) II, III, IV, I, V (d) V, II, III, I, IV

107. If the resins contain benzoic acids or cinnamic acids they are called

(a) Colophony (b) Balsams (c) Glucoresins (d) Resene

108. Lycopodium spores are used in quantitative microscopy for the following

I. Determine % purity of drugs

II. Estimation of percentage of foreign organic matter

III. Determination of palisade ratio

IV. Measurement of area of single layered tissue

Choose the CORRECT answer from the options given below

(a) I, II and III only (b) I, II and IV only (c) I only (d) II and IV only

109. The ring structure present in strychnine alkaloid is

(a) Indole (b) Purine (c) Phenanthrene (d) Imidazole

110. Isabgol belongs to family

(a) Apocynaceae (b) Plantaginaceae (c) Solanaceae (d) Golaceae

111. Lignin is a complex polymer which can be stained pink in the tissue using the following chemicals

(a) Chloral Hydrate and Phloroglucinol (b) Chlor-Zinc-Iodine

(c) Phloroglucinol and hydrochloric acid (d) Chloral Hydrate, Zinc and Ammonia

112. Match the following Ayurvedic formulations under Column I with the process/properties under Column II and choose the CORRECT options

LIST I AYURVEDIC FORMULATIONS		LIST II PROCESS OR PROPERTY	
1.	Bhasma	[P]	Semisolid
2.	Arista	[Q]	Calcination
3.	Churna	[R]	Alcohol generation
4.	Lehya	[S]	Dry powder
		[T]	Decoction

Choose the CORRECT answer from the options given below

(a) 1-[P], 2-[R], 3-[S], 4-[T] (b) 1-[R], 2-[Q], 3-[P], 4-[S]

(c) 1-[R], 2-[T], 3-[P], 4-[Q] (d) 1-[Q], 2-[R], 3-[S], 4-[P]

119. Match the process of reproduction and genetic exchange under column I with the explanation under column II Match List I with List II

LIST I PROCESS OF REPRODUCTION AND GENETIC EXCHANGE		LIST II EXPLANATION	
1.	Binary fission	[P]	Transfer of genetic material from the donor to recipient bacterium through cell contact
2.	Transformation	[Q]	Common vegetative reproduction
3.	Transduction	[R]	Transfer of genetic material in bacteria through virus
4.	Conjugation	[S]	Horizontal gene transfer by taking up of foreign genetic material (naked DNA)

Choose the CORRECT answer from the options given below

(a) 1-[P], 2-[R], 3-[S], 4-[Q]
(b) 1-[R], 2-[P], 3-[S], 4-[Q]
(c) 1-[Q], 2-[S], 3-[P], 4-[R]
(d) 1-[Q], 2-[S], 3-[R], 4-[P]

120. Match List I with List II

LIST I FERMENTATION PRODUCTS		LIST II STRAIN USED	
1.	Dextran	[P]	*Clostridium tetani*
2.	Bacterial amylase	[Q]	*Brevibacterium sp.*
3.	Glutamic acid	[R]	*Leuconostoc mesenteroides*
4.	Vitamin B_{12}	[S]	*Bacillus subtilis*
		[T]	*Streptomyces olivaceus*

Choose the CORRECT answer from the options given below

(a) 1-[T], 2-[P], 3-[S], 4-[R]
(b) 1-[P], 2-[S], 3-[Q], 4-[R]
(c) 1-[Q], 2-[R], 3-[T], 4-[S]
(d) 1-[R], 2-[S], 3-[Q], 4-[T]

121. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R

Assertion A : Exotoxins diffuse freely through the bacterial cell wall into the medium in which the organisms are growing

Reason R : They are water soluble and can pass into the surrounding medium

In the light of the above statements, choose the CORRECT answer from the options given below

(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

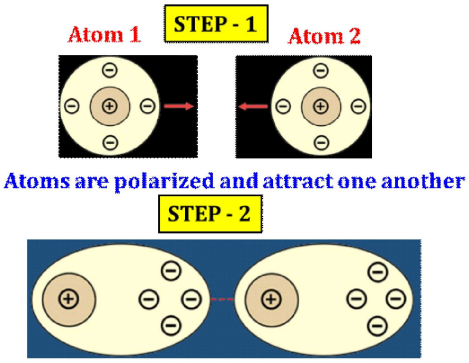
3. Ans (d)

Dipole-dipole weak interactions are also called as Keesom forces

❑ **VAN DER WAALS FORCE, KEESOM FORCE, DEBYE FORCE AND LONDON FORCE**

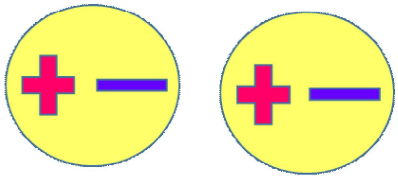
✓ **Van Der Waals Forces**

- Van der Waals forces are **weak intermolecular forces** that are dependent on the distance between atoms or molecules
- These forces arise from the interactions between uncharged atoms/molecules.



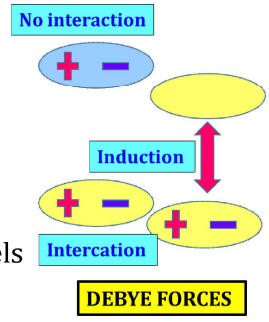
✓ **Keesom Forces**

- **Also called Dipole – dipole interaction, orientation effect**
- The **permanent dipoles interact** with one another in an **ion like fashion.**
- However, because the **charges are partial**, the **strength of bonding** is much weaker
- Keesom interactions has a force of **1-7 kcal/mol**



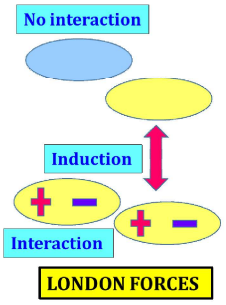
✓ **Debye Force**

- Also called **Dipole – induced dipole interaction**/ induction effect
- **Dipoles** occur when one molecule with a **permanent dipole** repels **another molecule's electrons.**



✓ **London Forces**

- Also called **Induced dipole – induced dipole interaction, dispersion effect**
- **Attractive** forces that cause **nonpolar substances** to **condense to liquids** and to **freeze into solids** when the temperature is **lowered sufficiently.**



Reference: Martin's Physical Pharmacy and Pharmaceutical Science, Patrick J. Sinko, 6th edition, Page no. 18-20

4. Ans (b)

Invert sugar is a product obtained by the hydrolysis of Sucrose

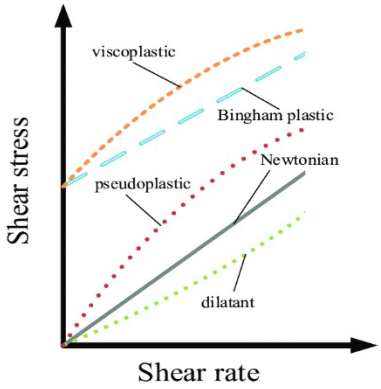
❑ **HYDROLYSIS OF CARBOHYDRATES**

Sucrose	• **Invert sugar** is a mixture of equal parts of **glucose and fructose** produced from the hydrolysis of **sugar (sucrose).** • Hydrolysis of sucrose by the enzyme sucrase (invertase) or dilute acid liberates one molecule each of glucose and fructose. $C_{12}H_{22}O_{11}$ (Sucrose) —Sucrase, Hydrolysis (H_2O)→ $C_6H_{12}O_6$ (Glucose) + $C_6H_{12}O_6$ (Fructose) Glucose + Fructose = Invert sugar

21. Ans (a)

❑ **SHEAR RATE AND SHEAR STRESS**

Shear rate and shear stress are fundamental quantities used in rheology to describe the behavior of a liquid or the motion and deformation of a substance



❖ **Shear Rate (Rate of Shear) (G):-** The difference of velocity **(dv)** between two planes of liquid separated by an infinitesimal distance **(dr)** is the Rate of Shear **(dv/dr).** [Unit: s^{1}]. Rate of shear is given the **symbol G.**

❖ **Shear Stress (Stress of Shear) (F):-** The force per unit area, **F'/A,** required to bring about flow is called the Shearing Stress given **symbol F.** [Unit: Pa]. Hence, rate of shear should be directly proportional to shearing stress

$$\frac{F'}{A} = \eta \frac{dv}{dr}$$

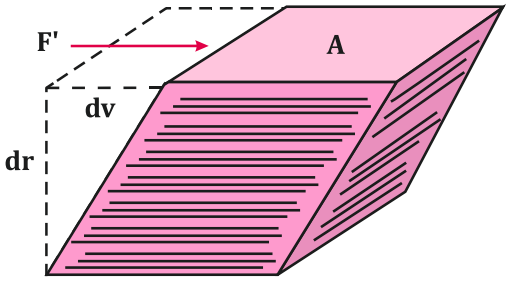


Fig. - Representation of the shearing force required to produce a definite velocity gradient between the parallel planes of a block of material.

Reference: Martin's Physical Pharmacy and Pharmaceutical Science, Patrick J. Sinko, 6th edition, Page no. 470

22. Ans (b)

❑ **FREEZING POINT DEPRESSION (lowering) method F.P.D (Cryoscopic method)**

- Depression of freezing point- depend on the number of particles in the solution
- Temperature at which blood plasma and tears freeze is **-0.520 (°C).**
- Any solutions which freezes at **-0.520 (°C)** is isotonic with blood plasma and tears.
- We calculate amount of adjusting agent needed to adjust isotonicity for solutions to be made iso- osmotic with blood serum is

$$w = \frac{0.52 - a}{b}$$

Where,

w= Weigh of the added substance

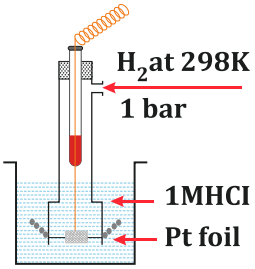
a = Freezing point of the unadjusted solution, (°C)

b= Freezing point of a 1% w/v solution of the adjusting substance. (if more than 1% the value of b must be adjusted) (°C)

Reference: Dispensing Pharmacy, R M Mehta, 6th edition, Page no. 94

49. Ans (c)

❒ **STANDARD HYDROGEN ELECTRODE (SHE)**



- **Consists of platinum wire**, carrying platinum foil coated with finely divided platinum black.
- The wire is sealed into a glass tube, placed in **beaker containing 1 M HCl.**
- The hydrogen gas at **1 atm pressure** is bubbled through the solution at 298K.
- Half-cell is Pt H_2 (1 atm) $|H^+$ (1 M).
- **The electrode potential of SHE has been fixed at all temperature.**
- It can be **used as indicator** as well as **reference electrode.**
- **It consists of a platinum foil coated with platinum black and has wire contacts through mercury.**

Reference: Principle of Instrumental Analysis, Skoog, 7th edition, Page no. 580

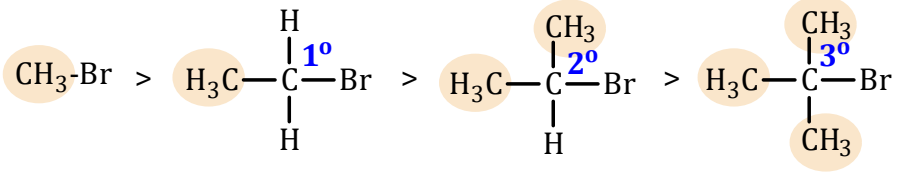
50. Ans (a)

❒ **S_N2 MECHANISM**

- **Alkyl halides** CH_3-X > R'-CH_2-X > R_2CH-X > R_3C-X.
- Primary is more reactive than secondary and tertiary alkyl halides.

S_N2 order:

Methyl bromide > Ethyl Bromide > Isopropyl bromide > tert-Butyl bromide



❖ **Distinction Between S_N2 and S_N1 Reactions**

FACTORS	S_N2 REACTIONS	S_N1 REACTIONS
Number of steps	One: $R:L + :Nu^- \longrightarrow R:Nu + :L^-$	Two: (i) $R:L + :Nu^- \xrightarrow{Slow} R: + L^-$ (ii) $R^+ + :Nu^- \xrightarrow{Fast} R:Nu$
Reaction rate and order	**Second order:** **Rate** $\propto$ [Substrate] [Nucleophile] **or** **Rate** = $K_2[RL][:Nu^-]$	**First order:** **Rate** $\propto$ [Substrate] **or** **Rate** = $K_1[RL]$
Molecularity	Bimolecular	Unimolecular
Reacting nucleophile	The nucleophile attacks the carbon of the substrate exclusively from the back side.	The nucleophile can attack the carbon of the substrate both on the back and front sides although the back-side attack predominates.

57. Ans (a)

❒ **MOLARITY**

$$\text{Molarity} = \frac{\text{Number of moles}}{\text{Volume in liter}}$$

$$\left(\text{Number of moles} = \frac{\text{Mass}}{\text{Molar mass}}\right)$$

So,

$$\text{Molarity} = \frac{\text{Mass / Molar mass}}{\text{Volume in liter}}$$

Given,

Molarity = 0.15 Molar mass = 40

Volume = 1 liter Mass = ?

$$\text{So, Molarity} = \frac{\text{Mass / Molar mass}}{\text{Volume in liter}}$$

$$0.15 = \frac{X / 40}{2}$$

$X = 0.15 \times 40 \times 2 =$ **12 gm**

Reference: GRB Physical chemistry, OP Tandon, 4th edition, Page no. 798

58. Ans (b)

❒ **DIFFERENCE BETWEEN CONTINUUM SOURCE AND LINE SOURCE**

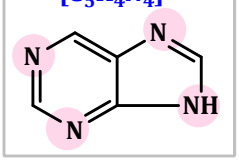
CONTINUUM SOURCE	LINE SOURCE
• Emit radiation over wide range of wavelength • Intensity of emission varies slowly as a function of wavelength. **Examples:** • Tungsten lamp • Carbon arc lamp • Deuterium lamp • Hydrogen discharge lamp • Xenon arc lamp	• Emit only few discreet wavelengths of light • Intensity is a function of wavelength. **Examples:** • **Hollow-cathode lamp** • Electrodeless discharge lamp • Sodium vapour lamp • Mercury vapour lamp • Lasers

Reference: Textbook of Principles Instrumental Analysis, Skoog, Holler and Crouch, 7th edition Page no. 151

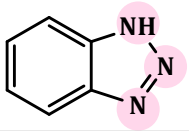
59. Ans (a)

❒ **HETEROCYCLIC COMPOUND (STRUCTURE AND FORMULA)**

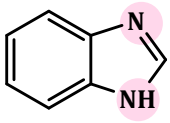
Purine ring $[C_5H_4N_4]$



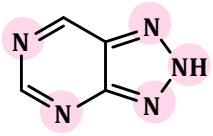
1H-Benzotriazole $[C_6H_5N_3]$



Benzimidazole $[C_7H_6N_2]$



Triazolo pyrimidine $[C_4H_3N_5]$

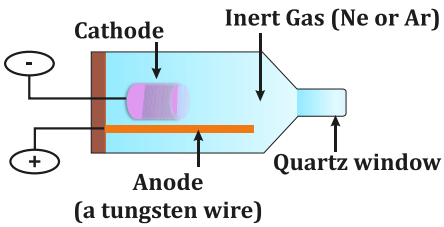


60. Ans (c)

❒ **HOLLOW CATHODE LAMP**

Radiation source of atomic absorption spectroscopy:

- It contains – **Argon** and **Neon gas**
- It consists of cathode and anode. Cathode is made up of specific element or alloys of elements or coating of elements on cathode.



Demerit

- In AAS, for determination of every element, separate hollow cathode lamp has to be used.
- This can **overcome** by using multielement lamps.
- **e.g.-** Na/K, Ca/Mg or Ca/ Mn/Zn are available.

Reference : Textbook of Pharmaceutical Analysis, Dr. S. Ravi Sankar, 5th edition, Page no. 27-4

76. Ans (c)

❑ **VOLUME OF DISTRIBUTION (V_d)**

- The apparent volume of drug, distributed in the body to provide same concentration as in blood plasma.

$$Vd = \frac{\text{Total amount of drug in the body}}{\text{Concentration of the drug in plasma}}$$

❑ **BLOOD PROTEINS TO WHICH DRUGS BIND**

PROTEIN	MOLECULAR WEIGHT	CONCENTRATION (G%)
Human Serum Albumin	65,000	3.5-5.0
α_1-Acid Glycoprotein	44,000	0.04-0.1
Lipoproteins	200,000 to 3,400,000	Variable
α_1- Globulin	59,000	0.003-0.007
α_2- Globulin	1,34,000	0.015-0.06
Haemoglobin	64,500	11-16

❑ **MARKERS USED TO MEASURE THE VOLUME OF REAL PHYSIOLOGICAL COMPARTMENT**

PHYSIOLOGICAL FLUID COMPARTMENT	MARKERS USED
Plasma (3L)	Evans blue, Indocyanine green, I-131, albumin
Erythrocytes (2L)	Cr-51
Extracellular fluid (15L)	Non-metabolisable saccharides like raffinose, inulin, mannitol and radioisotopes of selected ions: Na, Cl, Br, SO_4^{2-}
Total body water (42L)	Deuterium oxide, Antipyrine

Kidneys- Metallothionin, a **protein present** in kidneys, binds to **heavy metals** such as lead, mercury, and cadmium and results in their renal accumulation and toxicity.

Reference: Biopharmaceutics and pharmacokinetics, D M Brahmankar, 3rd edition, Page no. 111, 112, 119 & 123

77. Ans (a)

❑ **ANTICANCER DRUGS**

EGFR/HER 2 inhibitors: Trastuzumab, Gefitinib, Erlotinib, Cetuximab, Lapatinib

- It is a monoclonal antibody.
- It is a humanized monoclonal antibody which binds to the extracellular domain of another subtype of **EGFR termed HER2 (human epidermal growth factor receptor 2) and inhibits signal transduction**.

❑ **CLASSIFICATION OF ANTICANCER DRUGS (TARGETED DRUGS)**

S.NO.	CLASS	DRUGS
1.	BCR-ABL tyrosine kinase inhibitors	Imatinib, Dasatinib, Nilotinib
2.	EGF (HER) receptor inhibitors	Gefitinib, Erlotinib, Cetuximab, Trastuzumab, Lapatinib
3.	Angiogenesis inhibitors	Bevacizumab, Sunitinib, Sorafenib
4.	Proteasome inhibitors	Bortezomib
5.	CD20 inhibitors	Rituximab

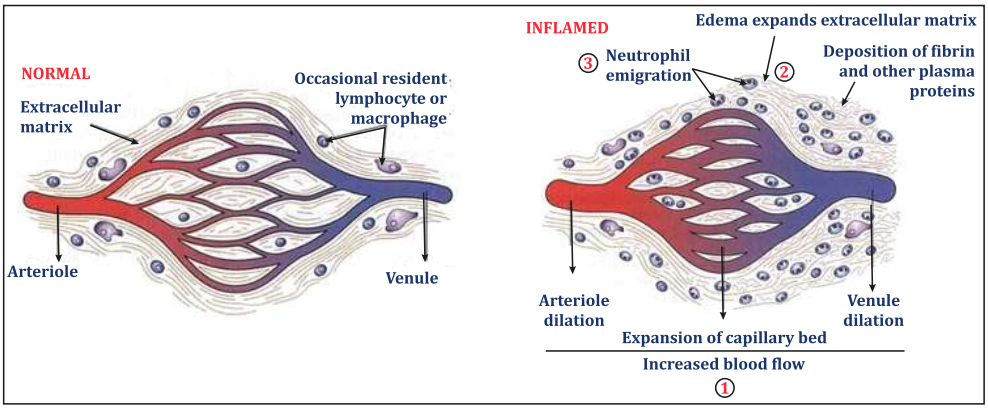
Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 917

88. Ans (a)

❑ **ACUTE INFLAMMATION: Short duration** (lasting less than 2 weeks) and represents the early body reaction, resolves quickly and is usually followed by **healing**.

➢ **The main features of acute inflammation are:**

- **Accumulation of fluid** and plasma at the affected site
- Intravascular **activation of platelets**
- **Polymorphonuclear neutrophils** as inflammatory cells



Reference: Anatomy and physiology, Ross and Wilson, 14th edition, Page no. 166

89. Ans (b)

Tacrolimus is an example of Calcineurin inhibitors (Specific T-cell inhibitors).

FOR MORE DETAIL SEE THE EXPLANATION NO. 81 OF GPAT 2023 SHIFT-I

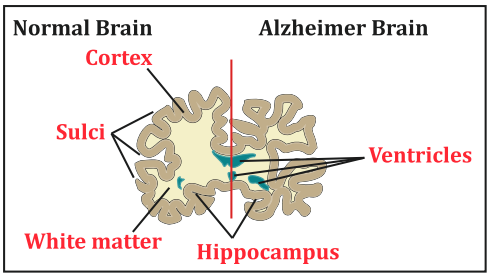
90. Ans (c)

Alzheimer's disease is caused by neurodegeneration of Hippocampus (part of brain)

❑ **ALZHEIMER'S DISEASE (AD)**

- Characterized by **progressive dementia**, **AD is a neurodegenerative disorder**, primarily affecting cholinergic neurons in the **brain (Hippocampus).**

❖ **Hippocampus:** Involved in memory, learning, and emotion.
❖ **Hypothalamus:** Regulates body temperature, hunger, thirst.
❖ **Midbrain:** Involved in auditory, visual processing.
❖ **Cerebellum:** Coordinates movement, balance.

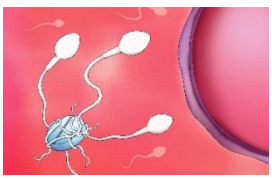


Reference: Essentials of Medical Pharmacology, K D Tripathi, 8th edition, Page no. 122

91. Ans (b)

❑ **MALE CONTRACEPTIVES**

- **Antiandrogens –** Depress spermatogenesis, but raise gonadotropins, cause unacceptable loss of libido.
- **Estrogens and progestins –** Act by suppressing gonadotropins – cause unacceptable feminization.
- **Androgens –** They inhibit gonadotropins but have poor efficacy. Even combination with progestin is not reliable
- **Superactive GnRH Analogues -** They inhibit gonadotropins release by continuous action, inhibit testosterone secretion as well, produce impotence, loss of libido.

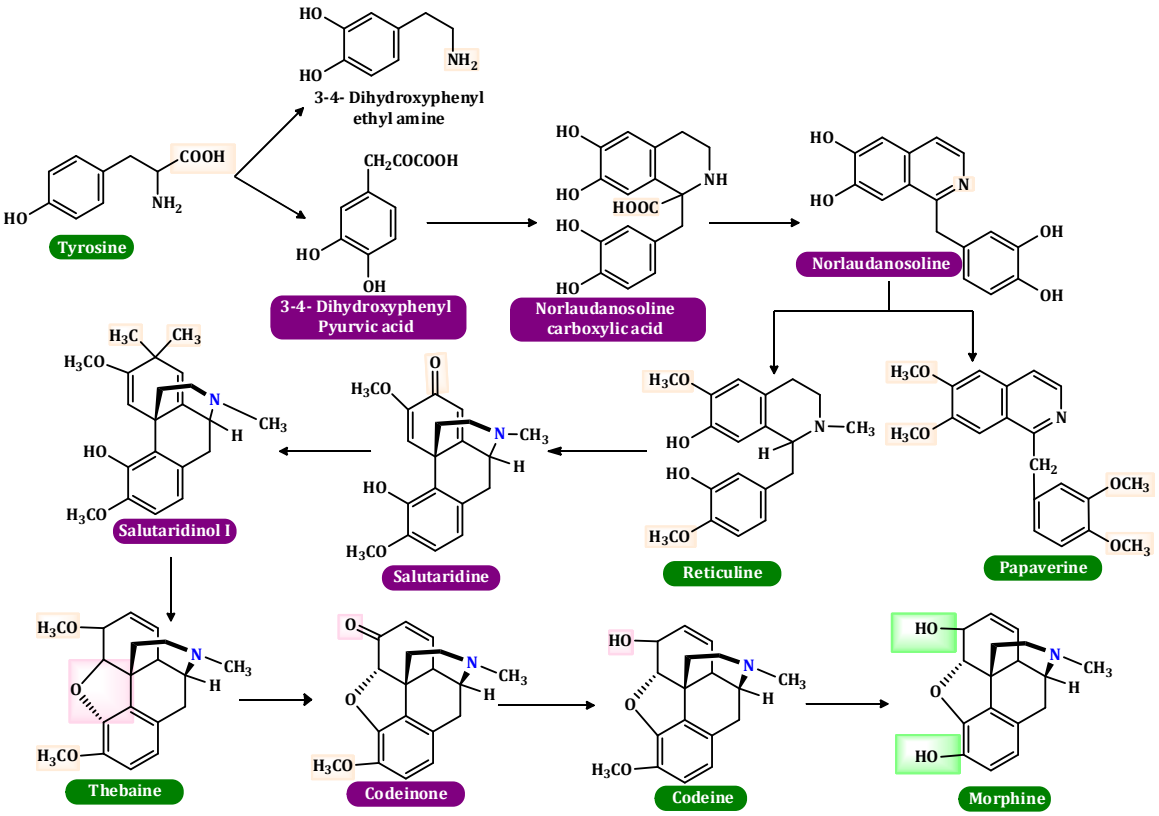


105. Ans (b)

❑ BIOSYNTHESIS PATHWAY OF THEBAINE, CODEINE AND MORPHINE (OPIUM ALKALOIDS)

The right sequence of the intermediates in the biosynthesis of opium alkaloids are

Tyrosine → Reticuline→ Thebaine → Codeine → Morphine



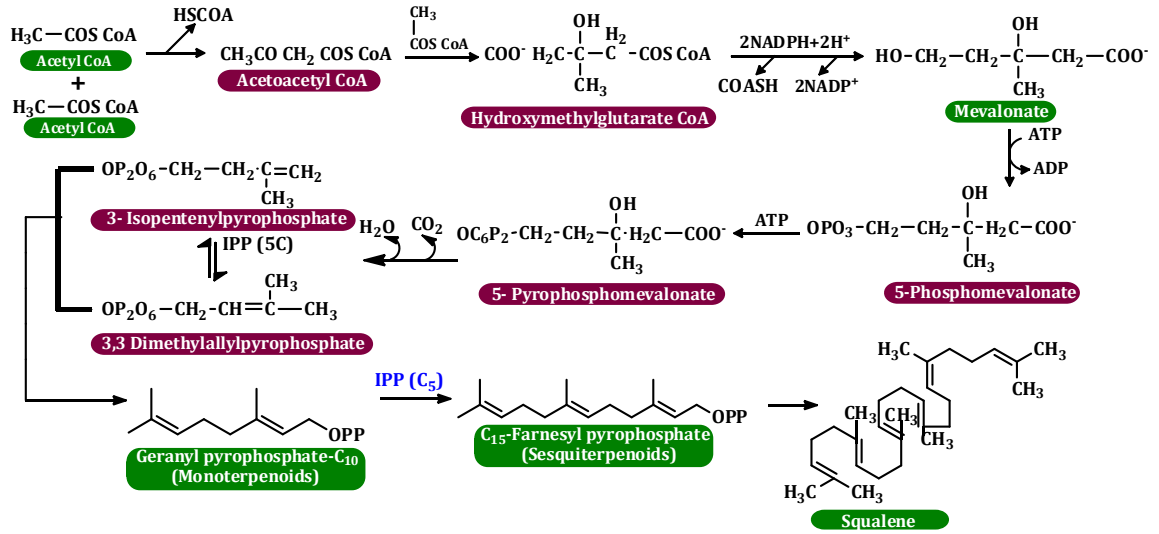
Reference: Textbook of Pharmacognosy, C.K. Kokate, 58th edition, Page no. 5.27

106. Ans (b)

❑ BIOSYNTHESIS OF ISOPRENOID COMPOUNDS

The right sequence of the intermediates in the biosynthesis of isoprenoids are

Acetyl CoA → Mevalonate → Geranyl PP → Farnesyl PP → Squalene



Reference: Textbook of Pharmacognosy, C.K. Kokate, 58th edition, Page no. 5.30

Previous Year Paper

GPAT-2023
(SHIFT - II)
PY-PHARMACEUTICAL SCIENCE

Video Explanation SCAN ME!

Multiple Choice Questions 125 QUE

PHARMACEUTICS

1. **The addition of Monobasic Potassium Phosphate to the suspended Bismuth Subnitrate particles cause the A to B owing to the C**
   (a) A- negative zeta potential, B-decrease, C- adsorption of the negatively charged phosphate anion
   (b) A-positive zeta potential, B-increase, C- adsorption of the negatively charged phosphate anion
   (c) A-positive zeta potential, B-decrease, C- adsorption of the negatively charged phosphate anion
   (d) A- positive zeta potential, B-decrease, C- adsorption of the positively charged hydrogenanion
2. **Noyes-Whitney equation predicts**
   (a) An increase of dissolution rate if the particle size is reduced by micronization because of an increase in area
   (b) Relationship between the radius of the diffusing molecule and its diffusion coefficient
   (c) The influence of electrolyte on the rate constant
   (d) An equilibrium between the surfactant and the drug molecules at the surface of the solution and in the bulk of the solution
3. **Which type of in-vitro-in-vivo correlation compares % drug released Vs % drug absorbed**
   (a) Level C (b) Level A (c) Multiple level C (d) Level B
4. **Ideally BA studies should be carried on _____ volunteers**
   (a) Aged (b) Children (c) Healthy (d) Patient
5. **Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R)**
   Assertion (A) : In case of Salicylic Acid Ointment BP Wool Alcohol Ointment made with white soft paraffin is used
   Reason (R) : Wool Alcohol Ointment made with white soft paraffin is used because the medicament is coloured
   In the light of the above statements, choose the most appropriate answer from the options given below
   (a) Both (A) and (R) are true and (R) is the correct explanation of (A)
   (b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
   (c) (A) is true but (R) is false
   (d) (A) is false but (R) is true

24. Match List I with List II

LIST – I PART OF THE VALUE ASSEMBLY		LIST- II (PURPOSE OF PARTS)	
1.	Gasket	[P]	Links the dip tube and the stem and the actuator
2.	Spring	[Q]	Prevents the leakage
3.	Mounting cup	[R]	Holds the Gasket in place
4.	Housing	[S]	Holds the valve in place

Choose the correct answer from the options given below

(a) 1-[R], 2-[Q], 3-[S], 4-[P]
(b) 1-[Q], 2-[R], 3-[S], 4-[P]
(c) 1-[S], 2-[P], 3-[Q], 4-[R]
(d) 1-[R], 2-[P], 3-[S], 4-[Q]

25. Absolute solubility does NOT rely on standard condition of

(a) pH (b) Pressure (c) Temperature (d) Volume

26. Vanishing cream is an ointment that may be classified as

(a) Water soluble base (b) Oleaginous base (c) Absorption base (d) Emulsion base

27. In terms of the kinetics, degradation in suspension is

(a) First order (b) Second order (c) Pseudo zero order (d) Zero order

28. While preparing the following

Rx

Salicylic acid : 3g
Sulfur ppt : 7g
Lanolin : 10g
White petroleum : 10g

The pharmacist should

(a) Use a rubber spatula to weigh and levigate the salicylic acid
(b) Mix the powders using geometric dilution in a motar
(c) Place on an ointment tile and levigate the ingredients using geometric dilution
(d) All of these

29. EDTA is an example of

(a) Unidentate Ligand
(b) Bidentate Ligand
(c) Tridentate Ligand
(d) Hexadentate Ligand

30. Efficiency of a reversible engine is given by

(a) Clapeyron equation
(b) Clausius Clapeyron equation
(c) Gibbs-Helmholtz equation
(d) Carnot's theorem

31. A sample of glucose was decomposed at 140° C in a solution containing 0.030 M HCl. The velocity constant, k, was found to be 0.0080 hr^{-1}. If the spontaneous rate constant, is 0.0010 hr^{-1} and the catalysis due to hydroxyl ions in this acidic solution is considered as negligible, then the catalytic coefficient, k_H is

(a) 0.22 per mole per hour
(b) 0.233 per mole per hour
(c) 0.27 per mole per hour
(d) 0.29 per mole per hour

32. Which of the following characteristics is most likely to be associated with a high apparent volume of distribution

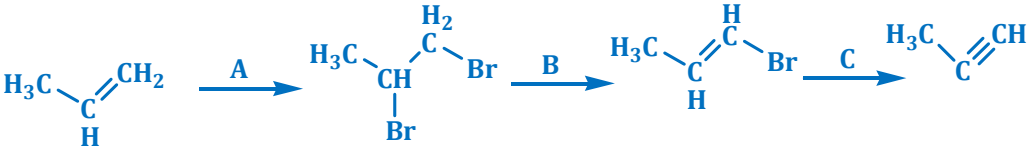
(a) Penetration across the blood brain and blood testis barriers
(b) Extensive binding to plasma protein
(c) Distribution into total body water
(d) Extensive binding to tissue constituents

44. Conversion of cyclic ketone to ring expended cyclic ester takes place by

(a) Willgerodt rearrangement (b) Michael rearrangement

(c) Lossen rearrangement (d) Baeyer Villiger rearrangement

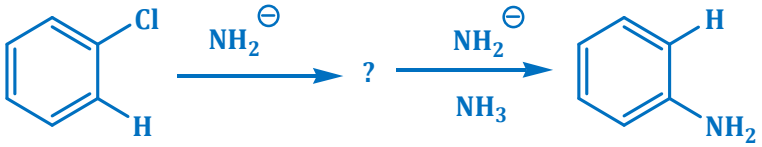
45. Identify A, B and C in below reaction



(a) A=Br_2, B=KOH, C=$NaNH_2$ (b) A=Br_2, B=HCl, C=$NaNH_2$

(c) A =Br_2, B = HCl, C = $NaBH_4$ (d) A = Br_2, B = KOH, C = $NaBH_4$

46. Identify intermediate forms in following substitution reaction



(a) Cyclohexa-1,3-dien-4-yne (b) Cyclohexa-1,3-dien-5-yne

(c) Cyclohexa-1,4-dien-5-yne (d) Cyclohexa-1,5-dien-3-yne

47. Match List I with List II

LIST - I NAME OF THE DRUG		LIST - II CHEMICAL CLASS	
1.	Zolpidem	[P]	Cyclopyrrolone
2.	Zaleplon	[Q]	Benzodiazepine
3.	Zopiclone	[R]	Imidazopyridine
4.	Triazolam	[S]	Pyrazolopyrimidine

Choose the CORRECT answer from the options given below

(a) 1-[S], 2-[R], 3-[Q], 4-[P] (b) 1-[Q], 2-[S], 3-[R], 4-[P]

(c) 1-[R], 2-[S], 3-[P], 4-[Q] (d) 1-[P], 2-[R], 3-[S], 4-[Q]

48. Addition of HBr to 1,3-butadiene at 40°C yields

(a) 80% 1,4-addition product and 20% 1,2-addition product

(b) 80% 1,2-addition product and 20% 1,4-addition product

(c) 80% 1,2-addition product and 20% 1,3-addition product

(d) 80% 1,2-addition product and 20% 1,4-addition product

49. Which heterocyclic ring is fused to a steroidal nucleus in Danazol

(a) Thiazole (b) Isoxazole (c) Imidazole (d) Pyrazole

50. Which of the following factor make carbonyl group in acyl compounds too susceptible to nucleophilic attack

(a) The tendency of oxygen to acquire electrons even at the expense of gaining positive charge

(b) The tendency of oxygen to acquire electrons even at the expense of gaining negative charge

(c) The tendency of carbon to loose electrons even at the expense of gaining negative charge

(d) The tendency of carbon to loose electrons even at the expense of gaining positive charge

51. Phenol reacts with chloroform in presence of aqueous sodium hydroxide to give chief product

(a) 2-Chloro Benzaldehyde (b) 2-Hydroxy Benzaldehyde

(c) 3-Hydroxy Benzaldehyde (d) 3-Chloro Benzaldehyde

ANSWER & EXPLANATION

1. Ans (c)

- If we disperse particles of bismuth subnitrate in water, we find that, based on electrophoretic mobility studies, they possess a large positive charge, or zeta potential.
- Because of the strong forces of repulsion between adjacent particles, the system is peptized or deflocculated. By preparing a series of bismuth subnitrate suspensions containing increasing concentrations of monobasic potassium phosphate
- The **addition of monobasic potassium phosphate to the suspended bismuth subnitrate particles** causes the **positive zeta potential** to **decrease owing to the adsorption of the negatively charged phosphate anion.**
- With the continued addition of the electrolyte, the zeta potential eventually falls to zero and then increases in the negative direction

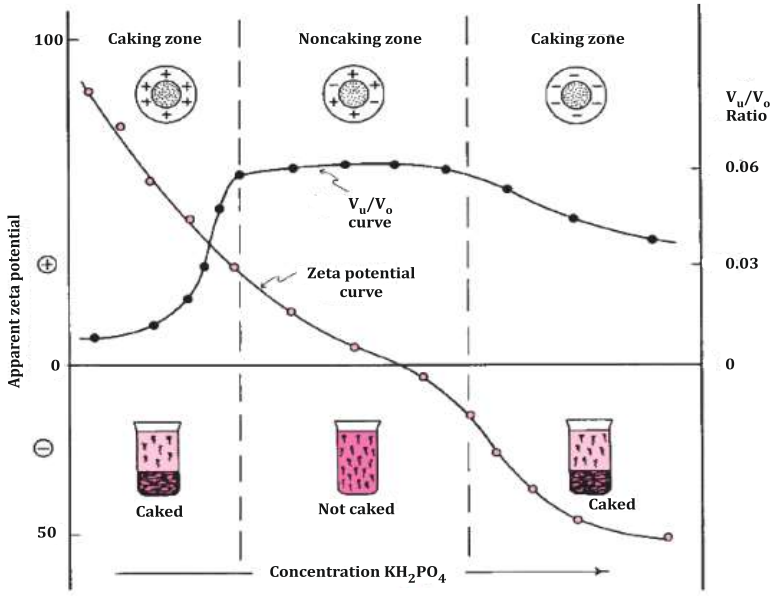


Fig.- Caking diagram, showing the flocculation of a bismuth subnitrate suspension by means of the flocculating agent monobasic potassium phosphate.

Reference: **Martin's Physical Pharmacy and Pharmaceutical Science, Patrick J. Sinko, 6th edition, Page no. 415**

2. Ans (a)

❑ **NOYES-WHITNEY EQUATION**

The dissolution rate of a drug substance in which surface area is constant during dissolution is described by the **modified Noyes-Whitney equation as follows:**

$$\frac{dC}{dt} = \frac{DAK_{w/o}(C_s - C_b)}{Vh}$$

11. Ans (a)

❑ **MECHANICAL EQUIPMENT FOR EMULSIFICATION**

EQUIPMENT	DESCRIPTION
Ultrasonifiers	Based on the principle of the **Pohlman liquid whistle**, in some designs the blade is caused to vibrate at the ultrasonic frequency by the action of the fluid, while in others this vibration is caused by an electrically powered piezoelectric crystal.
Colloid mills	Colloid mills operate on the principle of high shear, which is normally generated between the rotor and the stator of the mill.
Silverson homogenizer	Silverson homogenizers are designed with fine tolerance rotor/stator gaps that promote the high shear rates and high amounts of shear per pass through.
Mechanical stirrer	An emulsion may be stirred by means of various impellers mounted on shafts, which are placed directly into the system to be emulsified. Simple top entering propeller mixers are adequate for routine development work in the laboratory and for production purposes, if the viscosity of the emulsion is low.

Reference: Lachman Lieberman's The Theory and Practice of Industrial Pharmacy, Roop K Khar, 4th edition, Page no. 39, 51, 52, 702 & 703

12. Ans (a)

❑ **PARTICLE SIZE ANALYSIS METHODS**

METHOD	PARTICLE SIZE RANGE ANALYZED	PARTICLE MEASURE DESCRIPTION
Sieve	**> 50 µm**	**Measures larger particles**
Elutriation	2–100 µm	-
Andreasen pipette	**1 to 200 µm**	**Suitable for medium-sized particles**
Coulter counter	**> 0.5 µm**	**Can measure smaller particles**
Optical microscopy	> 0.2 µm	-
Centrifugation	0.05–5 µm	-
Electron microscopy	> 0.01 µm	-
Light scattering	**0.01–1 µm**	**Effective for very small particles**

Reference: Lachman Lieberman's The Theory and Practice of Industrial Pharmacy, Roop K Khar, 4th edition, Page no. 64

13. Ans (d)

❑ **SOME EXAMPLE OF OINTMENT AND THEIR PREPARATION**

OINTMENTS	TYPE OF PREPARATION
Whitfield's ointment B.P.C.	Ointment prepared by trituration and containing solids
Salicylic and Sulphur Ointment B.P.C.	Ointment prepared by trituration and containing solids
Resorcinol Ointment Compound B.P.C.	**Ointment prepared by trituration and containing liquids and solids**
Hamamelis Ointment B.P.C.	Ointment prepared by trituration and containing a liquid

Reference: Cooper and Gunn's Dispensing for Pharmaceutical Students, S J Carter, 12th edition Page no. 206-207

33. Ans (d)

Phenobarbital, Phenothiazine, Phenytoin bind to hemoglobin but **Chlorpromazine does NOT bind to hemoglobin.** For more detail as given in the table

❑ **BLOOD PROTEINS TO WHICH DRUGS BIND**

PROTEIN	MOLECULAR WEIGHT	CONCENTRATION (g%)	DRUGS THAT BIND
Human Serum Albumin	65,000	3.5-5.0	Large variety of all types of drugs
α_1-Acid Glycoprotein	44,000	0.04-0.1	Basic drugs such as imipramine, lidocaine, quinidine, etc.
Lipoproteins	200,000 to 3,400,000	Variable	Basic, lipophilic drugs like **chlorpromazine**
α_1-Globulin	59,000	0.003-0.007	Steroids like corticosterone, and thyroxine and cyanocobalamin
α_2-Globulin	1,34,000	0.015-0.06	Vitamins A, D, E and K and cupric ions
Haemoglobin	64,500	11-16	**Phenytoin, pentobarbital,** and **phenothiazines**

Reference: Biopharmaceutics and Pharmacokinetics A Treatise, D. M. Brahmankar, 3rd **edition, Page no. 119**

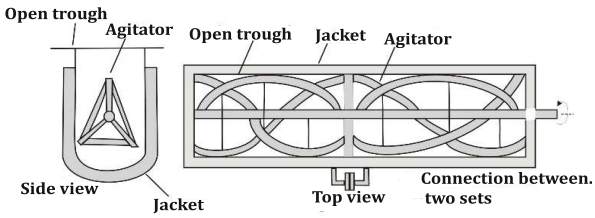
34. Ans (c)

❑ **SWENSON WALKER CRYSTALLIZER**

❖ **Principle**

- Crystallization is induced by passing the cold water in a direction opposite to the flow of hot concentrated solution.

❖ **Construction**



- It is a linear type and consists of a long open trough about 0.6 metres wide and 3 metres long with a semi- cylindrical bottom.
- Spiral scrapper rotates on its own-axis with the help of a motor
- For higher capacity, maximum of four such units are joined together.
- For still higher capacities, several such sets are placed one above the other.
- In this arrangement, the solution flows from one set to its below set.

❖ **Working**

- Cooling water enters through (other end) right side in the jacket.
- Due to cooling of the hot solution, supersaturation is achieved and crystals begin to form.
- If necessary, the size of crystals can be controlled by injecting an extra-amount of cooling water into the selected sections.
- Spiral scrapper rotates on its own-axis at a speed of 7 revolutions per minute helps in **agitating the mixture and conveying of the crystals.**
- **It also prevents the accumulation of crystals on the cooling surfaces by lifting them**

Reference: Pharmaceutical Engineering, Unit operation-II, CVS Subrahmanyam 2nd edition Page no. – 277

53. Ans (a)

❒ **EPIMERS**

- When **two monosaccharides differ from each other in their configuration around a single specific carbon** (other than anomeric) atom, they are referred to as epimers to each other.
- **Example:** Glucose and Galactose are C_4 epimers while Glucose and mannose are C_2 epimers.

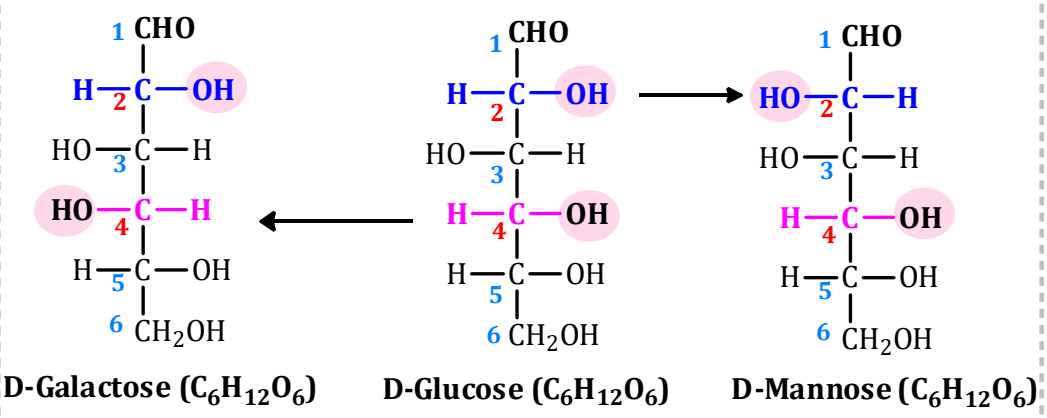


Fig.: Structures of epimers (glucose and galactose are C_4 epimers while glucose and mannose are C_2 epimers)

Reference: Biochemistry (with Clinical concepts & Case Studies), Dr. U. Satyanarayana and Dr. U. Chakrapani, 4th edition, Page no. 12

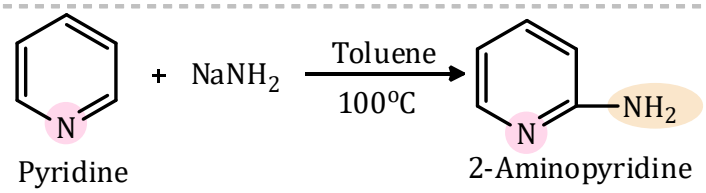
54. Ans (a)

❒ **NUCLEOPHILIC SUBSTITUTION REACTIONS**

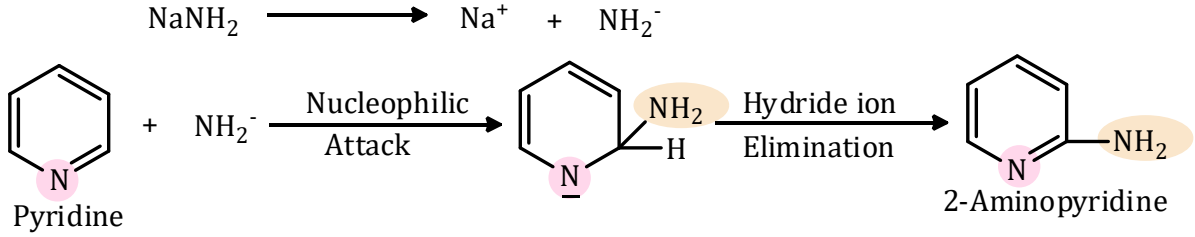
- The electron deficient nature of the C-4 & C-5 positions of pyridine makes the ring to easily susceptible for nucleophilic attack. For example,

❖ **Chichibabin reaction (preparation of amino pyridine)**

- Pyridine reacts with sodamide in toluene at 100 °C and yields 2-amino pyridine



Mechanism



Reference: Textbook of Pharmaceutical Organic Chemistry, Dr. V. Alagarsamy, Page no. 671

72. Ans (a)

❑ **CHARACTERISTICS OF DIFFERENT TYPES OF Ca^{2+} ION CHANNELS**

CHARACTERISTIC	L-TYPE	T-TYPE	N-TYPE
Activation threshold	High	Low	Medium
Inactivation rate	Slow	Fast	Medium
Location and function	**Excitation** (Contraction coupling in cardiac and smooth muscle.) **S-A, A-V node** (Conductivity) **Endocrine cells** (Hormone release) **Neurones** (Transmitter release)	**SA node** (Pace maker activity) **Endocrine cells** (Hormone release) **Certain arteries** (Constriction)	**Only on neurones in CNS, Sympathetic and myenteric plexuses** (Transmitter release)
Blocker	Nifedipine, **Diltiazem**, **Verapamil**	**Mibefradil**, Flunarizine, Ethosuximide	ω-Conotoxin

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 592

73. Ans (c)

Neomycin is used topically, while others (Netilmicin, Sisomycin and Paromomycin) are systemic aminoglycosides.

❑ **CLASSIFICATION OF AMINOGLYCOSIDES**

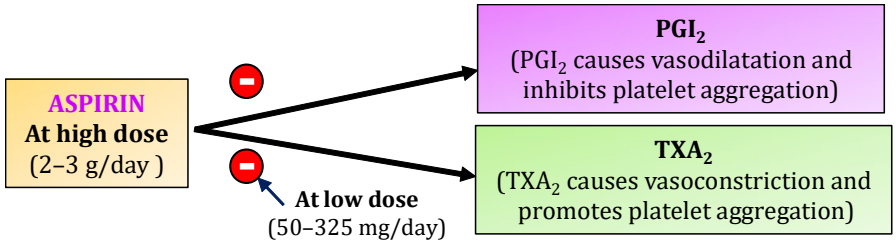
SYSTEMIC AMINOGLYCOSIDE **Trick → GST Ka SNAP bheja**	**G : G**entamicin, **S : S**isomicin, **T :T**obramycin, **K : K**anamycin, **S : S**treptomycin, **N : N**etilmicin, **A : A**mikacin, **P: P**aromomycin
TOPICAL AMINOGLYCOSIDE **Trick → but Not Fixed**	**N : Neomycin, F : F**ramycetin

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 793

74. Ans (b)

❑ **ASPIRIN**

- It is chemically called as **Acetylsalicylic acid**.
- In body converted to active metabolite - salicylic acid.
- Aspirin and most of the nonsteroidal antiinflammatory drugs (NSAIDs) inhibit both COX-1 and COX-2 isoforms, thereby decrease prostaglandin and thromboxane synthesis.
- The anti-inflammatory effect of NSAIDs is mainly due to inhibition of COX-2.
- Aspirin causes irreversible inhibition of COX. Rest of the NSAIDs cause reversible inhibition of the enzyme.
- Aspirin (At low dose) inhibits **PGI_2 and TXA_2** synthesis (50-325 mg/day).
- Aspirin (At high dose) inhibits only **TXA_2** synthesis (2-3 gram/day). Thus it **interface with platelet aggregation** and bleeding time prolonged.



85. Ans (b)

❑ **α_2-ADRENERGIC RECEPTORS**

- Couple to G_i/G_o proteins
- Activate G-protein gated potassium channels
- Cause membrane hyperpolarization

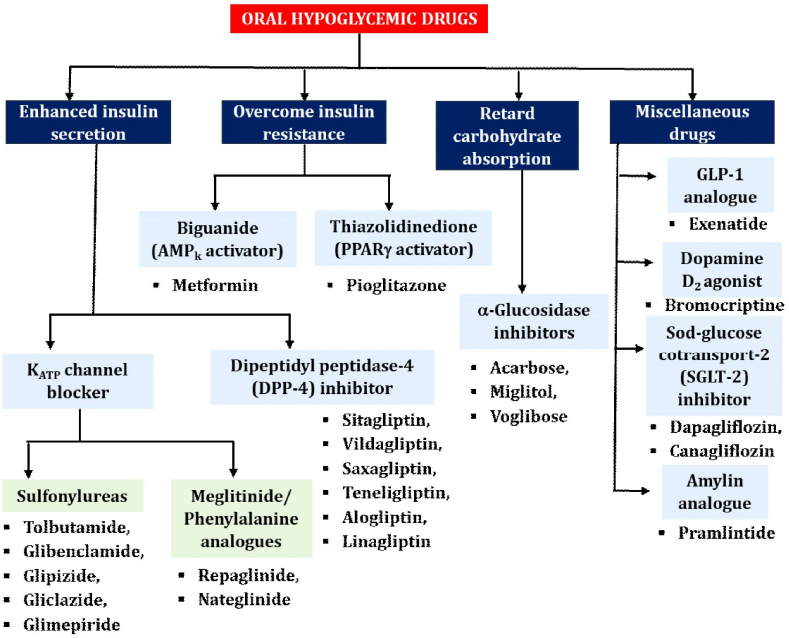
EFFECTS	THERAPEUTIC USES
• Decrease neuronal excitability • Reduce neurotransmitter release • Promote sedation, analgesia • α_2-adrenergic receptor agonists: - Clonidine, Dexmedetomidine	• Hypertension • Sedation • Analgesia • Anesthesia

❖ **α_1-adrenergic receptor:** Couples to G_q proteins, increases IP_3 and calcium.
❖ **β_1-adrenergic receptor:** Couples to G_s proteins, increases cAMP.
❖ **β_2-adrenergic receptor:** Couples to G_s proteins, increases cAMP.

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 55

86. Ans (a)

❑ **CLASSIFICATION OF ORAL HYPOGLYCEMIC DRUGS**

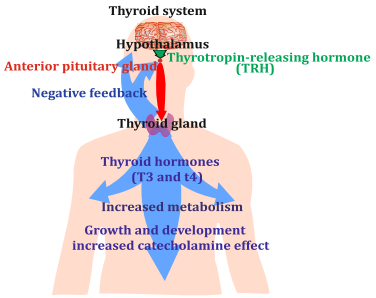


Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 294

87. Ans (d)

❑ **GRAVES' DISEASE**

- **Graves' disease** is an **autoimmune disorder** that can cause hyperthyroidism, or overactive thyroid.
- The thyroid is a **small, butterfly-shaped gland** in the front of your neck.
- Thyroid hormones control the way your body uses energy, so they affect nearly every organ in your body,
  even the way your heart beats.
- Patients will have **abnormally increased T_4 and T_3 levels and a decrease in TSH**.



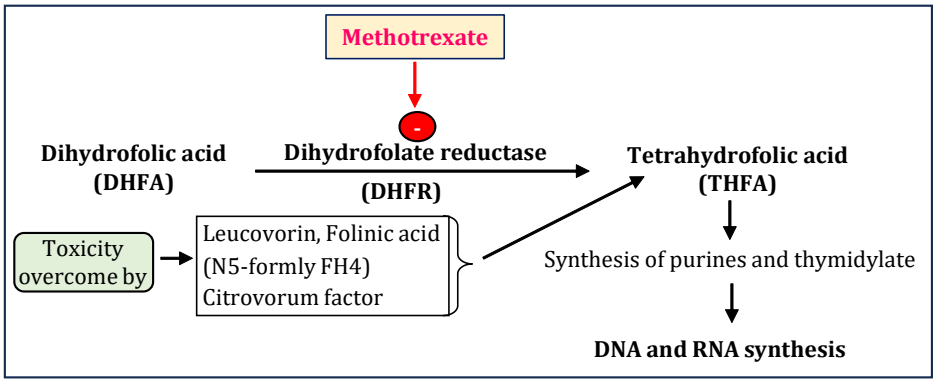
McArdle syndrome	Absence of muscle glycogen phosphorylase	Skeletal muscle
Pompe disease	Deficiency of Lysosomal α- 1, 4 glucosidases	All organ with lysosomes
Tarui's disease	Deficiency of Phosphofructokinase in muscle & erythrocytes	Muscle and RBC
Von Gierke disease	Deficiency of Glucose 6- phosphate	Liver or Kidney

Reference: Biochemitry, U. Satyanarayan, 1st edition, Page no. 269

92. Ans (b)

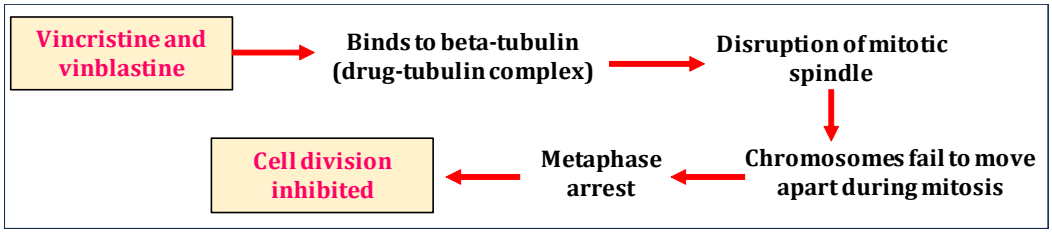
❑ **METHOTREXATE**

Methotrexate is thought to exert its actions by Interfering with purine synthesis.



❑ **VINCA ALKALOIDS**

Vincristine and Vinblastine act by **binding with the protein tubulin and arrest at metaphase.**

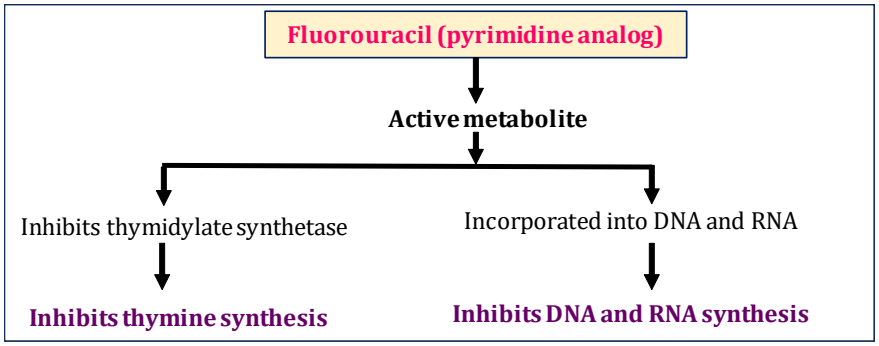


❑ **BLEOMYCIN**

- A mixture of **glycopeptide antibiotics**.
- **Inhibition of DNA synthesis.**
- Bleomycin has been shown to cause cell cycle arrest in **G_2 phase** and in **mitosis**.

❑ **5-FLUOROURACIL (5-FU)**

5-FU is activated to fluorodeoxyuridine monophosphate (**FdUMP**). This interferes with **DNA Synthesis** and function by **inhibiting thymidylate synthetase enzyme.**



Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 843, 924, 927 & 942

97. Ans (d)

Acetylcholine is the primary **excitatory neuro transmitter** in both sympathetic and parasympathetic ganglia. Drugs which inhibit synthesis (hemicholinium) or release **(botulinum toxin, procaine)** of ACh can interfere with ganglionic transmission, but drugs which act on cholinergic receptors in the ganglia are more selective.

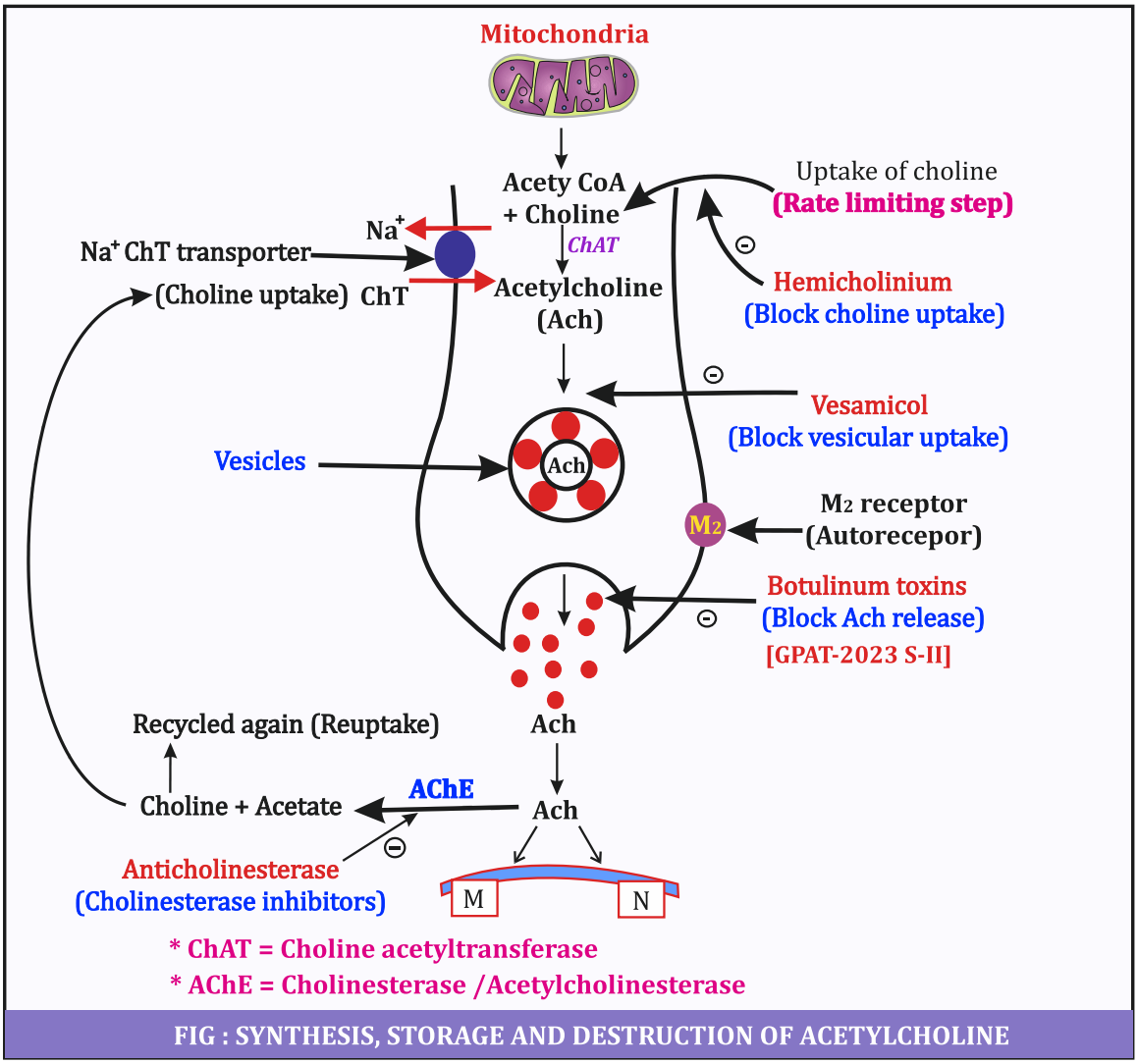


FIG : SYNTHESIS, STORAGE AND DESTRUCTION OF ACETYLCHOLINE

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 133

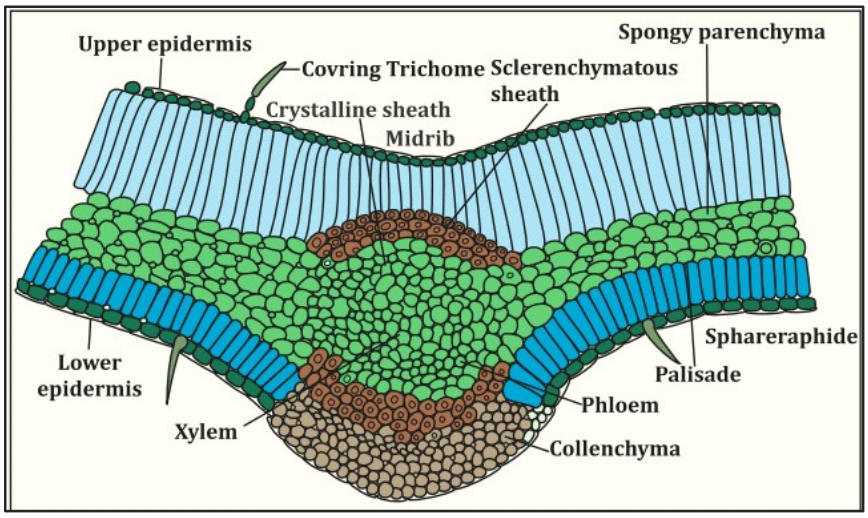
98. Ans (a)

Hepatitis A virus (HAV): Causing a faecally-spread selflimiting disease.
Hepatitis B virus (HBV): Causing a parenterally transmitted disease that may become chronic.
Hepatitis C virus (HCV): Previously termed non-A, non-B (NANB) hepatitis virus involved chiefly in transfusion related hepatitis.
Hepatitis delta virus (HDV): Which is sometimes associated as superinfection with hepatitis B infection.
Hepatitis E virus (HEV): Causing water-borne infection.
Hepatitis G virus (HGV): It is a recently discovered transfusion-transmitted

104. Ans (b)

❑ **MICROSCOPIC CHARACTERS OF SENNA**

- The epidermis shows presence of **unicellular, conical, thick-walled warty trichomes.**
- **Trichomes are slightly curved** at their bases and are present on both the surfaces.
- **Rubiaceous or parasitic stomata** are present on epidermal surfaces.
- **Palisade tissue is present** on both the sides, consisting of rectangular cells, enclosing **cluster-crystals of calcium oxalate.**
- A patch of sclerenchyma towards upper epidermis and above xylem (also known as pericyclic fibres) is present.

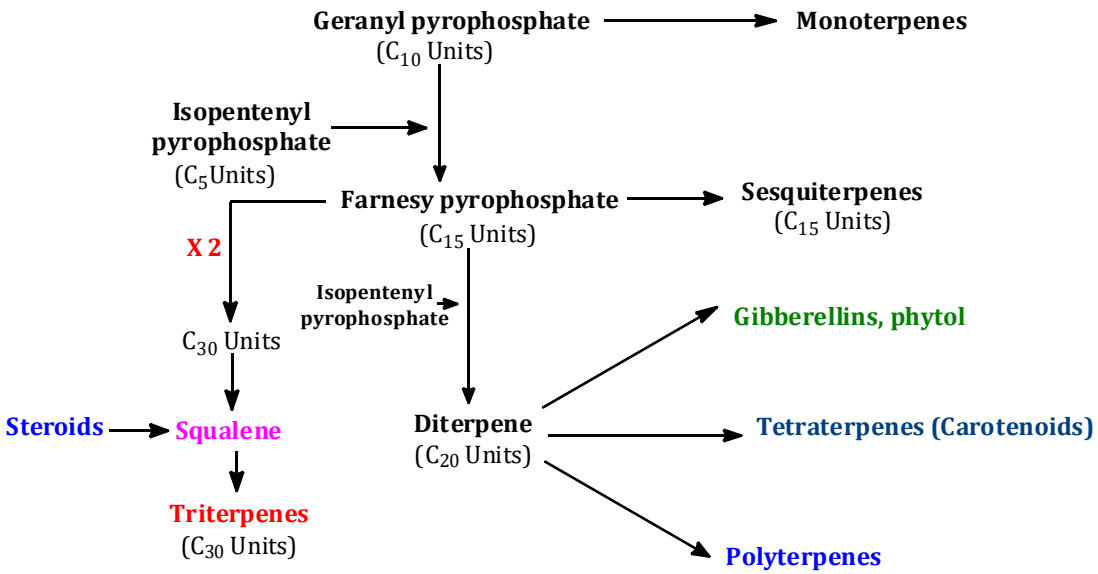


Reference: Textbook of Pharmacognosy, C.K. Kokate, 58th edition, Page no. 9.25

105. Ans (a)

❑ **BIOSYNTHESIS OF ISOPRENOID COMPOUNDS**

Biogenesis of Various Isoprenoid Compounds



Reference: Textbook of Pharmacognosy, C.K. Kokate, 58th edition, Page no. 5.33

Previous Year Paper

GPAT-2022

PY-PHARMACEUTICAL SCIENCE

Multiple Choice Questions

125 QUE

Video Explanation

SCAN ME!

PHARMACEUTICS

1. The intracellular fluid volume including those of the blood cells is approximately
   (a) 15 litres (b) 20 litres (c) 27 litres (d) 35 litres
2. India's first Central Drug Laboratory was established at
   (a) Mumbai (b) Lucknow (c) Kolkata (d) Hyderabad
3. Which of the following instrument is used to determine surface area and pore structure of pharmaceutical powders
   (a) Coulter counter (b) Andrerson apparatus
   (c) Quantasorb (d) Optical microscopy
4. In the process of extraction, if maceration is accomplished by heating the drug and solvent in a close vessel, then this modification is known as
   (a) Digestion (b) Refining (c) Expression (d) Rendering
5. The below mentioned complex is NOT the type of inclusion compounds
   (a) Channel-Lattice type (b) Quinhydrone complex
   (c) Layer type (d) Clathrates
6. Prescription price consists of
   (a) Cost of ingredients only
   (b) Cost of professional fee only
   (c) Cost of ingredients and cost of dispensing only
   (d) Cost of ingredients and professional fee only
7. Given below are two statements
   Statement I: Drugs Controller General of India is the Chairman of Drugs Technical Advisory Board (DTAB)
   Statement II: In DTAB, there will be eight ex-officio members, five nominated and five elected members
   In light of the above statements, choose the most appropriate answer from the options given below
   (a) Both Statement I and Statement II are correct
   (b) Both Statement I and Statement II are incorrect
   (c) Statement I is correct but Statement II is incorrect
   (d) Statement I is incorrect but Statement II is correct
8. Which of the following vehicles (not required to be sterile, but must be pyrogen free) is intended to be used in the manufacture of injectable products to be sterilized after preparation
   (a) Purified Water (b) Water for Injection USP
   (c) Sterile Water for Injection USP (d) Bacteriostatic Water for Injection USP

19. In thermoplastic materials, which are used as a container/packaging material, additives like polyethylene and polypropylene are used as [DROPPED QUESTION]

(a) Plasticizer
(b) Stabilizers
(c) Surface treatment film
(d) Slip agent

20. Match List I with List II

LIST I	LIST II
1. When two dosage forms have equal t_{max}	[P] When their total body clearance is constant
2. AUC values of the two analogs can be compared to measure relative bioavailability	[Q] Absorption rate constants are equal
3. Urinary data is valid to measure bioavailability	[R] When fraction absorbed and elimination rate is constant
4. C_{max} is proportional to the rate of absorption	[S] Excretion of drug and/or metabolite is related to the bioavailable dose

Choose the CORRECT answer from the options given below

(a) 1 - [Q], 2 - [P], 3 - [S], 4 - [R]
(b) 1 - [P], 2 - [Q], 3 - [R], 4 - [S]
(c) 1 - [P], 2 - [S], 3 - [R], 4 - [Q]
(d) 1 - [R], 2 - [P], 3 - [Q], 4 - [S]

21. Boston Consulting Group (BCG) Matrix is used for

(a) Product life cycle management
(b) SWOT analysis
(c) Product portfolio management
(d) Gap analysis

22. Given below are two statements

Statement I : Vertical long tube evaporator is also called as Rising film evaporator

Statement II : Falling film evaporator is also called as Forced circulation type evaporator

In light of the above statements, choose the most appropriate answer from the optionsgiven below

(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct

23. Of the following, which one is exempted from importing into India without the requirement of a license

(a) Insulin (b) Etoposide (c) Lactose (d)Glutethimide

24. Given below are two statements, one is labelled as Assertion [A] and the other is labelled as Reason [R]

Assertion [A] : During the process of decompression in tablet manufacturing, expansion occurs in some tablet

Reason [R] : Expansion occurs in some tablet because of Plastic deformation that has occurred during compression process

In light of the above statements, choose the CORRECT answer from the options given below

(a) Both [A] and [R] are true and [R] is the correct explanation of [A]
(b) Both [A] and [R] are true but [R] is NOT the correct explanation of [A]
(c) [A] is true but [R] is false
(d) [A] is false but [R] is true

43. Stability index, determined for evaluating the stability of oil– water viscous emulsions, based on electric conductivity changes during non-destructive short heating–cooling–heating cycles

[A] is defined as Δ/h, where h is the change in the conductivity between 35°C and 45°C and Δ is the conductivity interval within the two heating curves at 35°C

[B] Indicates the relative change in enthalpy between two cycles

[C] is defined as 2Δ/h, where h is the change in the conductivity between 35°C and 45°C and Δ is the conductivity interval within the two heating curves at 35°C

[D] Indicates the relative change in conductivity between two cycles

Choose the correct answer from the options given below

(a) [A] and [B] only
(b) [B] and [C] only
(c) [C] and [D] only
(d) [D] and [A] only

PHARMACOLOGY

44. Match List I with List II Match the following drugs with their classes

LIST I	LIST II
DRUGS	CLASSES
1. Anakinra	[P] IL-2 receptor antagonist
2. Basiliximab	[Q] TNF_α inhibitors
3. Infliximab	[R] Calcineurin inhibitors
4. Tacrolimus	[S] mTOR inhibitors
	[T] IL-1 receptor antagonist

Choose the CORRECT answer from the options given below

(a) 1 - [R], 2 - [Q], 3 - [P], 4 - [S]
(b) 1 - [T], 2 - [Q], 3 - [R], 4 - [P]
(c) 1 - [P], 2 - [R], 3 - [T], 4 - [Q]
(d) 1 - [T], 2 - [P], 3 - [Q], 4 - [R]

45. Which of the following is a malignant type of tumor

(a) Lipoma (b) Adenoma (c) Melanoma (d)Osteoma

46. In human body _____ system operates to maintain pH of blood plasma

(a) The acetate buffer
(b) The lysis buffer
(c) The potassium citrate
(d) The carbonic acid

47. Match List I with List II Match the following with their mechanism of action

LIST I	LIST II
MECHANISM OF ACTION	DRUGS
1. DPP_4 inhibitors	[P] Metformin
2. K_{ATP} Channel blocker	[Q] Pioglitazone
3. PPARγ activator	[R] Glimepiride
4. AMP_K Activator	[S] Teneligliptin
	[T] α glucosidase inhibitors

Choose the CORRECT answer from the options given below

(a) 1 - [Q], 2 - [T], 3 - [R], 4 - [S]
(b) 1 - [Q], 2 - [R], 3 - [S], 4 - [P]
(c) 1 - [S], 2 - [R], 3 - [Q], 4 - [P]
(d) 1 - [S], 2 - [P], 3 - [T], 4 - [R]

48. Blood grouping is basically possible because of the presence of following

(a) Antigens on RBCs (b) MHCs on WBCs (c) MHCs on RBCs (d) Antigens on WBCs

90. Identify the product formed when 2-cholestene is treated with Br_2

(a) 5β, 6α-dibromocholestane
(b) 2β, 3α-dibromocholestane
(c) 5α, 6β-dibromocholestane
(d) 5α, 6β-dibromo 3β-hydroxy cholestane

91. Controlled alkylation of a ketone via an enamine intermediate is named as

(a) Mannich reaction
(b) Robinson annulation
(c) Stork reaction
(d) Bamford Stevens reaction

92. Heme is

(a) Iron containing tetrapyrrole
(b) Iron containing polypeptide
(c) Copper or magnesium containing tetrapyrrole
(d) Iron containing imidazole

93. Isobutane upon bromination under the influence of ultraviolet light at 127 °C affords the following major product

(a) N-Butyl bromide
(b) Isobutyl bromide
(c) sec-Butyl bromide
(d) tert-Butyl bromide

94. Match the statements in List I with their CORRECT answers in List II, respectively, in respect to modified 1st law of thermodynamics, and Choose the correct answer from the options given below

LIST I	LIST II
1. Constant heat (q = 0)	[P] Isothermal
2. Reversible process at constant temperature (dT = 0)	[Q] Isometric
3. Constant volume (dV = 0)	[R] Adiabatic
4. Constant pressure (dP = 0)	[S] Isobar

(a) 1 - [Q], 2 - [P], 3 - [R], 4 - [S]
(b) 1 - [P], 2 - [R], 3 - [Q], 4 - [S]
(c) 1 - [R], 2 - [P], 3 - [Q], 4 - [S]
(d) 1 - [S], 2 - [P], 3 - [Q], 4 - [R]

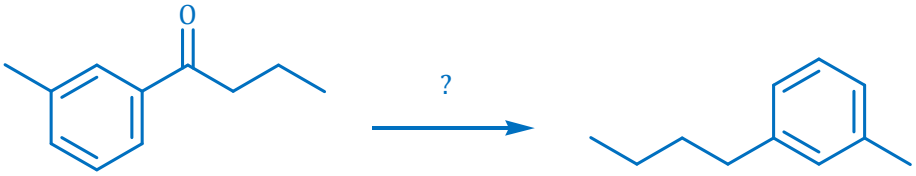
95. Ethylketazocine is a 6,7-benzomorphan derivative with_____receptor selectivity

(a) Mu–opioid (b) Delta–opioid (c) Kappa–opioid (d) NOP

96. In the determination of configuration of glucose, Fischer subjected (-) arabinose to Ruff's degradation The four-carbon sugar obtained by the degradation process was

(a) (-) Threose (b) (+) Threose (c) (-) Erythrose (d) (+) Erythrose

97. The set of specific reagents used in the below-mentioned synthesis of m-(n-Butyl) toluene from n-propyl m-tolyl ketone is

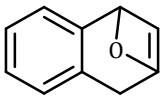


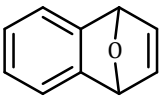
(a) Zn(Hg), HCl
(b) $NaBH_4$, CH_3OH
(c) NH_2NH_2, NaOH
(d) $SnCl_2$, CH_3OH

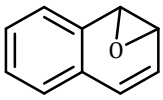
98. Optically active mandelic acid can be synthesized from benzaldehyde in the presence of the enzyme

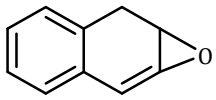
(a) Invertin (b) Myrosin (c) Emulsin (d) Zymase

99. The major product formed in the below reaction is

(a) 

(b) 

(c) 

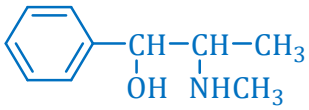
(d) 

100. Identify the functional groups from the below mentioned options that lead to weakening of benzoic acid

[A] –OH **[B] –Cl** **[C] $-NH_2$** **[D] $-NO_2$**

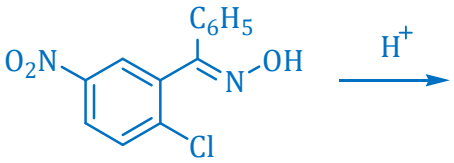
(a) A and B (b) A and C (c) B and C (d) A and D

101. The below structure is of

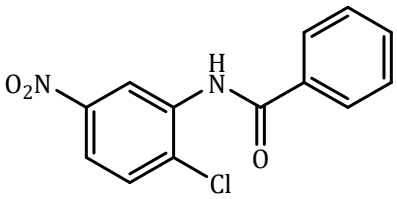


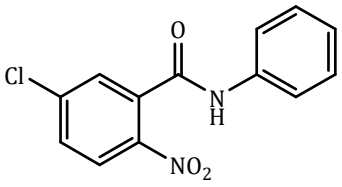
(a) Nor ephedrine (b) Pseudoephedrine
(c) Ephedrine (d) Nor pseudoephedrine

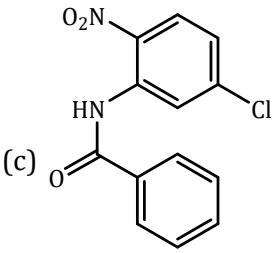
102. The major product formed in the below acid-catalyzed reaction is

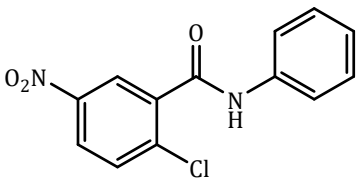


Choose the correct option

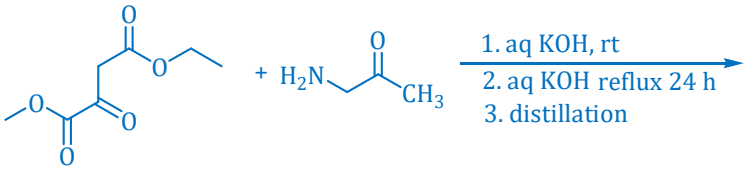
(a) 

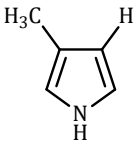
(b) 

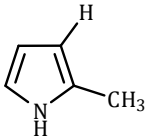
(c) 

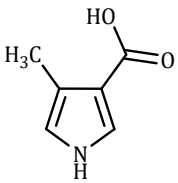
(d) 

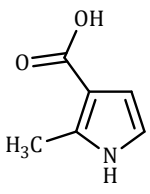
103. The major product formed in the below-given Knorr synthesis is



(a) 

(b) 

(c) 

(d) 

112. Potential at the equivalence point for a redox reaction

$$aOX_1 + bRED_2 \leftrightarrow bOX_2 + aRED_1$$

is given by the equation

(a) $E = (bE_2^o + aE_1^o)/(a+b)$ (b) $E = E^o + (0.0592/n) \times \log Q$

(c) $E = E^o + (0.0592/n) \times \log (Red/OX)$ (d) $E = E_1^o + E_2^o/2$

113. Back-titration method is used for

[A] Volatile substances

[B] Insoluble substances

[C] Substances for which a quantitative reaction proceeds rapidly only in the presence of excess of the reagent

[D] Substances that require heating with a volumetric reagent during the determination, in which decomposition or loss of the reactants would occur in the process

Choose the CORRECT answer from the options given below

(a) A only (b) A and C (c) A, B and D (d) A, B, C and D

114. Match List I with List II

LIST I	LIST II
BUFFERS	pH VALUE
1. HCl and KCl	[P] 8 to 10
2. HCl and Potassium Hydrogen Phthalate	[R] 2.2 to 4.0
3. NaOH and Potassium Hydrogen Phthalate	[Q] 1.2 to 2.2
4. H_3BO_3, NaOH, and KCl	[S] 4.2 to 5.8

Choose the CORRECT answer from the options given below

(a) 1 - [Q], 2 - [R], 3 - [S], 4 - [P] (b) 1 - [R], 2 - [Q], 3 - [S], 4 - [P]

(c) 1 - [Q], 2 - [S], 3 - [P], 4 - [Q] (d) 1 - [R], 2 - [S], 3 - [Q], 4 - [P]

115. Boric acid with molecular weight 61.83 was partitioned between water and amyl alcohol at 25 °C. The amount of boric acid was determined to be 0.24 g in 250 ml of amyl alcohol and 0.32 g in 100 ml water. The partition coefficient of boric acid between water and amyl alcohol, when calculated at molar concentration for each of the solution is

(a) 1.33 (b) 0.75 (c) 0.30 (d) 3.33

116. Match List I with List II, and

LIST I	LIST II
VOLUMETRIC SOLUTION	PRIMARY STANDARD
1. 0.1 M Iodine	[P] Potassium iodate
2. 0.1M Sodium thiosulphate	[Q] Potassium bromate
3. 0.1M Sodium hydroxide	[R] Potassium hydrogen phthalate
4. 0.1M Perchloric acid	[S] Arsenic trioxide
	[T] Potassium hydrogen phthalate

Choose the CORRECT answer from the options given below

(a) 1 - [S], 2 - [Q], 3 - [R], 4 - [T] (b) 1 - [S], 2 - [Q], 3 - [R], 4 - [P]

(c) 1 - [P], 2 - [S], 3 - [Q], 4 - [R] (d) 1 - [R], 2 - [Q], 3 - [S], 4 - [P]

OTHER SUBJECTS

117. Which one of the following is NOT a phospholipid

(a) Sphingomyelin (b) Lysolecithin (c) Cardiolipin (d) Galactosylceramide

ANSWER & EXPLANATION

1. Ans (c)

- The intracellular fluid volume is determined as the difference **between the TBW and ECF volume.**
- The **intracellular fluid volume including those of blood cells** is approximately **27 litres.**

❑ **FLUID COMPARTMENTS OF A 70 KG ADULT**

BODY FLUID	VOLUME (LITERS)	% OF BODY WEIGHT	% OF TBW
1. Vascular fluid/blood **(Plasma)**	6 (3)	9 (4.5)	15 (7.5)
2. Extracellular fluid **(excluding plasma)**	12	17	28
3. Intracellular fluid **(excluding blood cells)**	24	34	57
Total Body Water (TBW)	42	60	100

Reference: Biopharmaceutics and Pharmacokinetics A Treatise, D. M. Brahmankar, 3rd edition, Page no. 111

2. Ans (c)

- India's first Central Drug Laboratory was established at Kolkata.

❑ **DIFFERENT LABORATORY / INSTITUTES/ ORGANISATION AND THEIR LOCATION**

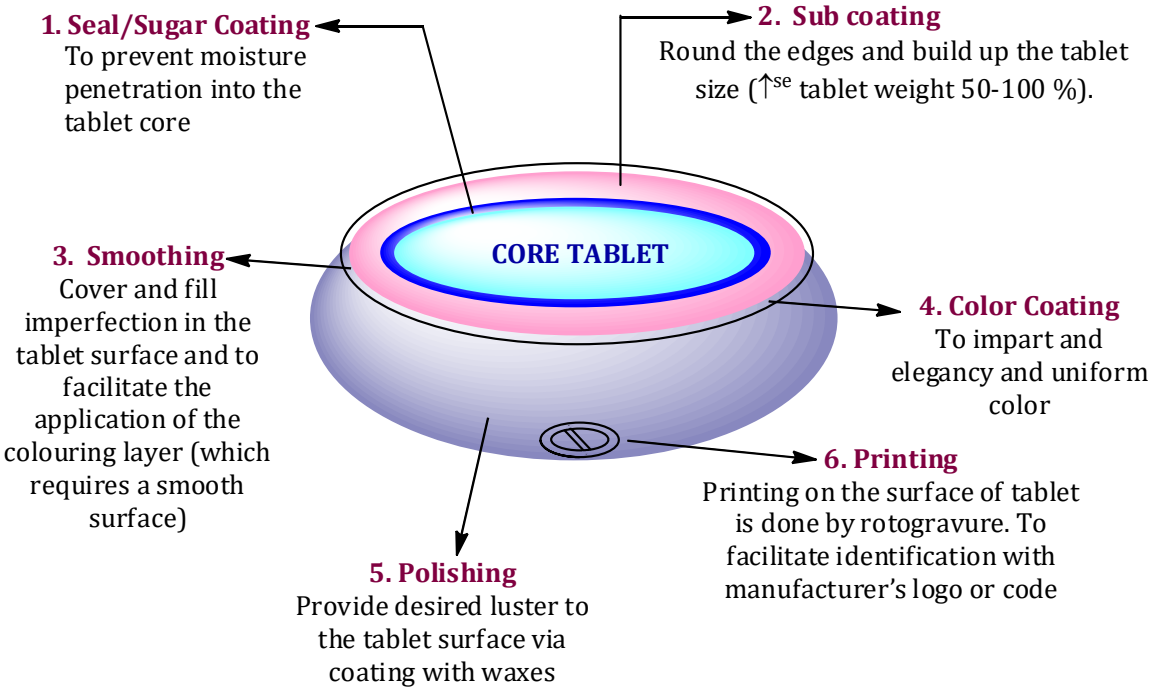
PLACE	LABORATORY / INSTITUTES/ ORGANISATION
Ghazipur, Neemuch	Government Opium Factory
Kolkata	**Central Drug Laboratory (CDL)**
Lucknow	**Central Drug Research Institute (CDRI)** **Industrial Toxicological Research Centre**
Kasauli	Central Research Institute (Sera, solutions of serum proteins for injection, vaccines, toxins, antigens, antitoxins, sterilized surgical ligature and sutures and bacteriophages)
Izatnagar or Mukteshwar	Veterinary Research Institute (Antisera, Vaccines, Toxoids, and Diagnostic antigens, all for veterinary use)
Ghaziabad	Central Pharmacopoeia Laboratory (Samples of Condoms)
Pune	• Indian Society of Blood Transfusion & Immunology • National Institute of Virology • National AIDS Research Institute
Mumbai	**Enterovirus Research Centre, Haffkine Institute compound**
Thane	Central Drugs Testing Laboratory (Intra-Uterine Devices and Falope)
New Delhi	• National Institute of Communicable Diseases (NICD) (For Polio Vaccine) • Indian Council of Medical Research
Jaipur	National Ayurvedic Institute
Geneva (Headquarter)	World Health Organization
Kolkata (Headquarter)	Patent Office

- Powdered opium or medicinal opium (contains 9.5-10.5% morphine) is opium diluted with **powdered lactose, cocoa husk, or rice starch.**
- It is usually light brown powder consisting of yellowish brown or reddish-brown particles that has characteristic odour of opium.

13. **This Question is DROPPED by NTA**

14. **Ans (a)**

❑ **STEPS OF SUGAR COATING**

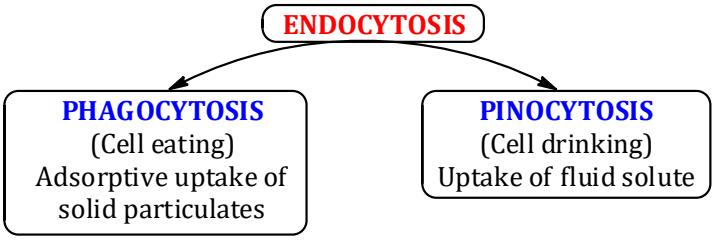


Reference: **Lachman/Lieberman's A Theory and Practice of Industrial Pharmacy, Roop K Khar, 4th edition, Page no. 512**

15. **Ans (d)**

❑ **ENDOCYTOSIS**

- It is a minor transport mechanism which involves engulfing extracellular materials within a segment of the cell membrane to form a saccule or a vesicle (hence also called as corpuscular or vesicular transport) which is then pinched-off intracellularly.
- This phenomenon is responsible for the cellular uptake of macromolecular nutrients like **fats and starch, oil soluble vitamins like A, D, E and K, water soluble vitamin like B_{12} and drugs such as insulin.**
- Endocytosis included two types of processes:



- **Orally administered Sabin polio vaccine,** large protein molecules and the botulism toxin (that causes food poisoning) are thought to be absorbed by **pinocytosis.**

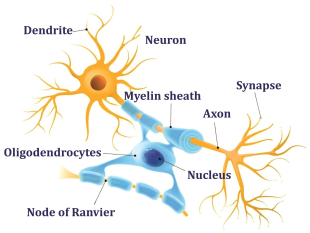
51. Ans (b)

SEE THE EXPLANATION NO. 49 OF GPAT 2022

52. Ans (b)

- Formation and maintenance of myelin sheath around CNS axons are done by Oligodendrocytes.

❑ **OLIGODENDROCYTES**



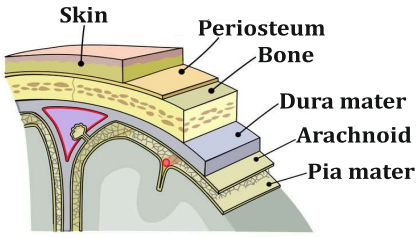
- These cells are smaller than astrocytes and are found in clusters round nerve cell bodies in grey matter; where they are thought to have a supportive function; adjacent to, and along the length of, myelinated nerve fibres. The oligodendrocytes **form and maintain myelin**, having the same functions as Schwann cells in peripheral nerves.
- Type of glial cell in Central Nervous System (CNS)
- Responsible for forming and maintaining myelin sheath around CNS axons

❖ **Schwann cells:** Form myelin sheath around Peripheral Nervous System (PNS) axons.
❖ **Microglia:** CNS immune cells, involved in phagocytosis and inflammation.
❖ **Astrocytes:** Supportive glial cells, regulate ion balance, blood-brain barrier.

Reference: Anatomy and physiology, Ross and Wilson, 14th edition, Page no. 166

53. Ans (d)

❑ **PERIOSTEUM OF BONE**



- Double-layered membrane covering bone surface.
- Essential for **bone growth, repair, and nutrition**.
- Protects bone by assisting in **fracture repair:** Periosteum helps stabilize fractures and promotes healing.
- Has osteogenic cells enabling bone growth in thickness, not length: Periosteum contains osteoblasts and osteogenic cells for appositional growth (increasing bone width).
- **Composed of outer fibrous layer and inner osteogenic layer:**
  - ✓ **Outer layer:** Dense irregular connective tissue (fibers and cells)
  - ✓ **Inner layer:** Osteogenic cells (osteoblasts, osteoclasts, and osteoprogenitor cells)

Reference: Anatomy and physiology, Ross and Wilson, 14th edition, Page no. 432

54. Ans (b)

❑ **TYPE 2 DIABETES**

It is associated with a number of abnormalities in plasma lipids and lipoproteins, including **reduced HDL cholesterol**. Low HDL cholesterol is a feature of metabolic syndrome, which also includes insulin resistance, high blood pressure, and elevated blood glucose and triglyceride levels.

Clinical features contributing to insulin resistance:

✓ **Increased LDL:** High levels of low-density lipoprotein (LDL) cholesterol
✓ **Reduced HDL:** Low levels of high-density lipoprotein (HDL) cholesterol
✓ **Increased triglycerides:** Elevated triglyceride levels

77. Ans (c)

RHUBARB

- **Synonyms –** Rheum, Revandchini
- **Biological source -** Rhubarb is obtained from dried rhizome of
  - ***Rheum emodi*** (Indian rhubarb)
  - ***Rheum palmatum*** and ***Rheum webbianum*** (Chinese rhubarb)
  - ***Rheum officinalis*** (American rhubarb)
- **Family –** Polygonaceae
- **Microscopic character –**
  - Rhubarb shows presence of **star spots** which indicate abnormal vascular bundle
  - In such vascular bundle, the medullary rays appear as star shaped
  - Parenchyma contains cluster crystal of Ca-oxalate.
  - Xylem vessel non- lignified.

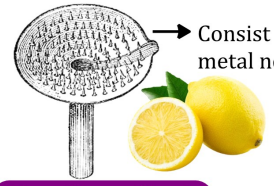
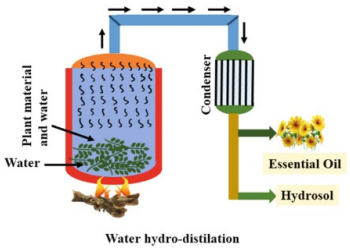
Reference: Textbook of Pharmacognosy, C.K. Kokate, 58th edition, Page no. 9.21

78. Ans (d)

The best quality of the Lemon oil is obtained by using **Hand press method.**

❑ **ISOLATION OF VOLATILE OIL**

Three methods have been developed for isolation of essential oils:

EXPRESSION	DISTILLATION	EXTRACTION
Volatile oil present in rind of fruits like lemon and orange peel obtained by this method (application of pressure) • Sponge method • Mechanical method • Ecuelle method • Hand press method (To get best quality of the Lemon oil).  Consist pointed metal needle **Ecuelle method** Lemon are placed inthe bowl and rotate until oil gland ruptured	**Hydro-distillation method** • Water distillation • Steam distillation  Water hydro-distilation **Water distillation**	When volatile oil content is very less i.e. Jasmine flower, Gardenia flower • Enfleurage method • Pneumatic method • Maceration  Layer of fat is applied on the glass plates **Enfleurage emethod** Drug (fresh flower petals) is spread on the glass plate and allowed to imbibe in the fat for 24hrs 

Reference: Trease and Evans Pharmacognosy, William C Evans, 16th Edition, Page no. - 280

79. Ans (c)

Amino alkaloid is present in Colchicum.

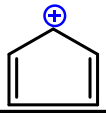
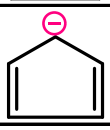
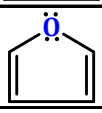
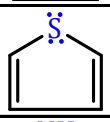
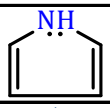
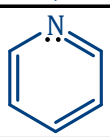
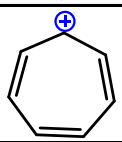
FOR MORE DETAIL, SEE THE EXPLANATION NO. 109 OF GPAT 2023 SHIFT I

❖ RULES FOR AROMATICITY

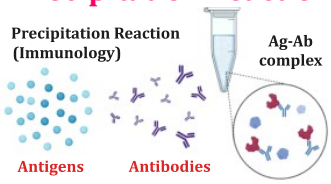
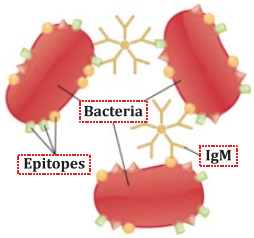
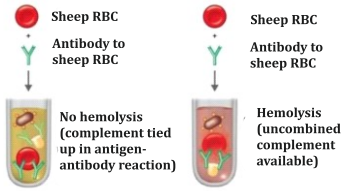
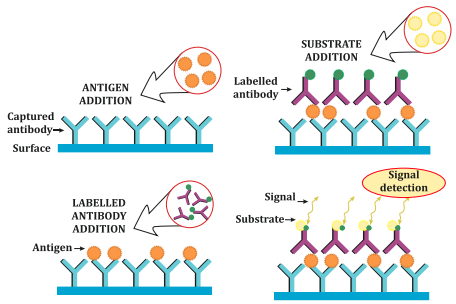
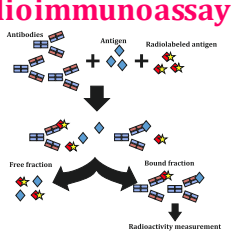
1. First, it must be **cyclic.**
2. Second, every atom in the ring must be **conjugated.**
3. Third, the molecule must be **planar** (Carbon is always sp^2).
4. Fourth, the molecule must have **[4n+2] pi electrons.**

❖ HUCKEL RULE

- Huckel rule is used to **determine the possession of aromatic properties** in a planar ring compound or molecule in organic chemistry.
- Huckel's rule stated mathematically says that **all planar aromatic compounds must have 4n+2 pi-electrons** where **n is a positive integer or zero (i.e. n= 0, 1, 2, 3...etc.)**
- Aromatic compounds are **comparatively stable due to the presence of resonance energy** and **delocalized electron clouds.**

COMPOUND	CYCLIC	PLANAR	CYCLIC RESONANCE	HUCKEL RULE (4n+2)πe-	AROMATIC YES/NO
	✓	✓	✓	2πe-	Yes
	✓	✓	✓	4πe-	No
	✓	✓	✓	4πe-	No
	✓	✓	✓	6πe-	Yes
	✓	✓	✓	6πe-	Yes
	✓	✓	✓	6πe-	Yes
	✓	✓	✓	6πe-	Yes
	✓	✓	✓	6πe-	Yes
	✓	✗	✗	4πe-	No
	✓	✓	✓	6πe-	Yes
	✓	✓	✓	6πe-	Yes

125. Ans (b)

S.NO.	TYPES OF ANTIGEN-ANTIBODY REACTION	PRINCIPLES AND USES
1.	**Precipitation Reaction** 	• **Streptococcal differentiation into serological groups.** • Identification of antigenic component of bacterial. • **Uses-** Detect antibody to exotoxin of Tetanus Diphtheria and Scarlet fever and in criminology use to detect blood stain.
2.	**Agglutination Reaction** 	**Hemagglutination-** When agglutination reaction occurs in clumping of RBC called hemagglutination. **Uses-** • Widal test for typhoid. • ABO and Rh grouping for blood group determination. • Weil-Felix test for typhus. • ***Treponema pallidum* identification.** • Coombs test for anti Rh antibody.
3.	**Complement fixation test** 	**Principle**- CFT detects complement fixing antibodies in patient's serum. **Uses-** • Wasserman test for syphilis. • **Screening for Rubella and Type 2 Herpes viruses.** • Conglutination test for nonhemolytic complements.
4.	**Enzyme-linked immunosorbent assay (ELISA)** 	• ELISA are sensitive techniques that use an enzyme Ab-Ag combination adsorbed onto the sides of a test well. • The fundamental principle of ELISA is the **antigen-antibody interactions** where a pathogen can be detected by the presence of antibodies (proteins, glycoproteins, etc.) on it. • **Serological diagnosis of influenza and mumps viruses.** • **Horse radish peroxidase (HRP) or alkaline phosphatase, Glucose oxidase and β-galactosidase** are common enzymes used in ELISA.
5.	**Radioimmunoassay (RIA)** 	**Radioimmunoassay (RIA)** is a sensitive, versatile technique, using radioactively labelled antigen or antibody. Hepatitis B immunoglobulin provide transfer of passive immunity.

Reference: Pharmaceutical Microbiology, N.K. Jain, 3rd edition, Page no. 271, 272, 276, 278/ Pharmaceutical Biotechnology, Daan J. A. Crommelin, Robert D. Sindelar, Bernd Meibohm, 3rd edition, Page no. 39

Previous Year Paper

GPAT-2021

PY-PHARMACEUTICAL SCIENCE

Multiple Choice Questions

125 QUE

Video Explanation

SCAN ME!

PHARMACEUTICS

1. The USP defines _____ as liquid preparations of vegetable drugs, containing alcohol as a solvent or as a preservative, or both, so made that, unless otherwise specified in an individual monograph, each milliliter contains the therapeutic constituents of 1 gram of the standard drug that it represents

(a) Tinctures (b) Extracts (c) Infusion (d) Fluid extracts

2. Match List I with List II

List - I (Equipment)	List - II (Model/Trade Name/Type)
1. Low shear mixer	[P] Manesty Drycota
2. Rotary tablet machine	[Q] Chilsonator (Fitzpatrick)
3. Capsule filling machine	[R] Slanted Double Cone Mixer
4. Compaction mill	[S] Prosolv (JRS Pharma)
	[T] PCF 1200 Model (Pharma Land)

Choose the CORRECT answer from the options given below

(a) 1 - [P], 2 - [Q], 3 - [S], 4 - [R] (b) 1 - [Q], 2 - [R], 3 - [P], 4 - [S]
(c) 1 - [R], 2 - [P], 3 - [S], 4 - [Q] (d) 1 - [P], 2 - [Q], 3 - [R], 4 - [S]

3. The properties of solutions containing surface active agents change sharply over a narrow concentration range and are called as

(a) Critical micelle concentration (b) Ionic concentration
(c) Hydrogen ion concentration (d) Surface tension

4. HEPA filters are defined as A or more efficient in removing, from the air. B particles generated by vaporization of the hydrocarbon Emory 3004

(a) A - 99.99 % B - 0.1 mm (b) A - 99.00 % B - 0.3 mm
(c) A - 99.99 % B - 0.3 mm (d) A - 99.00 % B - 0.1 mm

5. Name the popular system for ocular delivery of Pilocarpine, based on membrance -controlled reservoir systems

(a) Ocusert (b) Alzet pump (c) Progestasert (d) Nitrodur

6. The phenomenon of increasing the solubility of weak electrolytes and non-polar molecules by the addition of a water miscible solvent in which the drug has good solubility is called

(a) Complexation (b) Co-solvency (c) Solubilization (d) Hydrotropy

7. The system volume is increased when sheared is called

(a) Dilatant flow (b) Newtonian flow (c) Plastic flow (d) Pseudoplastic flow

8. The value of R in energy of activation is

(a) 1.98 cal/deg.molecule (b) 1.89 cal/deg.molecule
(c) 8.91 cal/deg.molecule (d) 9.18 cal/deg.molecule

28. For solid oral drug products, a change in the concentration of which of the following excipients is more likely to influence the bioavailability of a drug

(a) Starch (b) Magnesium stearate (c) Microcrystalline cellulose (d) Lactose

29. Match List I with List II

List - I (Term or Phrase)	List - II (Meaning)
1. Gutturi	[P] Into the left ear
2. In oculum sinistram	[Q] Into the right eye
3. In aurem sinistram	[R] For the left eye
4. In oculum dextrum	[S] To the throat

Choose the CORRECT answer from the options given below

(a) 1 - [S], 2 - [R], 3 - [P], 4 - [Q] (b) 1 - [Q], 2 - [P], 3 - [S], 4 - [R]
(c) 1 - [R], 2 - [S], 3 - [P], 4 - [Q] (d) 1 - [P], 2 - [R], 3 - [Q], 4 - [S]

30. Application for the issue of a permit to import small quantities of drugs for personal use are shall be made in

(a) Form – 12 (b) Form - 12A (c) Form - 12AA (d) Form – 13

31. One of the following apparatus is used to determine particle size by the gravity sedimentation method

(a) Pyknometer (b) Ostwald viscometer (c) Anderson apparatus (d) Friabilator

32. The relationship between the vapor pressure and the absolute temperature of a liquid isexpressed by

(a) Biles Equation (b) Lien and Kennon Equation
(c) Joule-Thomson Equation (d) Clausius- Clapeyron Equation

33. Preservatives are usually NOT added to

(a) Small volume parenterals (b) Large volume parenterals
(c) All parenterals (d) Bacteriostatic water for injection

34. Match the following

1. Schedule M	[P]	Regulations regarding life period and storage of various drugs
2. Schedule FF	[Q]	Regulations for manufacturing Premises. Waste disposal, requirements of plant and equipments (Good Manufacturing Practices)
3. Schedule G	[R]	Various drugs to be used under the medical supervision
4. Schedule P	[S]	Standards for Ophthalmic preparations

Choose the CORRECT answer from the options given below

(a) 1 - [P], 2 - [Q], 3 - [R], 4 - [S] (b) 1 - [Q], 2 - [S], 3 - [R], 4 - [P]
(c) 1 - [S], 2 - [Q], 3 - [R], 4 - [P] (d) 1 - [R], 2 - [P], 3 - [Q], 4 - [S]

35. In case of solvates the following are examples of Class I residual solvents that have been classified by the ICH

(a) Benzene, Carbon tetrachloride and 1, 2 - dichloroethane
(b) Acetonitrile, Cyclohexane and Toluene
(c) Methanol and N.N - dimethylacetamide
(d) Acetic acid, Acetone and Ethanol

36. Compendium of pharmaceuticals and specialties is an International drug compendia from

(a) German Pharmaceutical Association (b) Australian Pharmaceutical Association
(c) Indian Pharmaceutical Association (d) Canadian Pharmaceutical Association

37. Which of the following ICH Harmonized Tripartite Guidelines related to stability, provides approaches that allows for bracketing and matrixing designs for stability testing. This is especially important when a new drug product is to be commercialized with multiple strengths in multiple packaging configurations

PHARMACEUTICAL CHEMISTRY

77. Desmethyl diazepam is an active metabolite, having an elimination half-life of more than 40 hours, of all the following drugs EXCEPT

(a) Flurazepam (b) Chlordiazepoxide (c) Clorazepate (d) Diazepam

78. Which of the following method is used for the determination of osmotic pressure

(a) Beckmann's method (b) Berkeley and Hartley's method
(c) Cottrell's method (d) Landsberger's method

79. Which is NOT the colligative property

[P] Depression of freezing point [Q] Elevation of boiling point
[R] Elevation of vapour pressure [S] Osmotic pressure
Choose the CORRECT one of the following

(a) [P], [Q] and [S] (b) [P] and [Q] (c) [P] and [S] (d) [R] only

80. Substitution constant for Meta benzoic acids is denoted by

(a) σ_m (Sigma m) (b) $pKa_{(H)}$ (c) ρ_m (rho m) (d) pH_m

81. Which of the following is NOT an intensive property

(a) Concentration (b) Density (c) Pressure (d) Volume

82. A diuretic compound Cyclothiazide has a _____ substituent at C-3 of 1, 2, 4- Benzothiadiazine nucleus

(a) 5-Bornen-2-yl (b) 5-Norbornen-2-yl (c) 2-Bornen-5-y1 (d) 2-Norbornen-5-yl

83. Which among the following drugs on standing in aqueous solution can dimerize to 2, 5- bis (aminoxy-methyl) 3, 6-diketopiperazine

(a) Pyrazinamide (b) Ethionamide (c) Diethylcarbamazine (d) Cycloserine

84. This compound 2, 5, 8, 11, 14, 17, 20, 23, 26-nona-oxaoctacosan-28-yl p-(butylamino) benzoate is usually known for its _____ activity

(a) Antifungal (b) Antitussive (c) Vitamin (d) Glucocorticoid

85. Silver nitrate reagent is used for limit test in Indian Pharmacopoeia for

(a) Lead (b) Iron (c) Chloride (d) Mercury

86. Formaldehyde undergoes Grignard reaction to give

(a) Primary alcohol (b) Secondary alcohol
(c) Tertiary alcohol (d) Quaternary alcohol

87. Pyridine upon hydrogenation in presence of platinum at 25°C and 3 ATM pressure yields

(a) Piperidine (b) 2, 3-Dihydropyridine
(c) Pyrazine (d) 3, 4-Dihydropyridine

88. Which of the following drug belongs to class of antibiotic called ansamycins

(a) Rifampin (b) Streptomycin (c) Azithromycin (d) Streptozotocin

89. The dehydration of aldol product of two acetaldehyde molecules through E_1cB mechanism affords formation of

(a) 1-Butenal (b) 2-Butenal (c) 3-Butenal (d) 4-Butenal

90. Four-membered fully saturated heterocycle containing one oxygen is called

(a) Oxirene (b) Oxirane (c) Oxetene (d) Oxetane

91. Which among the following cations has the lowest molar ionic conductivity in water at infinite dilution and at 25 degree centigrade

(a) Hydrogen ion (b) Lithium ion (c) Sodium ion (d) Silver ion

92. Formation of pyranose structure from glucose leads to formation of diastereoisomers called

(a) Anomers (b) Epimers (c) Tautomers (d) Metamers

119. Given below are two statements, one is labelled as Assertion [A] and the other is labelled as Reason [R]

Assertion [A] : Gram negative bacteria do not retain the primary stain when washed with alcohol and subsequently stained again with secondary stain

Reason [R] : The outer membrane of gram negative bacteria contains lipopolysaccharides

In light of the above statements. Choose the CORRECT answer from the options given below

(a) Both [A] and [R] are true and [R] is the correct explanation of [A]
(b) Both [A] and [R] are true but [R] is NOT the correct explanation of [A]
(c) [A] is true but [R] is not false
(d) [A] is false but [R] is true

120. Which of the following product life cycle phases, it is indicative of market saturation in the sense that all the potential customers have bought the product EXCEPT those who have decided not to have it

(a) Growth phase
(b) Introductory phase
(c) Decline Phase
(d) Maturity phase

121. Glucose upon treatment with nitric acid yields

(a) Gluconic acid (b) Glucaric acid (c) Glucitol (d) Heptanoic acid

122. The artificial or synthetic seeds are prepared by the following process

(a) Somatic hybridization and culture
(b) Somatic embryogenesis and immobilization
(c) Microprojectile and transformation
(d) Artificial pollination and embryogenesis

123. Which of the following statement is the CORRECT description of product positioning

(a) Selecting one or more segment to enter
(b) Occupying distinctive position in the mind of customer
(c) Identifying group of buyers with common need
(d) Distinguishes company's product from competitor's product

124. The total number of amino acids in human insulin (total number of amino acids in A and B chain) is

(a) 51 (b) 84 (c) 32 (d) 08

125. Mixed micelle of lipids with bile acids and lipid soluble vitamins are absorbed by

(a) Pancreatic lipase (b) Apolipoproteins (c) Enterocytes (d) Chylomicrons

ANSWER KEY GPAT-2021

1- d	2-c	3-a	4-c	5-a	6-b	7-a	8-a	9-b	10-d
11-c	12-c	13-a	14-c	15-d	16-b	17-d	18-a	19-b	20-d
21-b	22-b	23-a	24-a	25-c	26-c	27-d	28-b	29-a	30-b
31-c	32-d	33-b	34-b	35-a	36-d	37-b	38-c	39-a	40-a
41-a	42-b	43-d	44-d	45-a	46-c	47-b	48-c	49-d	50-a
51-c	52-a	53-b	54-c	55-a	56-d	57-b	58-a	59-c	60-b
61-b	62-d	63-b	64-d	65-c	66-c	67-b	68-b	69-a	70-a
71-a	72-b	73-a	74-b	75-b	76-d	77-a	78-b	79-d	80-a
81-d	82-b	83-d	84-b	85-c	86-a	87-a	88-a	89-b	90-d
91-b	92-a	93-d	94-c	95-b	96-c	97-a	98-b	99-c	100-b
101-d	102-b	103-d	104-b	105-b	106-b	107-d	108-c	109-d	110-b
111-d	112-c	113-c	114-b	115-c	116-b	117-c	118-d	119-a	120-d
121-b	122-b	123-b	124-a	125-c					

ANSWER & EXPLANATION

1. Ans (d)

❑ **IMPORTANT TERM AND THEIR DESCRIPTION**

TERM	DESCRIPTION	IMAGES
Tinctures	Tinctures are defined in the **USP as alcoholic or hydroalcoholic solutions prepared from vegetable materials or from chemical substances**	
Extracts	Extracts are defined in the **USP as concentrated preparations of vegetable or animal drugs** obtained by **removal of the active constituents** of the respective drugs with suitable **menstrual, evaporation** of all or nearly all of **the solvent**, and adjustment of the **residual masses or powders** to the prescribed standards.	
Infusion	• An infusion is a dilute solution of the readily soluble constituents of crude drugs. • Fresh infusions are prepared by macerating the solids for a short period of time with either cold or boiling water.	
Fluid extracts	The **USP defines fluid extracts as liquid preparations of vegetable drugs, containing alcohol as a solvent or as a preservative,** or both, so made that, unless otherwise specified in an individual monograph, **each milliliter contains the therapeutic constituents of 1 g of the standard drug that it represents.**	

Reference: **Remington The science and Practice of Pharmacy, Linda A. Felton, 22nd edition, Page no. 465**

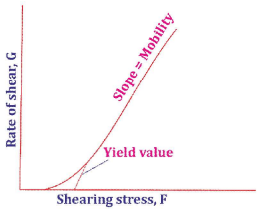
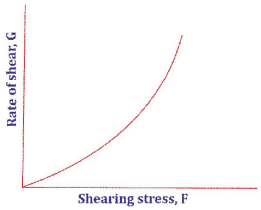
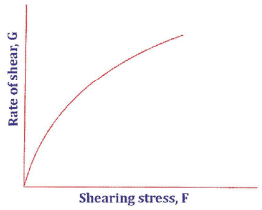
2. Ans (c)

❑ **IMPORTANT EQUIPMENT**

MACHINE	DESCRIPTION	IMAGE
Low shear mixer - Slated Double Cone Mixer	Low shear mixers include the barrel, cube, twin shell, double cone, **slated double cone,** ribbon, sigma blade, planetary mixers, etc.	
Rotary tablet machine - Manesty Drycota	Rotary tablet machines have also been developed into models capable of producing multiple-layer tablets; the machines are able to **make 1-, 2-, or 3-layer tablets (Oystar Manesty) Manesty Dry cota.**	
Capsule filling machine - PCF 1200 Model (Pharma Land)	Capsule filling machines that work with one or more processes of capsule filling. e.g. Modular capsule filling machine (Modu-C LS), produced by H Höfliger, another new capsule filling machine, produced by PharmaLand **(PCF 1200 Model).**	

7. Ans (a)

❑ TIME INDEPENDENT-NON-NEOWTONIAN FLOW

PLASTIC FLOW	PSEUDOPLASTIC FLOW	DILATANT FLOW
Plastic flow curves **do not pass** through the origin	Curve for a **pseudoplastic material** begins at the origin	It also **originates** from origin
Lines extrapolates to axis, leads to **formation of linear** curve called yield value.	No part of curve is **linear** so, no yield value	No yield value
Flocculated suspension ↑ses yield value	Mainly natural & synthetic gum exhibit pseudoplastic flow	Curve exhibit dilatant flow
		
Equation: $U = \frac{F - f}{G}$ **U** = Plastic viscosity f = Yield value (N/m^2) **G** = Rate of shear (S) **F** = Shear stress (N/m^2)	Equation: $F^N = \eta' G$ **N = 1** (Newtonian flow) **N >1** (Non-Newtonian flow)	Equation: $F^N = \eta' G$ **N < 1** (Degree of dilatancy increases) **N = 1** (Newtonian flow) **N >1** (Non-Newtonian flow)
Also known as **BINGHAM BODIES**	Also called **SHEAR THINNING SYSTEM**	Also called **SHEAR THICKENING SYSTEM**
The term apparent viscosity is used to indicate the changes in viscosity, because the viscosity varies as the shear stress changes.	Viscosity of pseudoplastic substance decrease with increase rate of shear	Increased apparent viscosity at higher rates of shear
Examples → Flocculated particles in concentrated suspension/ Suspension of ZnO in mineral oil, certain paints, ointments, butter, pastes and gels	**Examples** → Liquid dispersions of natural and synthetic gums (tragacanth sodium alginate, methyl cellulose, and sodium carboxy methyl cellulose, gelatin). Jellies, liquid paraffin	**Examples**→ Suspension of corn starch in water; Suspension containing high concentration of solids(>50%) of small, deflocculated particles; Inorganic pigments in water, e.g kaolin 12% in water; zinc oxide 30% in water.

Reference: Martin's Physical Pharmacy and Pharmaceutical Science, Patrick J. Sinko, 6th edition, Page no. 472-473

8. Ans (a)

❑ THE ARRHENIUS EQUATION

- The effect of temperature on reaction rate is given by the equation, first suggested by Arrhenius Increasing the temperature increases the energy and frequency of molecular collisions.
- The Arrhenius equation relates the **rate constant k** to all of these factors.
- **As the temperature increases, the average kinetic energy of the molecules in the liquid also increases**, then more easily they overcome the attractive forces that hold them together. This is called temperature dependence of viscosity.
- **According to Arrhenius, for every 10° rise in temperature, the speed of reaction increases about 2-3 times.**
- The temperature dependence and the theory of viscosity are expressed by the Arrhenius equation of chemical kinetics.

- In this design, two separate groups of volunteers are used. One group will be given the test product and the other group will be given the reference product.

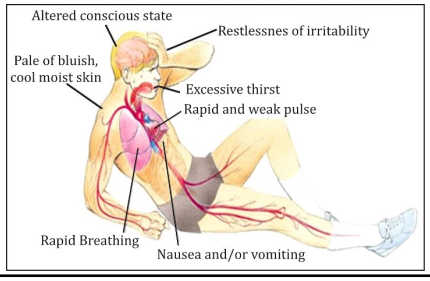
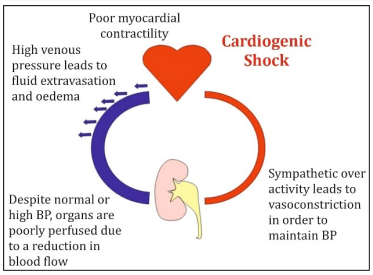
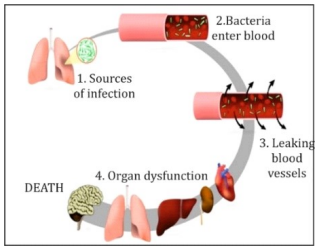
Reference: Shargel and Yu's Applied Biopharmaceutics and Pharmacokinetics, Leon Shargel and Andrew BC Yu, 7th edition, Page no. 493

39. Ans (a)

MATERIAL OF CONSTRUCTION	COMPOSITION	USES
Brasses	It is combination of **copper and zinc alloy.**	For tube plate in evaporators and condenser, for tubes and valves, extensively in making nuts, bolts and rods.
18/8 Stainless Steel	It consists of **18% of chromium and 8% of nickel.**	It is used for most pharmaceutical plant including storage and extraction vessels, evaporators and fermenting vessels. Small apparatus such as funnels, buckets, measuring vessels are made from stainless steel.
Keebush	**Rigid material (phenolic plastics)**	Used for gears and bearings.
Bronzes	It is the combination of **copper and tin alloy**	For filter gauzes, stirrers, valves, pumps, high pressure pipes, autoclaves and special tablet punches and dies.

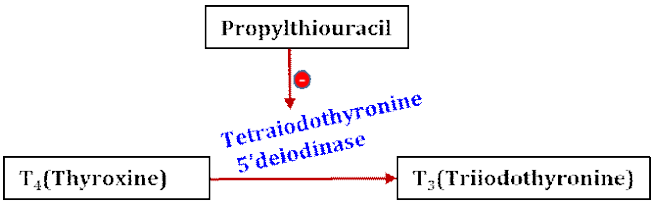
40. Ans (a)

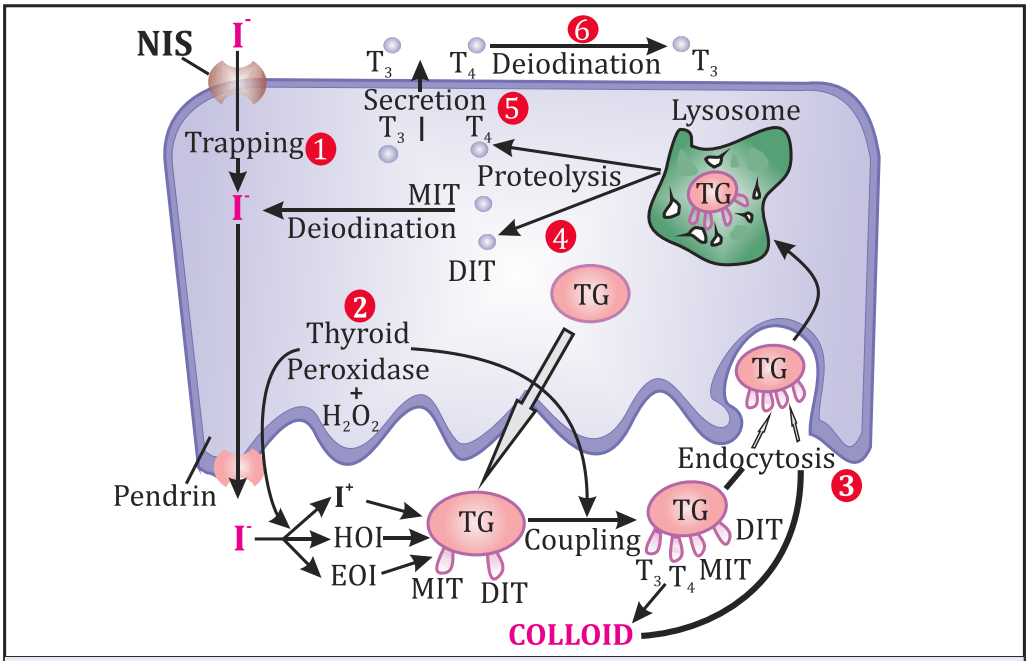
❑ **CLASSIFICATION OF SHOCK**

CLASS	DESCRIPTION	DIAGRAM
Hypovolaemic shock	• Results from inadequate circulatory blood volume by various etiologic factors that may be either from the loss of more than 15% of body's fluid due to blood loss or dehydration. • Leads to organ failure. • Excessive use of diuretics leads to this type of shock.	
Cardiogenic shock	Acute circulatory failure with sudden fall in cardiac output from acute diseases of the heart without actual reduction of blood volume (normovolaemia) results in cardiogenic shock.	
Septic (Toxaemic) shock	• Severe bacterial infections or septicaemia induce septic shock. • Deficiency of adrenal gland function and vasopressin production occurs in about half and one-third patients respectively.	

6. Peripheral conversion of T_4 to T_3

- Peripheral tissues, especially liver and kidney, convert T_4 to T_3.
- **Drugs: Propylthiouracil, Propranolol, Amiodarone and glucocorticoids inhibits peripheral conversion of T_4 to T_3.**





TG-Thyroglobulin,MIT-Monoiodotyrosine,DIT-Diiodotyrosine, T_4 - Thyroxine, T_3 - Triiodothyronine, HOI - Hypoiodous acid, EOI - Enzyme linked hypiodate, NIS - Na^+ iodide symporter, TSH - Thyroid stimulating hormone

Fig : Synthesis, storage and secretion of thyroid hormone

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 275

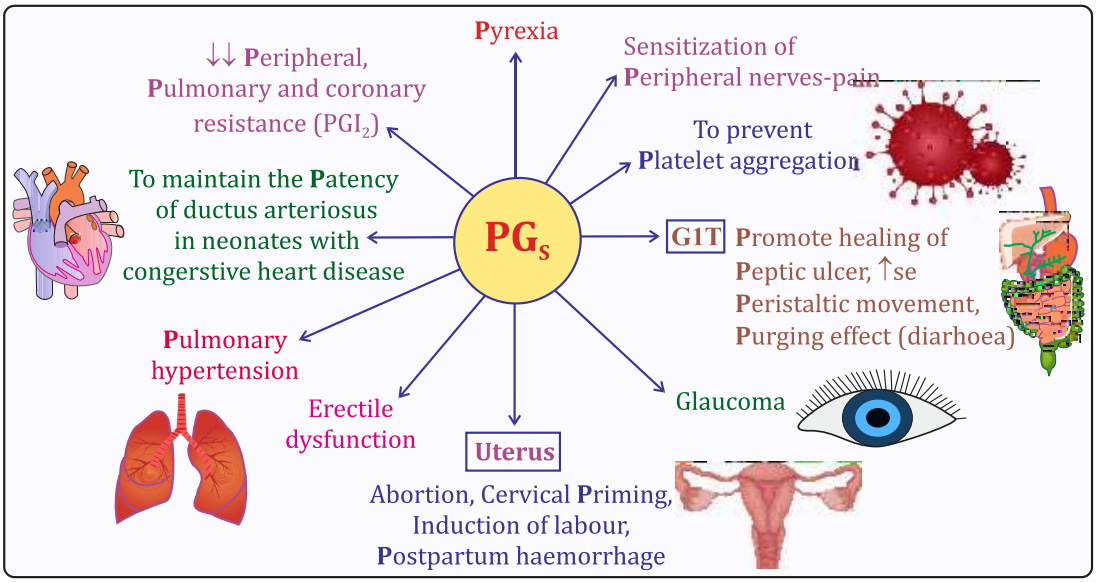
46. Ans (c)

❑ **FACTORS INVOLVE IN BLOOD CLOTTING**

CLOTTING FACTORS	NAME	FUNCTION
Factor I	Fibrinogen	Converted to fibrin
Factor II	Prothrombin	Converted to thrombin
Factor III	Tissue thromboplastin	Essential in activating in vivo coagulation
Factor IV	Ca^{2+} ions	Required for coagulation factors to bind phospholipid
Factor V	Labile factor	Co-factor involved in converting prothrombin to thrombin
Factor VII	Proconverting /Stable factors	In vivo activates factor (IX)
Factor VIII	Antihaemophilic factors	Co-factor involved in activating factor X. **Deficiency will cause hemophilia A**
Factor IX	Plasma thromboplastin component (PTC)	Involved in activating factor X. Deficiency will cause hemophilia B
Factor X	Stuart-Prower factor	Involved in converting prothrombin to thrombin

- Useful in the treatment of erectile dysfunction.

8. PGS are serves as analgesic agent (Pain producing agent) during inflammation.



Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 205-207

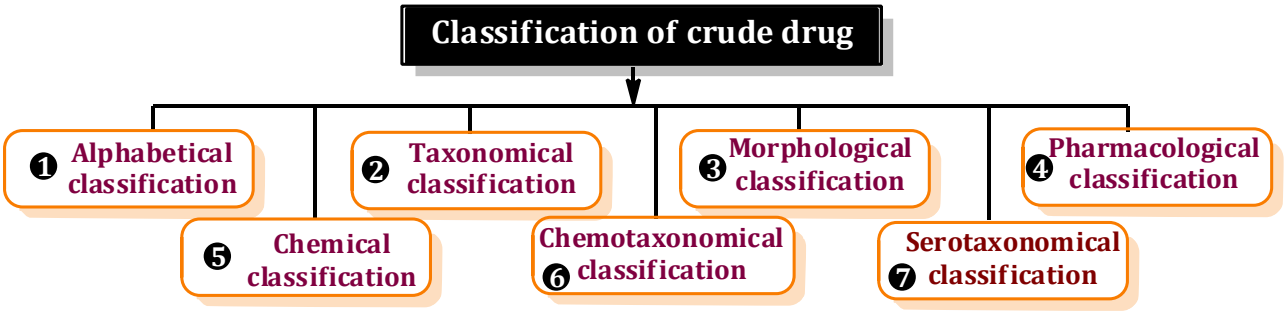
66. Ans (c)

SEE THE EXPLANATION NO. 112 OF GPAT 2023 SHIFT-I

67. Ans (b)

❑ **CLASSIFICATION OF CRUDE DRUG**

In Pharmacognosy the crude drugs are classified as follows



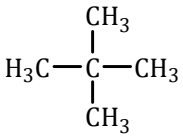
➢ **Chemotaxonomical classification**

It is the latest system of classification that gives more scope for understanding the relationship between **chemical constituents, their biosynthesis** and their possible action.

The **biosynthetic pathway** plays an important role while taking into **consideration the chemosystematics** and plant revolution, due to the fact that the **same kind of secondary metabolite may be the product of two altogether different pathways.**

Reference: Textbook of Pharmacognosy & Phytochemistry, Biren Shah , A.K. Seth, Page.no.26/ Pharmacognosy and Pharmacobiotechnology, 2nd edition, Ashutosh Kar, Page.no.810

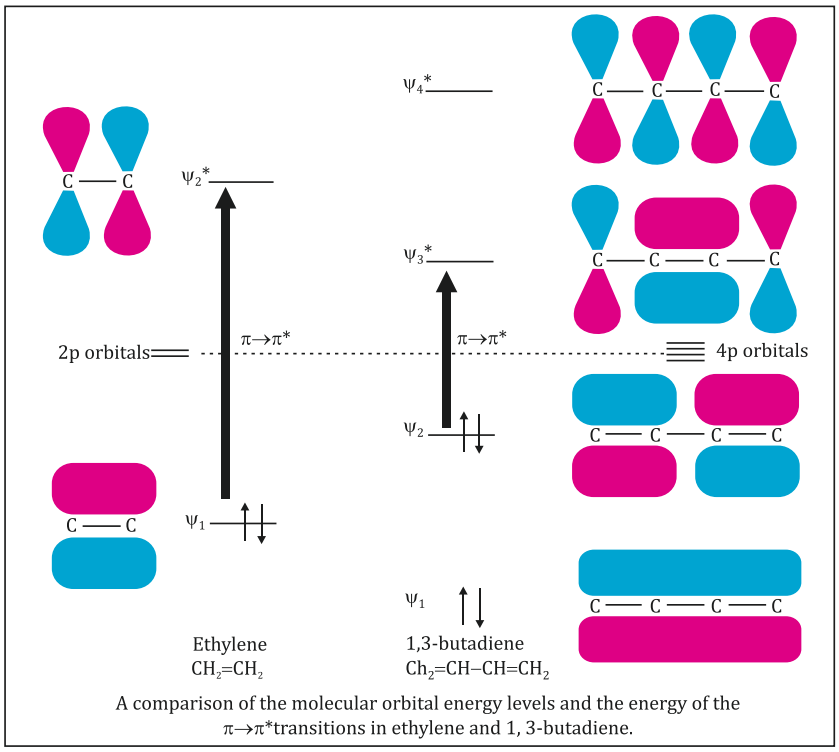
109. Ans (d)



- In 2,2-dimethylpropane all the protons are equivalent so there is no splitting and the NMR Signal is one singlet.

110. Ans (b)

- According to molecular orbital theory the atomic p orbitals on each of the carbon atoms combine to form π molecular orbitals.
- For example, in 1,3 butadiene there are 4 atomic p orbitals that forms π system of two conjugated double bonds.
- Since there are 4 atomic orbitals with which to build, four molecular orbitals results.



A comparison of the molecular orbital energy levels and the energy of the π→π*transitions in ethylene and 1, 3-butadiene.

111. Ans (d)

❑ **HEXOSE MONOPHOSPHATE SHUNT**

- Hexose monophosphate pathway or HMP shunt is also called pentose phosphate pathway or phosphogluconate pathway.
- HMP shunt is more anabolic in nature, since it is concerned with the **biosynthesis of NADPH** and pentoses.
- **No ATP is directly utilized or produced in HMP pathway.**
- HMP shunt is divided into two phases- **oxidative and non-oxidative**
- **The oxidative phase is irreversible, but the non-oxidative phase is reversible.**
- Ribulose 5-phosphate is acted upon by an epimerase to produce xylulose 5-phosphate while ribose 5-phosphate ketoisomerase **converts ribulose 5-phosphate to ribose 5-phosphate.**
- The overall reaction may be represented as-

$$6\text{ Glucose 6-phosphate} + 12\ NADP^+ + 6H_2O \longrightarrow 6CO_2 + 12\ NADPH + 12H^+ + 5\text{ Glucose 6-phosphate}$$

FOR MORE DETAIL SEE THE EXPLANATION NO. 116 OF GPAT 2023 SHIFT-I

Reference: Biochemistry, U. Satyanarayana and U. Chakrapani, 4th edition, Page no. 270-271, 274

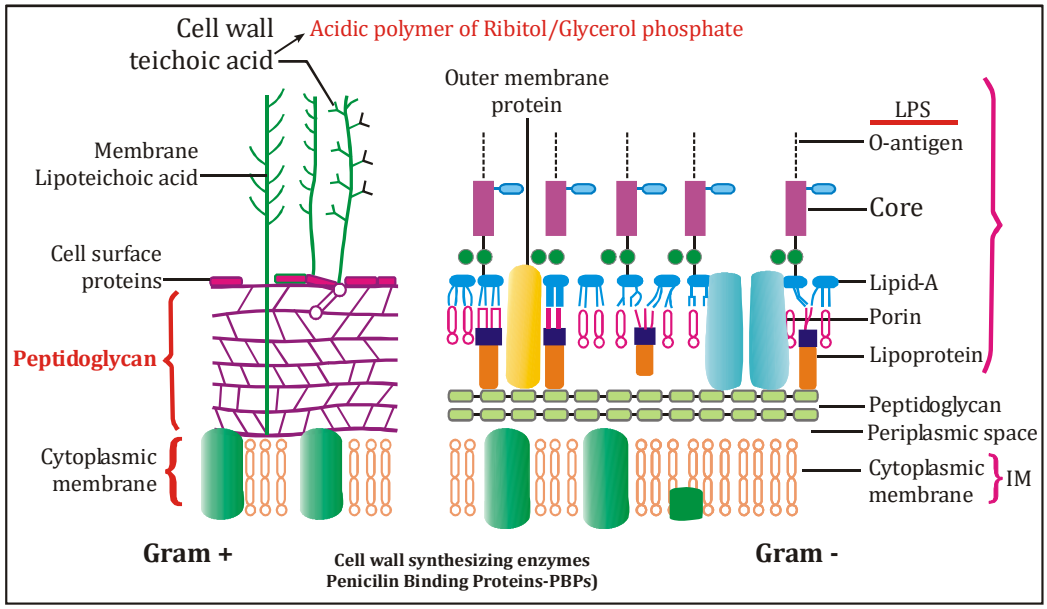
Most resistant
Prions
Endospores of bacteria
Mycobacteria
Cysts of protozoa
Vegetative protozoa
Gram-negative bacteria
Fungi, including most fungal spores
Viruses without envelopes
Gram-positive bacteria
Viruses with lipid envelopes
Least resistant

Reference: Pharmaceutical Microbiology, Hugo Russell's, 8th edition, Page no. 349

119. Ans (a)

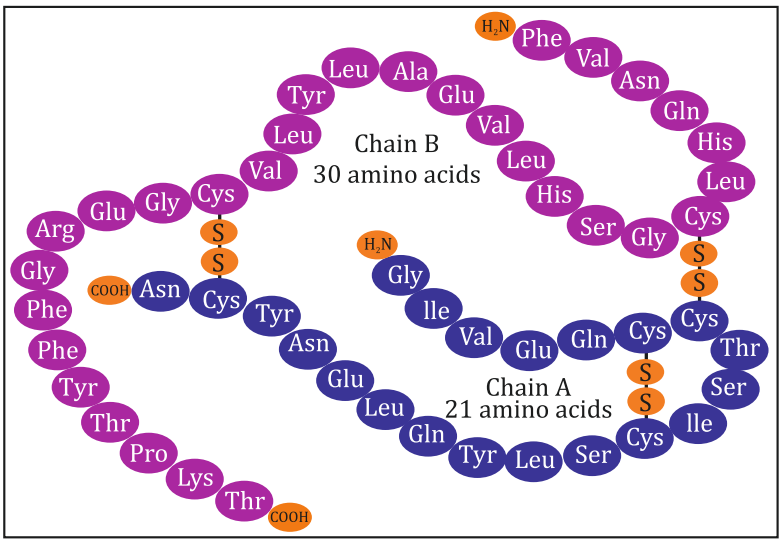
Gram staining is differential staining procedure separates most bacteria into two groups on the basis of cell wall composition:

- Gram-positive bacteria (thick layer of peptidoglycan-90% of cell wall)- stains purple.
- Gram-negative bacteria (thin layer of peptidoglycan-10% of cell wall and high lipid content)–stains red/pink.



- Gram-positive organisms contain a highly cross-linked layer of peptidoglycan that retains the primary dye, crystal violet (CV), following the application of the mordant, iodine (I). The iodine and crystal violet form a complex within the peptidoglycan.
- **Lipopolysaccharides (LPS) are** important outer membrane components of gram-negative bacteria.
- When decolourizer is applied to the cells, the CV-I complex remains within the cell, making it appear dark purple to blue.
- **The gram-negative organisms do not contain a thick cross-linked layer of peptidoglycan. The peptidoglycan is loosely distributed between the inner cell and the outer cell membranes. Following the application of the crystal violet and iodine, the CV-I complexes are not trapped within the peptidoglycan**. Application of the acid-alcohol decolourizer dehydrates the outer cellular membrane, leaving holes in the membrane and effectively washing or removing the CV-I complex from the cells.

124. Ans (a)



❑ **INSULIN**

- Insulin is a polypeptide hormone produced by the β-cells of islets of Langerhans of pancreas.
- Human insulin contains 51 amino acids, arranged in two polypeptide chains.
  - ✓ **A chain consists of 21 amino acids**
  - ✓ **B chain consist of 30 amino acids**
- The Chains A and B are linked by disulphide bridges.

Reference: Biochemistry, U. Satyanarayana and U. Chakrapani, 4th edition, Page no. 669-670

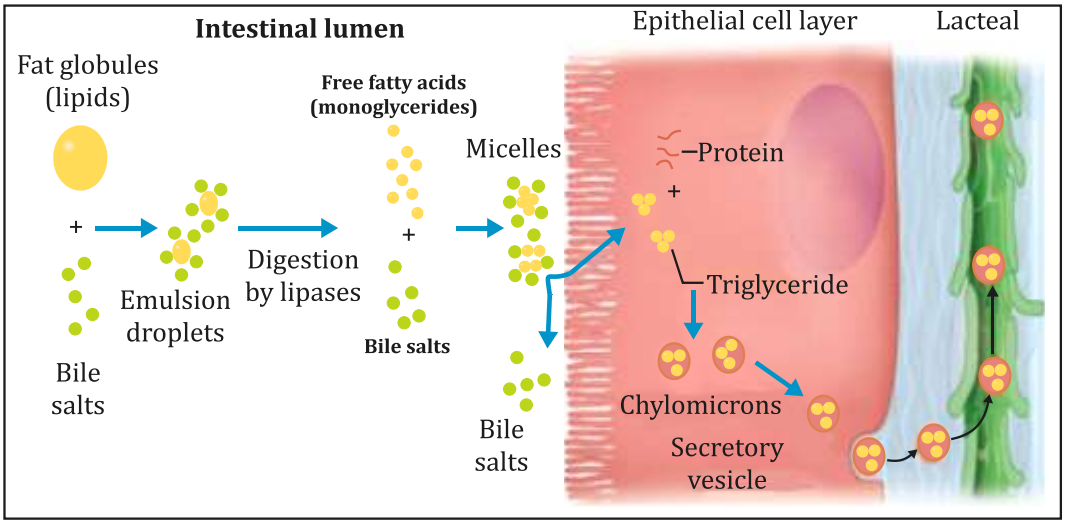
125. Ans (c)

❑ **MIXED MICELLES**

- The mixed micelles serve as the major vehicles for the transport of lipids from the intestinal lumen to the membrane of the intestinal mucosal cells, the site of lipid absorption.

❑ **ENTEROCYTES**

- Enterocytes are intestinal absorptive cells that line the small and large intestines.
- They have a glycocalyx surface coat that contains digestive enzymes, and microvilli on their apical surface that increase their surface area.
- This allows them to transport small molecules into the enterocyte from the **intestinal lumen.**
- **Mixed micelle of lipids with bile acids and lipid soluble vitamins are absorbed by enterocytes.**



Reference: Biochemistry, U. Satyanarayana and U. Chakrapani, 4th edition, Page no. 175-176

Previous Year Paper

GPAT-2020

PY-PHARMACEUTICAL SCIENCE

Multiple Choice Questions

125 QUE

Video Explanation

SCAN ME!

PHARMACEUTICS

1. **Hydrated proton is called**
   (a) Water proton (b) Hydronium ion (c) Roxonium ion (d) Proton pump
2. **Burow's solution is**
   (a) Aluminium acetate solution strong (b) Calcium phosphate solution strong
   (c) Ammonium acetate solution strong (d) Calcium hydroxide solution strong
3. **When the concentration of an aqueous sodium chloride solution has the same colligative properties as the solution in question, the value so obtained is known as**
   (a) Normality (b) Isotonicity value (c) Molarity (d) Molality
4. **As per the Drugs and Cosmetics Act 1940, if a drug is not labelled in prescribed manner it is a**
   (a) Spurious drug (b) Substandard drug
   (c) Adulterated drug (d) Misbranded drug
5. **The general purpose soda lime glass is NOT a suitable material for fabricating the container for**
   (a) Parenteral (b) Oral solutions
   (c) Liquids for external use (d) Dry powders
6. **The mechanism by which fluorides inhibit dental caries is**
   (a) By increasing susceptibility to acid (b) By increasing the sensitivity of tooth enamel
   (c) Decreased acid solubility of enamel (d) Increased acid solubility of enamel
7. **When a solid forms a gel more readily when gently shaken or otherwise sheared than when allowed to form the gel while the material is kept at rest, the phenomenon is known as**
   (a) Thixotropy (b) Rheopexy (c) Negative rheopexy (d) Anti thixotropy
8. **The dispersion of course material by shearing in a narrow gap between a static cone and a rapidly rotating cone is caused by**
   (a) Colloid Mill (b) Electrical Dispersion
   (c) Peptisation (d) Ultrasonic Irradiation
9. **Which of the following is NOT a fundamental (primary) factor considered for selection of a location for the construction of pharmaceutical or chemical plant**
   (a) Soil (b) Market for products
   (c) Labour supply (d) Raw materials
10. **The drug concentration between Minimum effective concentration (MEC) and maximum safe concentration (MSC) is called**
    (a) Toxic range (b) Therapeutic index
    (c) Therapeutic ratio (d) Therapeutic range

59. Which three of the following are physiological effects of ganglionic stimulating agents

[P] Stimulation of sympathetic ganglia and the adrenal medulla leading to cardiovascular responses

[Q] Initial transient stimulation and then a more persistent depression of all autonomic ganglia

[R] Marked depression of CNS leading to analgesia

[S] Chronic exposure causes a marked increase in the density of nicotinic receptors contributing tolerance and dependence

[T] Combined activation of parasympathetic ganglia and cholinergic nerve ending by nicotine results in increased tone and motor activity of the bowel

[U] Inhibition of salivary and bronchial secretions that is followed by stimulation

(a) [P], [R] and [S]
(b) [Q], [S] and [U]
(c) [Q], [R] and [T]
(d) [P], [Q] and [S]

60. Meloxicam belongs to which class of Non-steroidal Anti-inflammatory Drugs (NSAIDs)

(a) Preferential COX-2 inhibitor
(b) Selective COX-1 inhibitor
(c) Preferential COX-1 inhibitor
(d) Selective COX-2 inhibitor

61. Which one of the following is NOT the property of osmotic diuretics

(a) Undergo limited reabsorption by the renal tubule
(b) Are relatively inert pharmacologically
(c) They inhibit carbonic anhydrase
(d) Freely filtered at the glomerulus

62. Two pore domain K^+ ions channels are opened by which one of the following categories of anaesthetic

(a) Barbiturates
(b) Benzodiazepines
(c) Opioid analgesics
(d) Halogenated inhalation anaesthetic

63. Which one is NOT an opioid receptor

(a) Gamma (b) Kappa (c) Mu (d) Delta

64. Identify antiarrhythmic drug that increases duration of QT wave and decreases the sinus rate, whereas it has no effect on QRS complex

(a) Lidocaine (b) Amiodarone (c) Verapamil (d) Quinidine

65. Auto rhythmicity is present in which of the following group of tissues

(a) Skeletal muscle and cardiac muscle
(b) Skeletal muscle and visceral smooth muscle
(c) Cardiac muscle and neuronal tissue
(d) Cardiac muscle and visceral smooth muscle

66. d-tubocurarine produces skeletal muscle relaxation by inhibiting

(a) Ganglionic nicotinic receptors
(b) Muscarinic receptors
(c) Nicotinic receptors in neuromuscular junction
(d) Alpha-adrenergic receptors

67. Which of the following is NOT one of the triade effects of adrenaline leading to rise in blood pressure

(a) A direct myocardial stimulation that increases the strength of ventricular contraction
(b) An increased heart rate (positive chronotropic action)
(c) Vasoconstriction in many vascular bed specially in precapillary resistance vessels of skin
(d) Stimulation of presynaptic alpha-2 adrenoreceptor leading to increase sympathetic tone

68. Which of the following drugs possesses Antiplatelet effects

(a) Erythropoietin (b) Urokinase (c) Desmopressin (d) Clopidogrel

69. Which one of the following is a organ specific (localized) autoimmune disease

(a) Grave's disease
(c) Scleroderma
(c) Polyarteritisnodosa
(c) Rheumatoid arthritis

82. The fundamental principle "Law of similia" falls under which therapy

(a) Ayurveda (b) Siddha (c) Homoeopathy (d) Aromatherapy

83. In the process of Extraction, ethanol is used as a solvent for

(a) Sucrose (b) Waxes (c) Alkaloids (d) Gums

84. Nicotine from tobacco is an alkaloid which is

(a) Oxygen free liquid (b) Semisolid
(c) Crystalline (d) Oxygen free solid

85. In shikimic acid pathway, chorismite mutase converts chorismic acid to

(a) Carotenoids (b) Phytol
(c) Prephenate (Prephenic acid) (d) Gutta

86. Plants which are NOT differentiated into root, stem and leaves are

(a) Plant aginales (b) Principes (c) Thallophyte (d) Bromeliales

87. In colour test for alkaloids colchicine with mineral acids gives

(a) Blue colour (b) Red colour (c) Yellow colour (c) Violet colour

88. In yam, the presence of, irregular arrangement of the fibres, the ends of which often project from the surface is because of

(a) Absence of linters (b) Absence of combing
(c) Presence of impurities (d) Improper drying

PHARMACEUTICAL CHEMISTRY

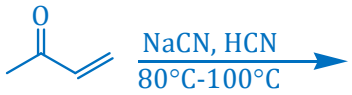
89. Electron releasing groups stabilizes free radicals by

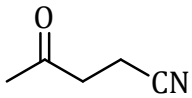
(a) Positive inductive (+I) effect (b) Negative mesomeric (-m) effect
(c) Positive mesomeric (+m) effect (d) Negative inductive (-I) effect

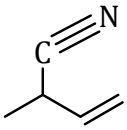
90. Which of the following rearrangement involves migration of a group from carbon to electron deficient nitrogen

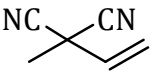
(a) Willgerodt rearrangement (b) Baeyer villiger rearrangement
(c) Pinacol-pinacolone rearrangement (d) Beckmann rearrangement

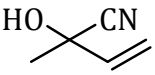
91. What is the product of the following reaction



(a) 

(b) 

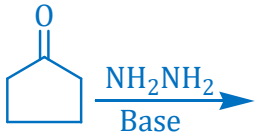
(c) 

(d) 

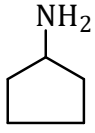
92. This 4-amino quinoline antimalarial drug marketed as R, S isomer, has two trifluromethyl moieties at position 2' and 8' and no electronegative substituent either at 6' or 7' positions is

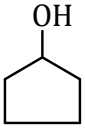
(a) Mefloquine (b) Chloroquine (c) Primaquine (d) Amodiaquine

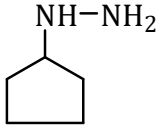
93. Product of the following reaction



(a) 

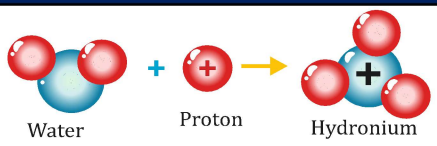
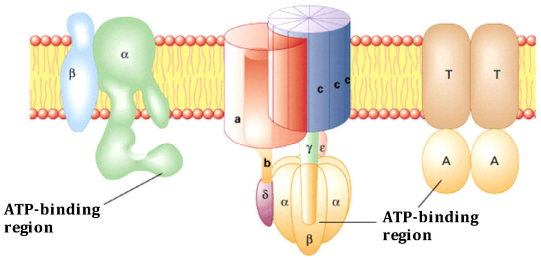
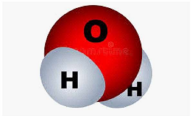
(b) 

(c) 

(d) 

ANSWER & EXPLANATION

1. Ans (b)

TERM	DESCRIPTION	IMAGES
Hydronium ion	The **hydrogen ion consists of the hydrated proton(H^+),** known as the **hydronium or Oxonium ion (H_3O^+).**	
Proton pump	A **proton pump** is an integral membrane protein pump that builds up a proton gradient across a biological membrane. A membrane protein that moves protons across a biological membrane using energy from adenosine triphosphate (ATP).	
Water proton	A **water proton**(H^+) is a positively charged hydrogen ion that moves rapidly between water molecules.	Water molecule 

Reference: Martin's Physical Pharmacy and Pharmaceutical Science, Patrick J. Sinko, 6th edition, Page no. 146/Remington the Science and Practice of Pharmacy, Linda A. Felton, 22nd edition, Page no. 261

2. Ans (a)

❑ **COMMONLY USED PHARMACEUTICAL PREPARATIONS**

PREPARATION	USE
Aluminium Acetate Solution, Strong (Burow's solution)	Used as **wet dressing in dermatology** and as **ear drops.**
Calcium Phosphate Solution, Strong	Dietary Supplement, Antacid and Dental Applications
Ammonium Acetate Solution, Strong	Used as a mild expectorant and a diaphoretic
Calcium Hydroxide Solution, Strong	Lime water is an ingredient of some dermatological products
Chlorinated Soda Solution, Surgical (Dakin's Solution)	Cleansing and deodorizing infected wounds
Chloroxylenol Solution (Roxenol)	Antiseptic Solution used in obstetrics

Reference: Cooper and Gunn's Dispensing for Pharmaceutical Students, S.J Carter, 12th edition, Page no. 94 & 95

19. Ans (c)

- **The internal phase in monodisperse system (All particles having the same size) should not be more than 74% of total volume of system .**
- Volume of aqueous phase, relative to amount of oil phase (phase volume ratio), decides the rheological properties of emulsion.

PHASE VOLUME RATIO	TYPE OF FLOW
5%	Newtonian
50%	Pseudoplastic
74%	**Plastic flow (Phase inversion may occur)**

- **The volume of disperse phase should not exceed 74% or more than 50-60% of the total volume because it may cause phase inversion**

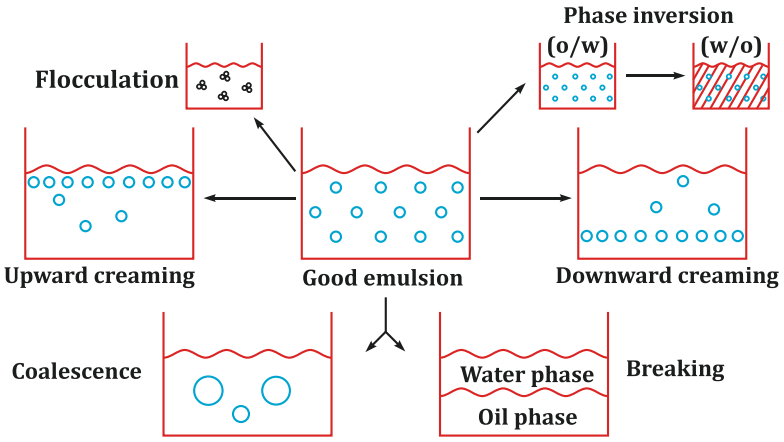


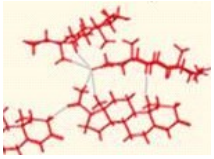
Fig. - Emulsion Instability

Reference: Aulton's Pharmaceutics the Design and Manufacture of medicines, Michael E. Aulton and Kevin M.G. Taylor, 4th edition, Page no. 91

20. Ans (d)

❑ **POLYMORPHS**

Polymorphs



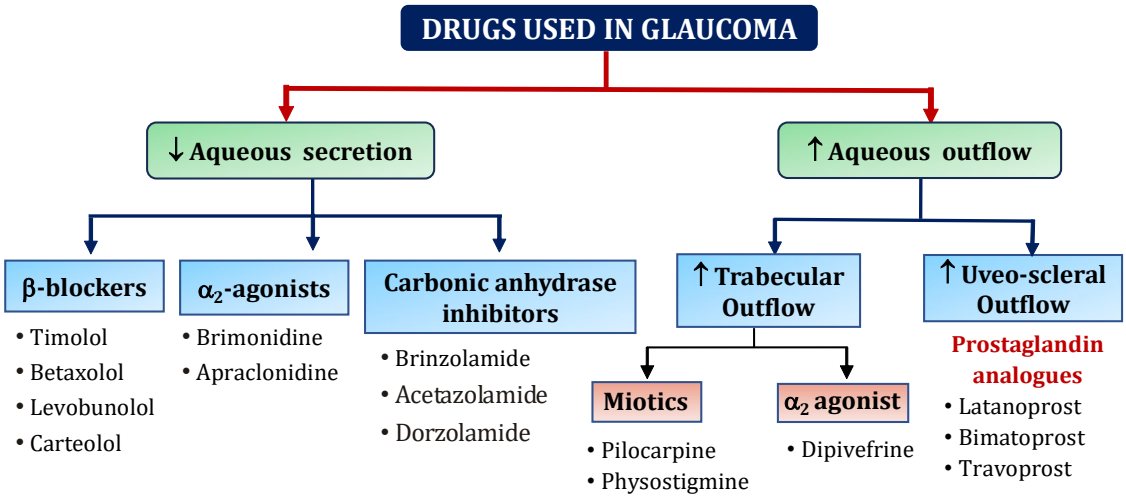
- Substance exists in more than one crystalline form.
- Polymorphs are different from each other from – **Solubility, Melting point, Density, Hardness, Compression, X-ray crystal** and **diffraction patterns**
- Order of solubility – **Amorphous > Metastable > Stable**
- **Stable polymorph represents the lowest energy state, highest melting point and least aqueous solubility of the drug.**
- **Method to determine polymorphism**
  i. X-ray diffraction
  iii. NMR technique
  iii. Optical crystallography
  iv. Hot stage microscopy
  v. Melting point determination

Two types of polymorphs

Enantiotropic polymorph	Monotropic polymorph
One which can be reversibly changed into another form by altering the temperature or pressure. Example: sulphur	One which is unstable at all temperatures and pressures. Example: Glyceryl stearates.

Reference: Martin's Physical Pharmacy and Pharmaceutical Science, Patrick J. Sinko, 6th edition, Page no. 29/Lachman Lieberman's The Theory and Practice of Industrial Pharmacy, Roop K Khar, 4th edition, Page no. 188

❑ CLASSIFICATION OF DRUGS USED IN GLAUCOMA

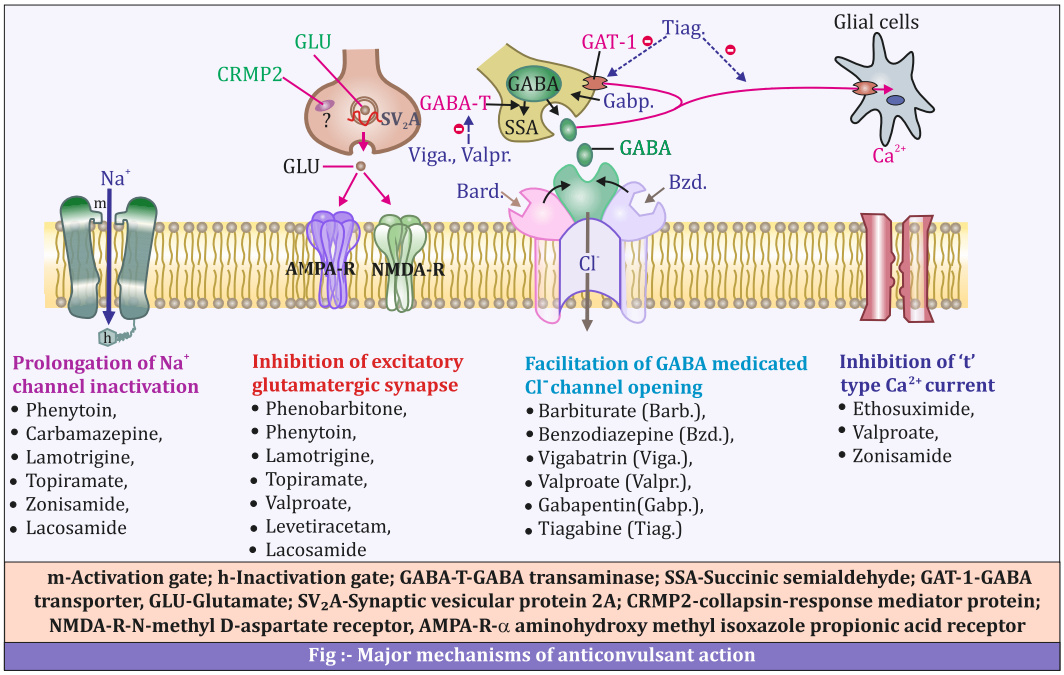


Reference: Review of Pharmacology, Gobind Rai Gupta and Sparsh Gupta, 9th edition, Page no. 61

53. Ans (c)

❑ LAMOTRIGINE

- **Lamotrigine** is a broad-spectrum antiepileptic.
- **It** acts by **prolongation of Na^+ channel inactivation** and suppression of high frequency firing.



m-Activation gate; h-Inactivation gate; GABA-T-GABA transaminase; SSA-Succinic semialdehyde; GAT-1-GABA transporter, GLU-Glutamate; SV_2A-Synaptic vesicular protein 2A; CRMP2-collapsin-response mediator protein; NMDA-R-N-methyl D-aspartate receptor, AMPA-R-α aminohydroxy methyl isoxazole propionic acid receptor

Fig :- Major mechanisms of anticonvulsant action

Reference: Essentials of Medical Pharmacology, K D Tripathi, 8th edition, Page no. 440

54. Ans (a)

❑ COTRIMOXAZOLE (Sulfamethoxazole: Trimethoprim)

- WHO approved fixed dose combination of **[20 : 1 (This ratio obtained in plasma when two are given in a dose ratio 5 : 1)]**

❖ Advantage of Combination are

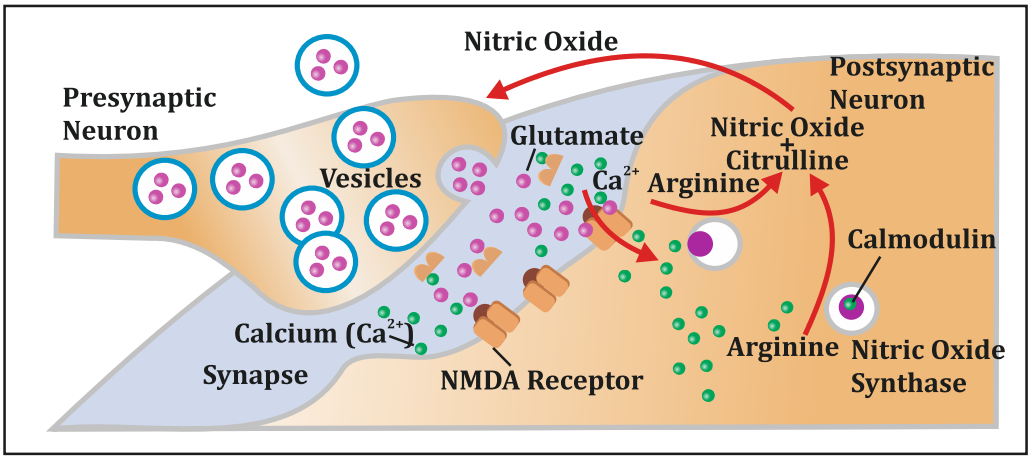
- Individually both are bacteriostatic but the combination has bactericidal effect.
- Chances of development of bacterial resistance are also greatly reduced.

70. Ans (c)

Nitric oxide is vascular relaxation factor produced by endothelial cells.

NITRIC OXIDE	OTHER NEUROTRANSMITTER
It is synthesized **on demand and immediately**	These are synthesized in a constant manner
It diffuses out of the cells	These are stored in vesicles and release by exocytosis

The molecular mechanism of release of nitric oxide is shown in the figure



71. Ans (d)

❑ **HALLMARKS OF CANCER**

HALLMARKS OF CANCER	EXPLANATION
Self-sufficiency in growth signals	Cancer cells stimulate their own growth
Insensitivity to anti-growth signals	**Cancer cells resist inhibitory signals which stops their growth**
Evading apoptosis	Cancer cells resist their programmed cell death
Limitless replicative potential	Cancer cells multiply indefinitely
Sustained angiogenesis	Cancer cells stimulate the growth of blood vessels to supply nutrients to tumors
Tissue invasion and metastasis	Cancer cells invade local tissue and spread to distant sites

Reference: Textbook of Pathology, Harsh Mohan, 7th edition, Page no. 202 & 203

72. Ans (d)

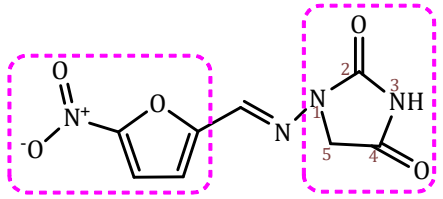
❑ **METABOLIC ACIDOSIS**

- A fall in the blood pH due to metabolic component is brought about by fall of bicarbonate level and excess of H^+ ions in the blood.
- This occurs in the following situations:
  i. Production of large amounts of lactic acid (lactic acidosis) e.g. in vigorous exercise, shock.
  ii. **Uncontrolled diabetes mellitus** (diabetic ketoacidosis).
  iii. Starvation.
  iv. **Chronic renal failure.**
  v. **Therapeutic administration of ammonium chloride or acetazolamide** (diamox).

106. Ans (d)

❑ **STRUCTURE OF NITROFURANTOIN**

Nitrofurantoin - 1-[(5-nitro-2-furyl)methylideneamino]imidazolidine-2,4-dione



2-Nitro furan Imidazole 2,4-dione

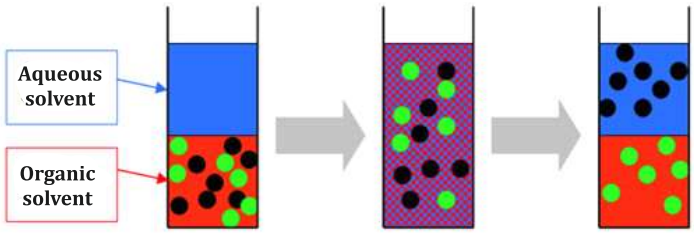
Nitrofurantoin is a Nitrofuran derivative.
It contains of two basic heterocyclic nucleus such as 2-nitro furan and imidazole 2,4-dione.

Reference: Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, John M. Beale, Jr., John H. Block, 12th edition, Page no. 213

107. Ans (a)

- Liquid-liquid extraction is based on the principle of partition co-efficient or distribution co-efficient.
- Liquid-liquid extraction (also known as solvent extraction) involves the separation of the constituents (solutes) of a liquid solution by contact with another insoluble liquid.

Principle:

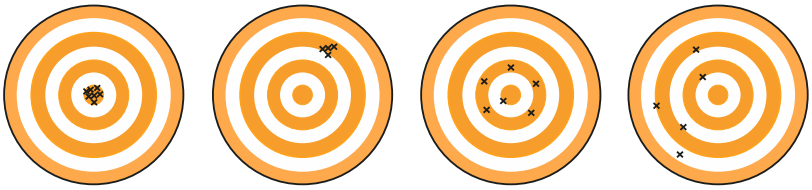


When Liquid-liquid extraction is carried out in a test tube or flask the two immiscible phases are shaken together to allow molecules to **partition** (dissolve) into the preferred solvent phase.

Reference: Cooper and Gunn's Tutorial Pharmacy, 6th edition, Page no. 251

108. Ans (a)

Accuracy	Accuracy is 'the degree of agreement between the measured value and the true value'. An absolute true value is seldom known. So, the term accuracy refers to how near the **observed value is to true or standard value.**
Precision	Precision is defined as the degree of agreement between replicate measurements of the same quantity. **It is the repeatability of a result**.
Deviation	A deviation is any unwanted event that **differs from the approved processes,** procedures, instructions, specifications, or established standards.
Bias	Bias is the **difference between a laboratory's average value and the reference average for a similar test item.**



High Accuracy High Precision Low Accuracy High Precision High Accuracy Low Precision Low Accuracy Low Precision

Reference: Textbook of Pharmaceutical Analysis, Ravi Sankar, 3rd edition, Page no. 23-1

Previous Year Paper

GPAT-2019

PY-PHARMACEUTICAL SCIENCE

Multiple Choice Questions

125 QUE

Video Explanation

SCAN ME!

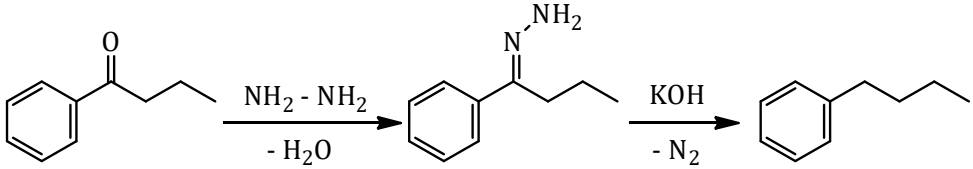
PHARMACEUTICS

1. **Which of the following is NOT a mechanism for achieving gastroretention**
   (a) Osmosis (b) Floating (c) Mucoadhesion (d) Swelling
2. **Which of the following oxide is NOT used for achieving Amber color to glass**
   (a) Manganese (b) Iron (c) Cobalt (d) Carbon
3. **Theories of emulsification are characterized by one of the following, EXCEPT**
   (a) Film formation (b) Phase inversion
   (c) Monomolecular adsorption (d) Solid particle adsorption
4. **Movement of charged particle through a liquid under the influence of an applied potential difference is known as**
   (a) Sedimentation potential (b) Streaming potential
   (c) Electrophoresis (d) Electroosmosis
5. **As per US FDA, NDA's for new chemical entitles are classified as either**
   (a) 'P' for product review or 'S' for standard review
   (b) 'P' for priority review or 'S' for standard review
   (c) 'P' for product review or 'S' for safety review
   (d) 'P' for priority review or 'S' for safety review
6. **In tablet, hydroxy propyl methyl cellulose is used as**
   (a) Diluent (b) Film former (c) Disintegrant (d) Binder
7. **Which one of the following is the property of micro-emulsion**
   (a) They have particle size more than 1 micron
   (b) They have poor stability
   (c) They exhibit a viscoelastic gel phase, when internal phase is added in excess
   (d) They have milky yellow colour
8. **21 CFR part 211 of USFDA describes**
   (a) Current good clinical practice (b) Current good packaging practice
   (c) Current good manufacturing practice (d) Current good laboratory practice
9. **"Shake well" label must be placed on the containers of**
   (a) Ophthalmic suspension (b) Occuserts
   (c) Ophthalmic solution (d) Ophthalmic gels
10. **In case of Aerosol testing valve delivering acceptance criteria for a volume of 54 µl or less**
    (a) ±75% (b) ±5% (c) ±10% (d) ±15%

92. Reaction of α-halo ester with an aldehyde or ketone in the presence of a base like $NaNH_2$ gives α, β-epoxy carboxylic ester. This reaction is referred as

(a) Willgerodt rearrangement
(b) Bamford Stevens reaction
(c) Darzens glycidic synthesis
(d) Baeyer Villiger rearrangement

93. Identify the named reaction

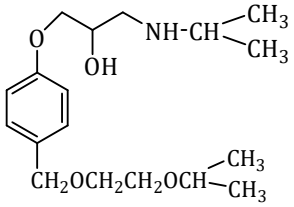


(a) Curtius Rearrangement
(b) Clemmensen reduction
(c) Wolff-Kishner reduction
(d) Wolff-Rearrangement

94. What will be the Heat of vaporisation of 1 mole of water, when it has the entropy change (ΔS) of 35.2 cal/mole.deg (at 25°C)

(a) 1.408 cal/ mole
(b) 10489 cal/ mole
(c) 8465 cal/ mole
(d) 880 cal/mole

95. Identify the name of drug with the following structure



(a) Esmolol (b) Betaxolol (c) Metoprolol (d) Bisoprolol

96. The following ACE inhibitor used in treating cardiovascular disorder is synthesized from the natural amino acids L-alanine and L-proline

(a) Ramipril (b) Enalapril (c) Lisinopril (d) Captopril

97. One of the following is a most commonly used protecting group for amines

(a) Para Methyl benzyl (PMB)
(b) t-Butyloxy carbonyl (t-BOC)
(c) Methoxy methylene (MOM)
(d) Tetra hydro pyranyl oxy (THP)

98. Anti-addition of bromine to trans-2-butene yields

(a) Enantiomer and racemic mixture
(b) Only racemic mixture
(c) Only enantiomers
(d) Only meso compounds

99. Conversion of aryldiazonium chloride to aryl chloride can be achieved in the presence of

(a) Copper (II) chloride
(b) Copper (I) chloride
(c) Sodium chloride
(d) Calcium chloride

100. The chief product obtained by the reaction of neo-pentyl bromide under E_1 reaction conditions

(a) Neopentyl alcohol
(b) 2-methyl-2-butane
(c) 2-methyl-1, 3-butadiene
(d) 2-methyl butane

101. This semi synthetic derivative of Penicillin is synthesized by acylation of 6-APA with p-hydroxy phenyl glycine

(a) Becampicillin (b) Amoxicillin (c) Ampicillin (d) Carbenicillin

102. Choose the correct product of the following reaction

$HNO_3 + 2H_2SO_4 \rightleftharpoons$?

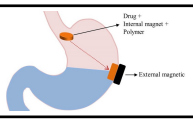
(a) $H_3O^{\oplus} + 2HSO_4^{\ominus} + NO_2^{\oplus}$
(b) $H_2O + 2HSO_4^{\ominus} + NO_2^{\oplus}$
(c) $H_3O^{\oplus} + 2HSO_4^{\oplus} + NO_2^{\oplus}$
(d) $OH + 2HSO_4 + NO_2^{\ominus}$

ANSWER & EXPLANATION

1. Ans (a)

- **Floating, Mucoadhesion and Swelling** is a mechanism for achieving gastroretention **but Osmosis** is **NOT a mechanism for achieving gastroretention.**
- **Gastroretentive drug delivery** is an approach to prolong gastric residence time, thereby targeting site-specific drug release in the GIT for local or systemic effects.

❑ **TYPES OF GASTRORETENTIVE DRUG DELIVERY AND THEIR APPROACHES**

TYPES	APPROACHES
High density systems 	These are formulated by coating drug on heavy inert materials. eg: zinc oxide, titanium dioxide, iron powder
Floating systems 	The main mechanism involved in this system is the production of carbon-dioxide gas due to reaction between sodium bicarbonate, citric acid & tartaric acid.
Swelling systems 	These are a type of non-floating GRDFs. These when enters stomach swells to an extent that cannot pass through the pyloric sphincter.
Bio/mucoadhesive system 	These types of systems adhere to the biological membrane (mucosa) of the stomach.
Magnetic systems 	In this approach dosage form contains a small internal magnet, and a magnet placed on the abdomen over the position of the stomach.

2. Ans (c)

Manganese, Iron and Carbon is used for achieving Amber color to glass but **Cobalt is NOT** used for achieving Amber color to glass.

❑ **COMPOSITION OF GLASS**

COLOR OF GLASS	COMPOSITION
Amber 	**Carbon and sulphur or iron and manganese dioxide**
Yellow 	Cadmium and sulphur
Blue 	Cobalt oxide or occasionally copper (cupric) oxide
Green 	Iron oxide, manganese dioxide and chromium dioxide

25. Ans (b)

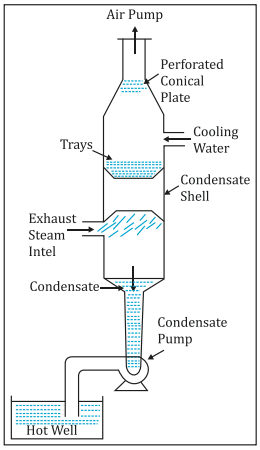
❑ **OFFENCES AND PENALTIES OF NDPS ACT**

OFFENCE	FIRST CONVICTION
In relation to cannabis plant (Opium)-transport, sale, purchase, import, export	
(a) To cultivate any cannabis plant (b) To produce, manufacture, possess, sell, purchase, transport, import inter-state , export inter-state or use cannabis in contravention of this Act or Rules etc.	**10 Years / Fine upto Rs.1 Lakh**
i. Where contravention involves small quantity	6 Months/Fine upto Rs. 10,000
ii. Lesser than commercial quantity but greater than small quantity	10 Years/Fine upto Rs. 1 lakh
iii. Commercial quantity	10-20 Years/Fine upto Rs. 1-2 lakhs

Reference: Textbook of Forensic Pharmacy, NK Jain,8th edition, Page no. 211

26. Ans (a)

❑ **DIRECT-CONTACT OR JET CONDENSER**



- Tubular condensers used for condensing exhaust steam in power plants are known as Surface Condensers.
- **The Jet Condenser** is a system in which a liquid jet is directed into a vapor stream, typically with the intention of de-superheating the vapour.
- A jet of liquid is pumped into a narrow bore pipe and a nozzle at the center line into a tube containing vapour.
- **The function of barometric leg in Direct, Contact or Jet condensers, is to remove the condensate/cooling water mixture.**

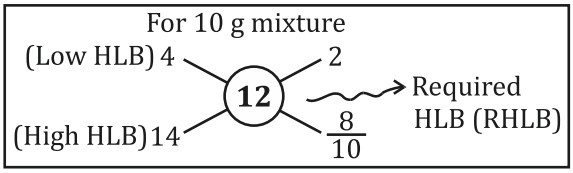
27. Ans (d)

Conjugative, Acetylation, Hydrolytic mechanism of metabolism of drug is NOT affected by weight change of patient but Oxidative metabolism of drug is NOT affected by weight change of patient.

❑ **METABOLISM MECHANISM**

METABOLISM	DESCRIPTION
Conjugative metabolism	• Conjugative metabolism, or phase II metabolism, **can indeed be affected by changes in a patient's body weight,** but the effects are generally indirect and more pronounced in cases of **extreme obesity or significant weight loss.**
Acetylation metabolism	• **Acetylation, a phase II conjugative metabolism pathway**, can be influenced by changes in a patient's body weight, particularly under conditions of **obesity or severe weight loss.** • However, the effect of weight on acetylation is generally indirect and is also modulated by genetic factors and the presence of metabolic disorders.
Hydrolytic metabolism	• Hydrolytic metabolism, while generally stable, can indeed be indirectly influenced by significant **changes in body weight**, especially in cases of **extreme obesity or malnutrition.**
Oxidative metabolism	• **Weight changes in a patient do not directly affect the oxidative metabolism of drugs**, which is primarily governed by the liver's enzyme systems, particularly the cytochrome P450 enzymes.

38. Ans (b)



For 7g mixture

$$= 2 \times \frac{2}{10} + 8 \times \frac{7}{10}$$

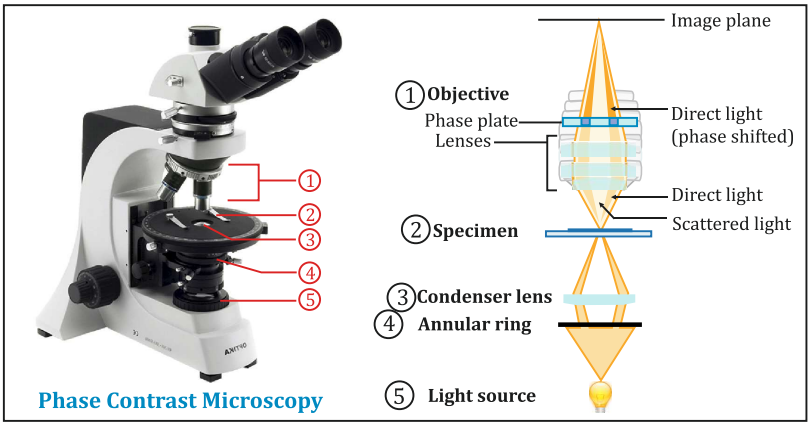
$$= 1.4\text{gm} + 5.6\text{ gm}$$

Hence, A=1.4 gm and B=5.6 gm

39. Ans (b)

❑ **PHASE CONTRAST MICROSCOPY**

- Phase contrast microscopy, is a contrast-enhancing optical technique that can be utilized to produce high-contrast images of transparent specimens, such as living cells (usually in culture), microorganisms, thin tissue slices, lithographic patterns, fibers, latex dispersions, glass fragments, and subcellular particles (including nuclei and other organelles).
- **The phase contrast microscopy is a special adaptation of the light microscopy & helps to obtain a clear picture of living or unstained cells.**
- The adaptors convert minute difference in phase changes in transmitted light due to refractive indices of all cell organelles in to perceptible shades of grey.
- This allows organelles of the living cell to become visible with fair contrast in them.



Reference: Aulton's Pharmaceutics the Design and Manufacture of Medicines, Michael E. Aulton and Kevin M. G. Taylor, 4th edition, Page no. 211

40. Ans (d)

❑ **VARIOUS TERMS AND THEIR DESCRIPTIONS**

Perfusion rate	**The volume of blood that flows per unit time per unit volume of tissue.**
Highly perfused tissue	Lungs, Kidney, Liver, Heart, Brain, Adrenals
Moderately perfused	Muscle and Skin
Poorly perfused	Fat and Bone
Gastric emptying rate	It is the speed at which the stomach contents empty into the intestine.
Residence time	Residence time refers to the average time a drug molecule stays in a particular compartment (such as the **gastrointestinal tract, plasma, or a specific tissue**) before being eliminated or absorbed.
Elimination rate	The elimination rate constant describes the fraction of drug eliminated per unit of time or the rate at which plasma concentrations will decline during the elimination phase.

Reference: Biopharmaceutics and Pharmacokinetics A Treatise, D. M. Brahmankar, 3rd edition, Page no. 108

67. Ans (b)

❑ MUSCARINIC RECEPTOR BLOCKING DRUG (ANTICHOLINERGICS)

CLASS OF DRUG	EXAMPLE
Natural Alkaloids	Atropine, Hyoscine **(Scopolamine used in sea-sickness)**
Semisynthetic and Synthetic derivative	
Atropine derivative used in COPD and Asthma	Ipratropium, Tiotropium bromide
Atropine derivative **used as mydriatics**	Homatropine, Cyclopentolate, Tropicamide, Hyoscine
Atropine derivative used in peptic ulcer	Pirenzepine, Telenzepine
Atropine derivative used as antispasmodic	Dicyclomine, Oxybutynin, Fluvoxate
Atropine derivative used as preanesthetic agent	Glycopyrrolate
Atropine derivative **used as antiparkinsonian**	Procyclidine, Trihexylphenyl (Benzhexol), Biperiden, Benztropine

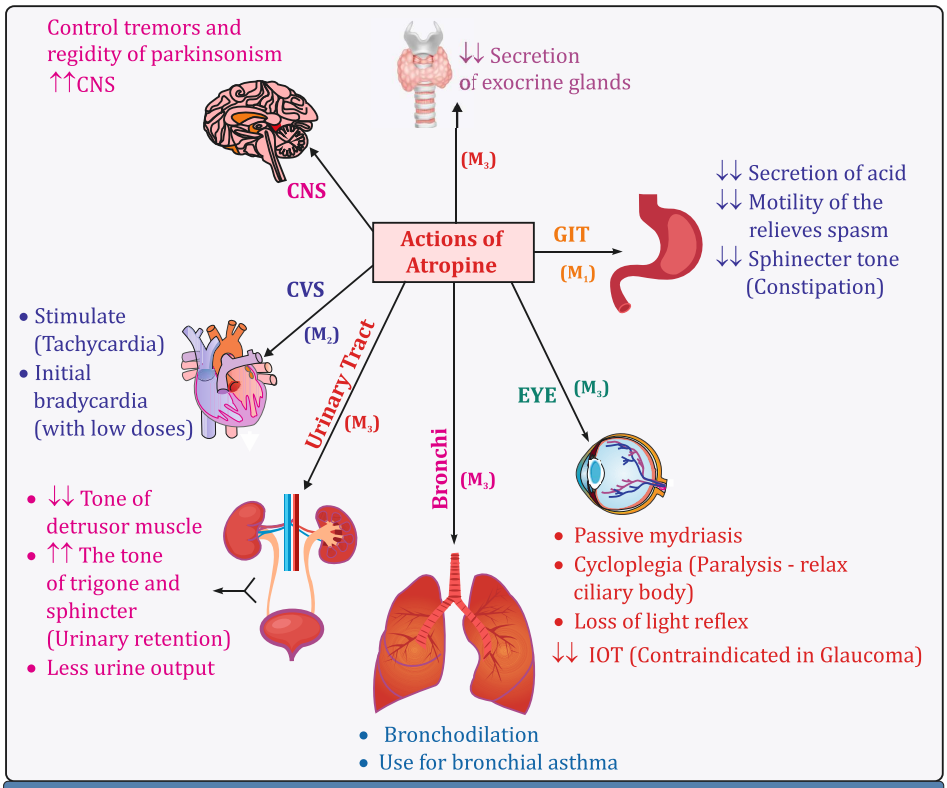


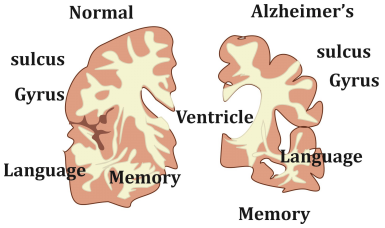
Fig: Pharmacological Actions of Atropine

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 130, 131 & 132

68. Ans (d)

❑ ALZHEIMER'S DISEASE (AD)

- A progressive neurodegenerative disorder which affects older individuals and is the most common cause of dementia.
- It may progress to a totally vegetative state.
- **Atrophy of cortical and subcortical areas is associated with deposition of β-amyloid protein in the form of extracellular neuritic 'senile' (amyloid)** plaques and formation of intracellular neurofibrillary tangles made up of "tau" protein.



80. Ans (d)

The size of Lycopodium spores is approximately: 25 µm (micrometers)

FOR MORE DETAIL SEE THE EXPLANATION NO. 108 OF GPAT 2023 SHIFT-I

81. Ans (b)

Shellac is a resinous substance derived from the secretions of the female lac insect *Kerria lacca*.

DRUG AND SYNONYMS	BIOLOGICAL SOURCES	CHEMICAL CONSTITUENTS
Shellac/ Lac/ Sealing wax 	Lac found in India, the **resinous protective secretion** of tiny lac insect, ***Lacifer lacca or Kerria lacca.***	• Aleuritic acid, • Shelloic acid, • Laccaic acid (colouring matter which is water soluble).
Civet 	Odours secretion obtained from external generative organ of male and female civet cat, ***Viverra zibetha.***	• Civetol • Civetone • Ethylamine
Isinglass 	Russian isinglass consists of the dried prepared swimming bladder of the sturgeon fish, ***Acipenser huso.***	Collagens
Musk 	Dried secretion obtained from prenaptial follicles of male musk deer ***Moschus moschiferus***	• Fat • Wax • Cholesterin

Reference: Textbook of Pharmacognosy, C. K. Kokate, 58th edition, Page no. 14.173

82. Ans (d)

- **Coniferae**

  Key Features:

  1. Trees or shrubs
  2. Mostly evergreen
  3. **Needle-like leaves** (simple, alternate, or whorled)
  4. **Monoecious** (male and female reproductive organs on same plant) **or dioecious** (male and female reproductive organs on separate plants)
  5. Sporophylls (spore-bearing leaves) usually in cones
  6. **Resin ducts** present in all parts (roots, stems, leaves, cones)

- **Ginkgo**

  Key Features:

  Ginkgo biloba, also known as the Maidenhair Tree, is indeed:

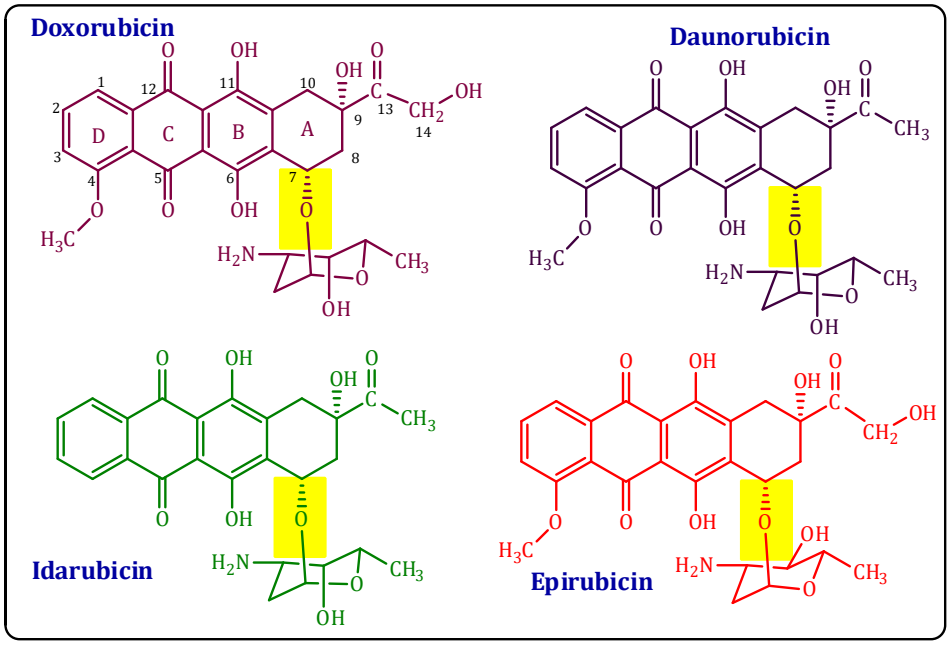
  1. The only living species in the order Gingkgoales.
  2. The sole surviving member of the division Ginkgophyta.

- **Cycadale:**

  Key Features:

  1. Unbranched, columnar or cylindrical trunk.
  2. Pinnate leaves (feather-like) growing directly from trunk.
  3. Leaves arranged in a rosette pattern (crown).

Reference: Textbook of Pharmacognosy, Willian C Evans, 16th edition, Page no-22



Reference: Wilson and Gisvold's Organic Medicinal and Pharmaceutical Chemistry, John M Beale 12th edition, Page no. 385

91. Ans (a)

Given

Freezing point (T_f) = 0.53°C

Using Lewis equation

$\pi = 12\ \Delta T_f - 0.02(\Delta T_f)^2$

Where

π = Osmotic Pressure,

ΔT_f = freezing point depression

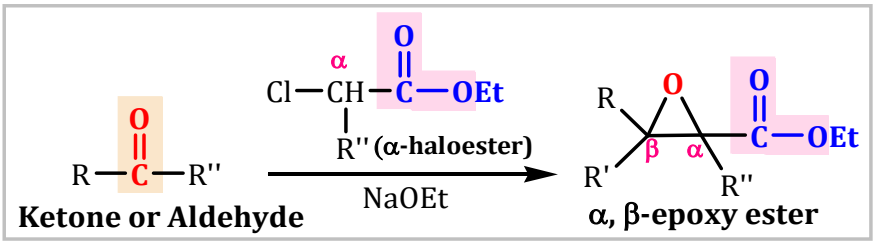
Solution

$\pi = 12 \times 0.53 - 0.02 \times (0.53)^2 = \mathbf{0.636\ atm}$

92. Ans (c)

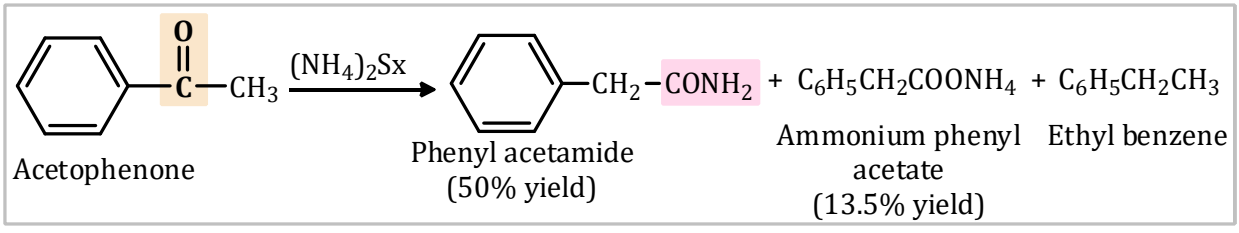
❒ **DARZENS GLYCIDIC ESTER SYNTHESIS**

- The Darzens reaction (also known as the Darzens condensation or glycidic ester condensation) is the chemical reaction of a **ketone or aldehyde with an α-haloester** in the presence of a base to form an **α, β-epoxy ester, also called a "glycidic ester".**



❒ **WILLGERODT-KINDLER REACTION**

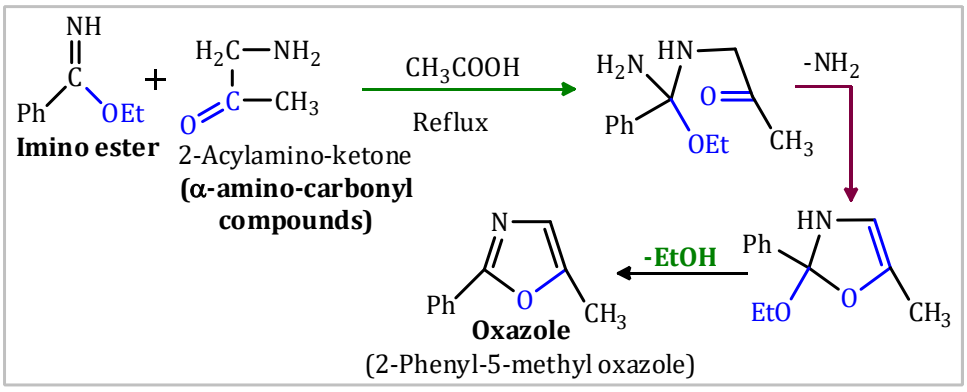
- The conversion of **aryl ketones into an amide** by using yellow ammonium polysulphide called Willgerodt reaction.



103. Ans (d)

❒ **FROM α-AMINOCARBONYL COMPOUNDS**

- Oxazole is prepared by the condensation of α-amino carbonyl compound with **Iminoester**.



104. Ans (d)

❒ **EFFECT OF SUBSTITUENTS ON ELECTROPHILIC AROMATIC SUBSTITUTION**

FOR DETAIL SEE THE EXPLANATION NO. 36 OF GPAT 2024

Strongly activating > Moderately activating > Weakly activating > Weakly deactivating

$-NHR > -NHCOR > -C_6H_5 > -I$

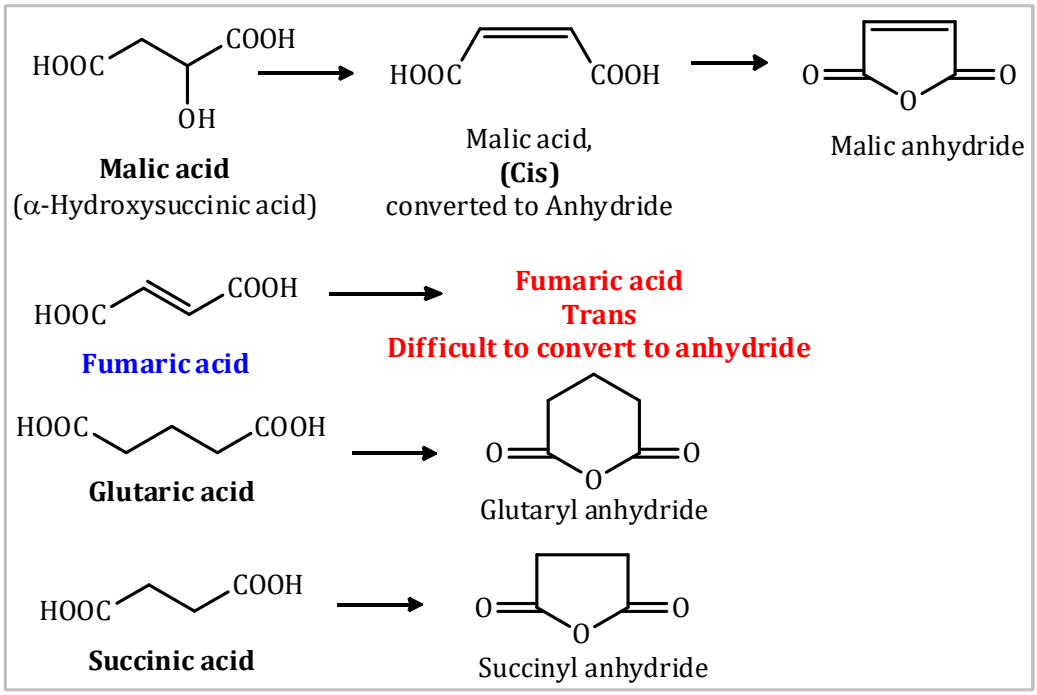
Reference: G.R.B. Organic Chemistry for Competitions, Dr O. P. Tandon and Dr A. K. Virmani, Page no. 894

105. Ans (C)

SEE THE EXPLANATION NO. 89 OF GPAT 2019

106. Ans (b)

❒ **GEOMETRIC ISOMERISM**



Previous Year Paper

GPAT-2018

PY-PHARMACEUTICAL SCIENCE

Multiple Choice Questions

125 QUE

Video Explanation

SCAN ME!

PHARMACEUTICS

1. **Following are endogenous carriers use for targeted drug delivery, EXCEPT**
   (a) Lipoprotein (b) Serum Albumin
   (c) Erythrocyte (d) Microparticulates
2. **Keesom interactions has a force of**
   (a) 0.5- 1 kcal/mol (b) 1-7 kcal/mol
   (c) 1-3 kcal/mol (d) None of these
3. **Dipole - induced dipoles are also known as**
   (a) London forces (b) Keesom forces
   (c) Debye forces (d) Hydrogen bonding
4. **The angle of repose is calculated by**
   (a) tan α = Radius/Height (b) tan α = 1+ Radius/Height
   (c) tan α = 1- Radius/Height (d) tan α = Height/Radius
5. **Which method is used by pharmacists for complete blending of potent powders with large quantities of diluents**
   (a) Spatulation (b) Levigation (c) Trituration (d) Geometric dilution
6. **IVIVC utilizes the principles of statistical moment analysis**
   (a) Level A (b) Level B (c) Level C (d) Level D
7. **As per Factories Act 1948, in CHAPTER VI dealing with working hours of adults, no adult worker shall be required or allowed to work in a factory for more than _____ hours in a week**
   (a) 30 (b) 40 (c) 48 (d) 56
8. **Which of the following is NOT patentable in India as per the Patents Act 1970**
   (a) New product (b) New process
   (c) New use of existing drug (d) New process for existing drug
9. **Which of the following agencies is NOT classified as an 'executive agency' for administration of the act under the provision of Drugs and Cosmetics Act 1940**
   (a) Licensing Authority (b) Drug Inspectors
   (c) Drugs Consultative Committee (d) Customs Collectors
10. **Statement 1 : Vortex formation can be minimized by push pull mechanism**
    Statement 2 : Vortex formation reduces the mixing intensity by increasing the velocity of impeller
    (a) True, False (b) True, True (c) False, False (d) False, True

77. ***Uncaria gambir*** **belongs to the family**

(a) Rubiaceae (b) Combretaceae (c) Punicaceae (d) Rosaceae

78. **Catechu is used in medicine as an**

(a) Antidiabetic (b) Anti cancer (c) Antipyretic (d) Astringent

79. **The constituent of Cochineal is**

(a) Cantharidin (b) Hirudin (c) Tannic acid (d) Carminic acid

80. **The sweet taste and odour of Fennel is due to**

(a) Anethole (b) Fenchone (c) Eugenol (d) Phellandrene

81. **A compound now increasingly used as standard practice for enhancing the flow of rubber latex by spraying on to the scraped bark of the rubber tree increasing the latex yields from 36% to 130% is**

(a) Brassinosteroids (b) Abscisic acid

(c) Ethephon (d) Kinetin

PHARMACEUTICAL CHEMISTRY

82. **Which statement CORRECTLY describes Hess's Law**

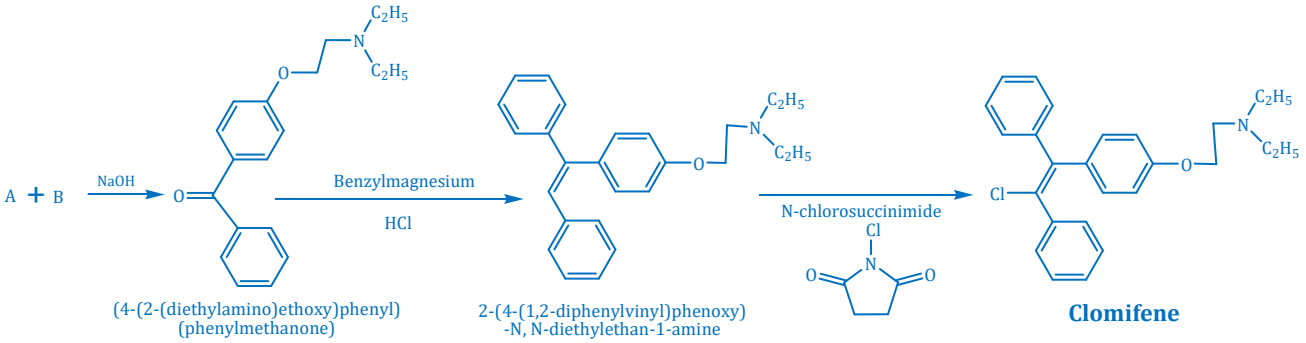
(a) The enthalpy of all reactants in their standard states is defined as zero

(b) Enthalpy changes can be calculated only if one or more of the reactants is/are element

(c) The enthalpy change of a reaction can be calculated only at 1 atm pressure and 25°C

(d) The enthalpy change of a reaction is independent of the route of reaction

83. **Identify the starting material A and B in the synthesis of Clomifene**



(a) Where A 4-hydroxy-benzophenone and B 2-diethylamino-ethyl chloride

(b) Where A 4-hydroxy benzaldehyde and B 4-methoxy aniline

(c) Where A 4-hydroxy-benzophenone and B 4-methoxy aniline

(d) Where A 4-hydroxy-benzophenone and B benzaldehyde

84. **The role of glutathione in tissues includes all EXCEPT**

(a) Participate in decomposition of hydrogen peroxide

(b) Participate in activation of methionine

(c) Participate in detoxification reactions

(d) Biologically active in oxidized form

85. **Which of the following is a 3,3-sigmatropic reaction which converts a 1,5-diene to an isomeric 1,5-diene**

(a) Cope rearrangement (b) Claisen rearrangement

(c) Photochemical 2+2 reaction (d) Diels-Alder reaction

86. **Which statement regarding Huckel's rule is FALSE**

(a) There must be (4n + 2) pi (π) electrons

(b) The molecule must be planar

(c) The molecule must be cyclic

(d) Each of the pi (π) electrons must be associated with a conjugated double bond

121. All of the following enzymes are used in ELISA EXCEPT

(a) Glucose oxidase
(b) Alkaline phosphatase
(c) Coagulase
(d) β- galactosidase

122. Which of the following disinfectant effectively destroys vegetative bacterial cells including gram positive and gram negative bacteria, bacterial endospores, fungi, and viruses

(a) 8% formaldehyde + 70% alcohol
(b) 70% Alcohol
(c) 0.1% Phenol aqueous
(d) 0.1% Iodine aqueous

123. Arrange the following steps in sequence of their order for production of recombinant Insulin

[P] Fusion of A and B chains for disulphide bond

[Q] Cyanogen bromide treatment to remove methionine and β-galactosidase

[R] Introduction of A and B chain in the plasmid containing β-galactosidase gene

[S] Synthesis of A and B chain in *E.coli*

(a) [P]→ [Q]→ [S]→[R]
(b) [S]→[R] →[P]→[Q]
(c) [R]→[S] →[Q]→[P]
(d) [Q]→[P] →[S]→[R]

124. Motif is represented by

(a) Commas repeated on the lattice
(b) 3D translational periodic arrangement of points
(c) Geometric shapes of lattice
(d) Centre of symmetry in lattice

125. Which of the following is NOT true about the Ebola Virus Disease (EVD)

(a) Spreads through human-to-human transmission via direct contact
(b) Antiviral drugs are approved by FDA to mitigate the infection
(c) Diagnostic tests include ELISA
(d) The virus is named after a river

ANSWER KEY GPAT-2018

1-d	2-b	3-c	4-d	5-d	6-b	7-c	8-c	9-c	10-a
11-b	12-c	13-d	14-c	15-c	16-a	17-b	18-b	19-a	20-b
21-a	22-d	23-a	24-b	25-b	26-d	27-c	28-b	29-b	30-d
31-a	32-d	33-c	34-a	35-c	36-c	37-b	38-b	39-b	40-a
41-c	42-a	43-c	44-b	45-b	46-c	47-b	48-b	49-d	50-b
51-c	52-d	53-a	54-a	55-a	56-b	57-c	58-b	59-a	60-b
61-a	62-a	63-b	64-a	65-c	66-b	67-a	68-b	69-c	70-c
71-d	72-a	73-d	74-c	75-c	76-d	77-a	78-d	79-d	80-a
81-c	82-d	83-a	84-d	85-a	86-d	87-a	88-a	89-d	90-c
91-c	92-c	93-d	94-d	95-b	96-c	97-c	98-c	99-d	100-a
101-d	102-a	103-b	104-a	105-c	106-b	107-a	108-b	109-b	110-a
111-c	112-c	113-d	114-d	115-c	116-c	117-b	118-b	119-d	120-c
121-c	122-a	123-c	124-a	125-b					

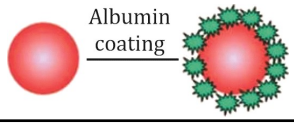
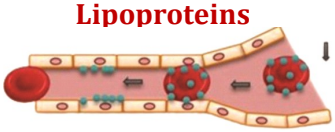
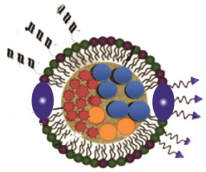
ANSWER & EXPLANATION

1. Ans (d)

- **Microparticulates is exogenous carriers use for targeted drug delivery.**
- **Microparticulates,** Soluble polymeric and Biodegradable polymeric drug carriers So, it is noted that lipoproteins, serum albumin and erythrocyte can act as endogenous carrier for targeted drug delivery.

❑ **THE VARIOUS CARRIERS USED FOR DRUG TARGETING ARE**

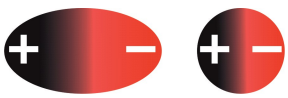
- Polymeric carriers
- Albumin
- Lipoproteins
- Liposomes

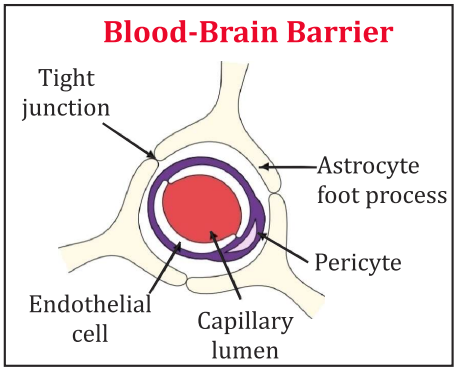
CARRIER FOR DRUG TARGETING	DESCRIPTION
Albumin 	It has been conjugated with drugs such as methotrexate **to increase duration of drug action** and deliver drug to liver
Lipoproteins 	Low-density lipoproteins enter cell by endocytosis and thus have the **potential for transporting drugs into the cell** in which lipoprotein-drug complex can be hydrolysed by lysosomal enzymes
Resealed Erythrocytes 	**Drug loading in body's own erythrocytes** when used to serve as controlled delivery systems

2. Ans (b)

Van der Waals Forces is **weak forces** that involve the dispersion of charge across a molecule called a dipole.

❑ **TYPES OF VAN DER WAALS FORCES**

INTERMOLECULAR FORCES	Induced dipole–induced dipole interaction,	Dipole dipole forces	Dipole Induced dipole
OTHER NAME	London force, Dispersion force 	Keesom forces, orientation effect, 	Debye forces, induction effect 
OCCURRENCE	Between two non-polar molecule	Between 2 polar molecules	Between one polar and one non-polar molecule
BOND ENERGY	<1 kcal/mol	1-10 kcal/mol	1-10 kcal/mol



13. Ans (d)

❑ **EFFECT OF K_a AND K_e ON C_{max}, t_{max} AND AUC**

Influence of K_a and K_e on C_{max}, t_{max} and AUG				
Parameters affected	Influence when **K_e is constant**		Influence when **K_a is constant**	
	Smaller K_a	**Large K_a**	Smaller K_e	Large K_e
C_{max}	↓	↑	↑	↓
t_{max}	Long	**Short**	Long	Short
AUG	No Change	No Change	↑	↓

Where, ↑ = increase and ↓ = decrease.

Reference: Biopharmaceutics and Pharmacokinetics A Treatise, D. M. Brahmankar, 3rd edition, Page no. 284

14. Ans (c)

❑ **MATHEMATICAL MODELS USED TO DESCRIBE DRUG RELEASE KINETICS FROM VARIOUS MATRICES**

KINETIC MODEL	MATHEMATICAL RELATION	SYSTEMS THAT FOLLOW THE MODEL
First order	In $Q_t = In \quad Q_0 + K_t$ (release proportional to amount of drug remaining)	Water-soluble drugs in porous matrix
Zero order	$f_t = K_0 t$ (release independent of drug concentration)	Osmotic systems, transdermal systems
Higuchi's square root of time equation Weibull	$f_t = K_H t^{\frac{1}{2}}$ (release proportional to square root of time)	Diffusion matrix formulations
Weibull	$m = 1 - e\left[-(t - T_i)^{\frac{b}{a}}\right]$	**Erodible matrix formulations**
Hixson – Crowell's Cube – root equation	There is a change in particle size and surface area during dissolution of drug $W_0^{\frac{1}{3}} - W_t^{\frac{1}{3}} = K_s t$	Erodible matrix formulations

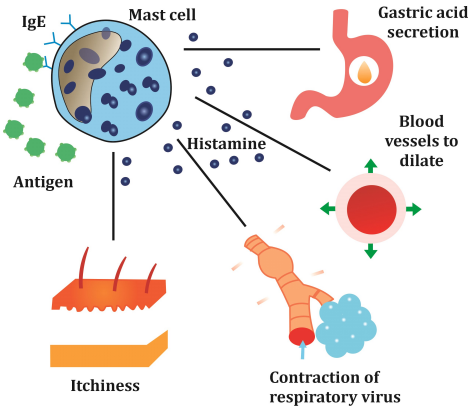
- **Griseofulvin:** Inhibits fungal cell mitosis and nuclear acid synthesis.
- **Sulfamethoxazole:** It **inhibits folate synthetase.**
- **Tetracycline:** Binds to 30S ribosomal subunit, prevents binding of tRNA to the mRNA-ribosome complex and **interferes with protein synthesis.**

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 774 & 842

48. Ans (b)

❑ **HISTAMINE**

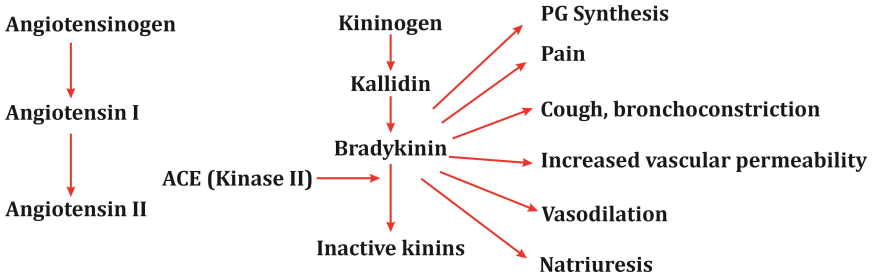
- **Histamine is a local hormone, vasodilator and neurotransmitter**
- Histamine, ('tissue amine') is a basic amine and are present in animal tissues and in certain plants, e.g. stinging nettle.
- **Histamine** is **present mostly** within storage granules of **mast cells**. Tissues rich in histamine includes skin, gastric and intestinal mucosa, lungs, liver and placenta.
  - **Beta cells** secrete insulin.
  - **Lymphocytes** secrete cytokines.
  - **Adipocytes** constitute fat cells.



Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 174

49. Ans (d)

- **ACE** is a relatively nonspecific enzyme. In addition to angiotensin I, it acts on substrates in as bradykinin and other tachykinins.
- **Angiotensin-Converting Enzyme (ACE) Inhibitors:** ACE inhibitors prevent the formation of angiotensin II and (indirectly) aldosterone.
- **Inhibition of ACE may result in accumulation of these substrates.**



➢ **Adverse effects (Mnemonic - CAPTOPRIL)**

TRICK – CAPTOPRIL

C = Cough **(Dry Cough)** due to increase bradykinin level in lungs.
A = Angioedema (Swelling of lips)
P = Proteinuria
T = Teratogenic effect
O = O Severe hypOtension
P = P NeutroPenia
R = Rashes
I = Itching
L = Loss of taste sensation (Dysgeusia) and nausea

Reference: Pharmacology for Dentistry, Tara V Shanbhag, 2nd edition, Page no. 100

54. Ans (a)

- **The enzyme HMG-CoA reductase is involved in the pathogenesis of atherosclerosis.**
- **Atherosclerosis** is a thickening and hardening of large and medium-sized muscular arteries, primarily due to involvement of tunica intima and is characterized by **fibrofatty plaques or atheromas.** It can put blood flow at risk as arteries become blocked.

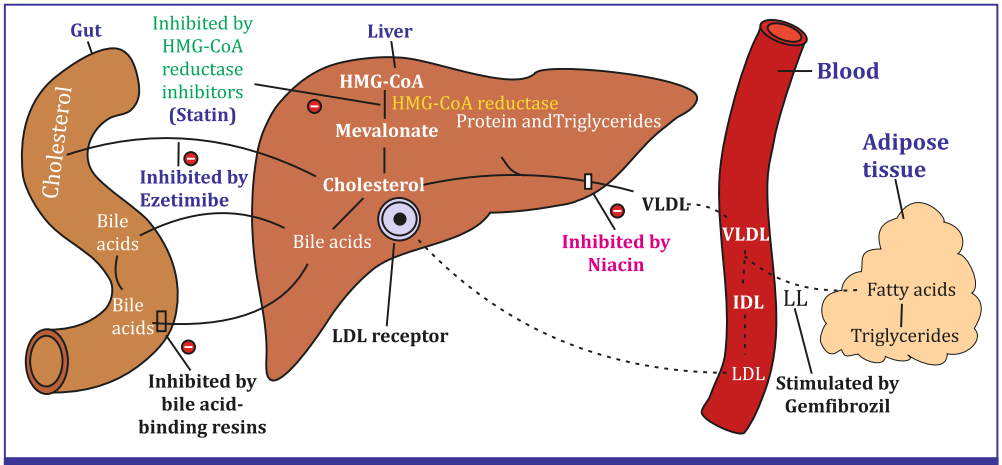


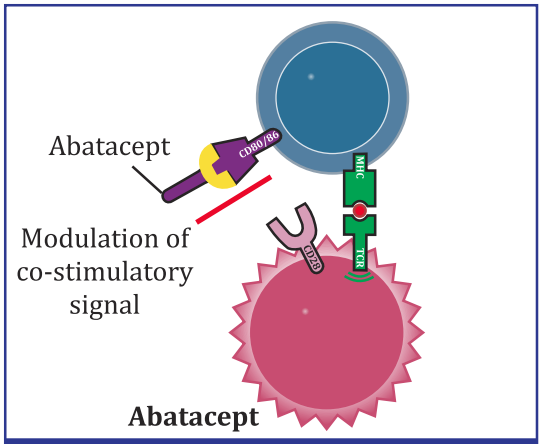
Fig : MECHANISM OF ACTION OF HYPOLIPIDAEMIC DRUGS

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 683

55. Ans (a)

❑ **ABATACEPT**

- It is a **recombinant fusion protein** which combines part of **FC domain of human IgG** with extracellular domain of T-cell inhibitory receptor CTLA, by binding to CD80 and CD86 molecules, it **prevents the 2nd signal for costimulation of T-cells.**
- They are **T-cell modulating agent** that **inhibits the activation of T-cells** and used in early stage RA.
- Beneficial response occurs in many RA patients who are refractory to a combination of **Methotrexate + TNF α antagonist.**



MECHANISM OF ACTION OF ABATACEPT

Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 230

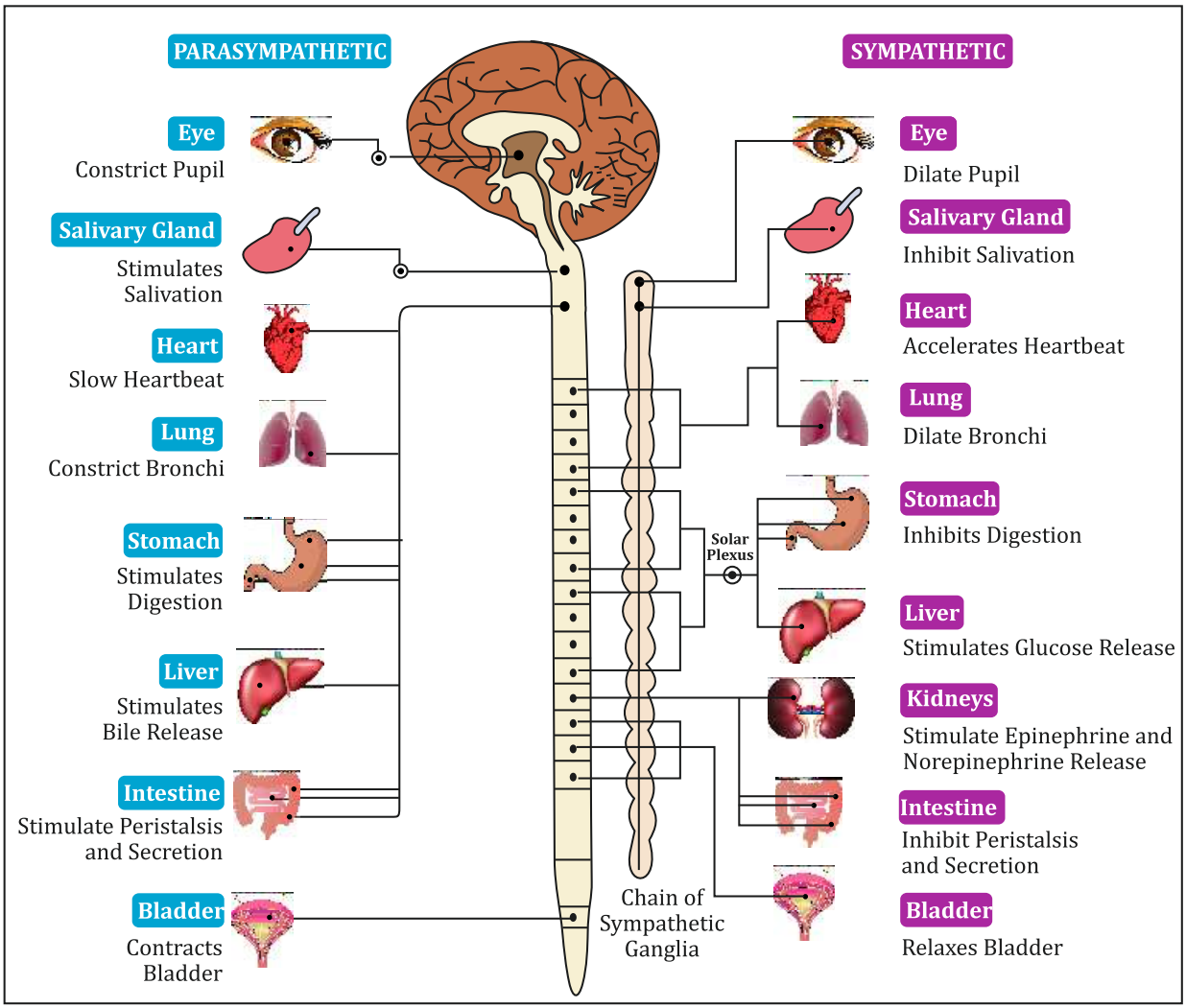
56. Ans (b)

❑ **TYPES OF REACTION FEATURES AND THEIR EXAMPLES**

TYPE OF REACTION	FEATURES	EXAMPLES	MANAGEMENT
Type A (Augmented or Predictable) reactions	• More common • Predicable • Mechanism based and dose dependent adverse reaction. • Dose related and mostly preventable and reversible	• Side effects: hypoglycaemia due to insulin • Secondary effects: corticosteroids weaken host defence mechanism • Toxic effects: morphine causes respiratory depression in overdosage	Reduce dose or withhold. Consider effects of concomitant therapy.

63. Ans (b)

❑ **THE DIFFERENCE BETWEEN SYMPATHETIC AND PARASYMPATHETIC**



Reference: Anatomy and Physiology in health and illness, Ross and Wilson, 14th edition, Page no. 195

64. Ans (a)

To obtain a more effective bronchodilation, the drugs that are **combined along with beta-adrenoceptor agonists** are **Cholinergic antagonists.**

FOR MORE DETAIL SEE THE EXPLANATION NO. 48 OF GPAT 2021

65. Ans (c)

❑ **RISPERIDONE**

- It is **5-HT$_{2A}$, H$_1$ and** α-adrenergic property and potent **D$_2$ blocker.**
- Only atypical antipsychotic having marked extrapyramidal effect which causes increase in prolactin secretion due to D$_2$ blockage.
- **At low doses, it is combined with antidepressants used in treatment of resistant depression.**

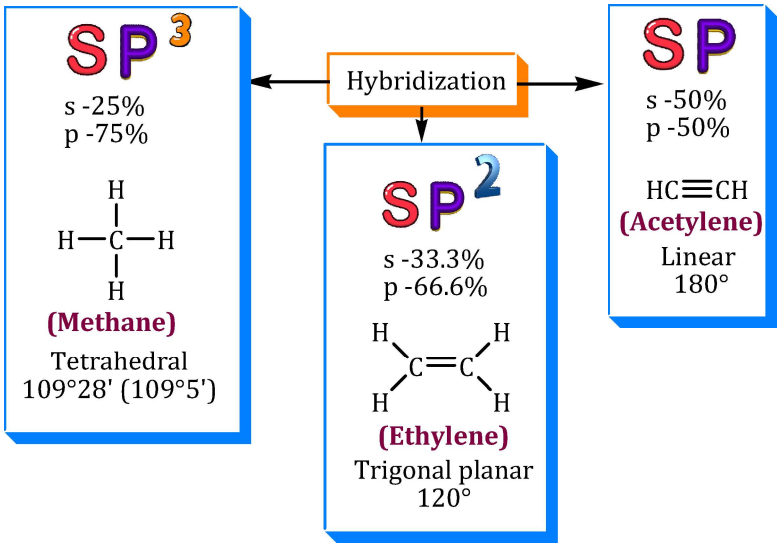
Reference: Essentials of Medical Pharmacology, KD Tripathi, 8th edition, Page no. 468

95. Ans (b)

❒ **HYBRIDIZATION**

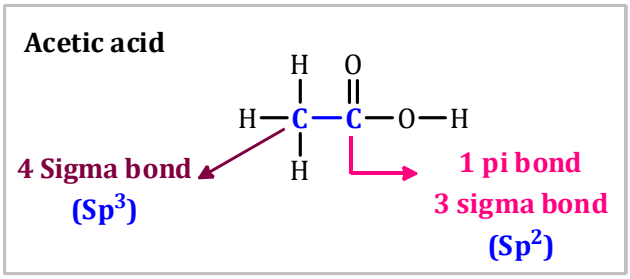
- It is defined as the concept of mixing two atomic orbitals with the same energy levels to give a degenerated new type of orbitals.
- This intermixing is based on quantum mechanics.

✓ **These are sp^3, sp^2 and sp hybridization**



TYPE	GEOMETRY	BOND ANGLE	NUMBER OF HYBRIDIZED ORBITALS	NUMBER OF UNHYBRI -DIZED P-ORBITALS	PERCENTAGE		EXAMPLE
					s-character	p-character	
sp^3	Tetrahedral	109°28' (109°5')	4	0	25.0	75.0	Alkane (Methane-CH_4)
sp^2	Trigonal planar	120°	3	1	33.3	66.6	Alkene (Ethylene-$CH_2=CH_2$)
sp	Linear	180°	2	2	50.0	50.0	Alkyne (Acetylene-CH≡CH)

❖ **For example, C atom of CH_3COOH has following hybridization**



Reference: Textbook of Organic Chemistry, ArunBahl and B.S Bahl, 22nd edition, Page no. 65

121. Ans (c)

SEE THE EXPLANATION NO. 125 OF GPAT 2022

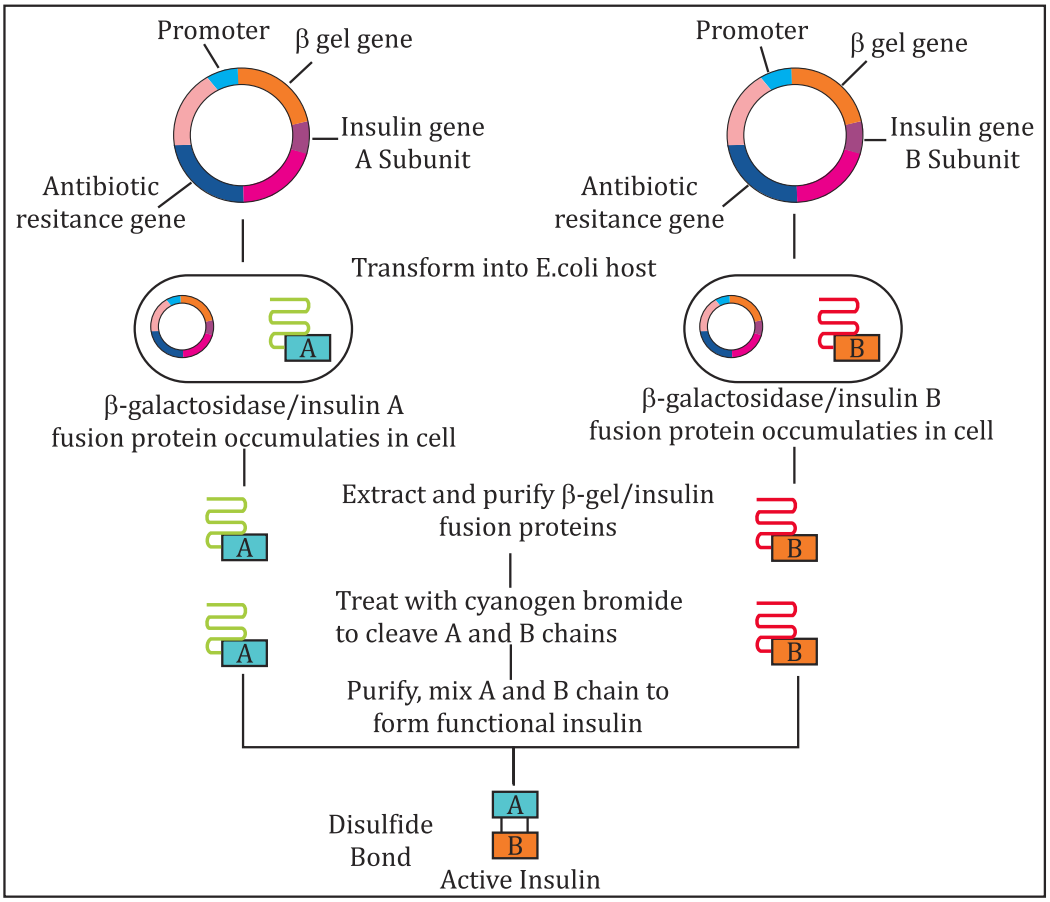
122. Ans (a)

CHEMICAL	ACTION	USES
Ethanol/ Ethyl alcohol (50-70%)	Denatures proteins and solubilizes lipids	**Antiseptic used on skin**
Isopropanol (50-70%)	Denatures proteins and solubilizes lipids	Antiseptic used on skin
Formaldehyde (8%)	Reacts with NH_2, SH and COOH groups	**Disinfectant, kills endospores**
Tincture of Iodine (2% 12 in 70% alcohol)	Inactivates proteins	Antiseptic used on skin Disinfection of drinking water
Chlorine (Cl_2) gas	Forms hypochlorous acid (HCIO), a strong oxidizing agent	Disinfect drinking water, general disinfectant
Silver nitrate ($AgNO_3$)	Precipitates proteins	General antiseptic and used in the eyes of newborns

Reference: Microbiology, Michael J. Pelczar, 5th edition, Page no. 503

123. Ans (c)

❑ **STEPS INVOLVED IN THE PRODUCTION OF RECOMBINANT INSULIN AS FOLLOWS**



Reference: A Textbook of Biotechnology, Dr. R. C. Dubey, 1st edition, Page no. 150

Previous Year Paper

GPAT-2017

PY-PHARMACEUTICAL SCIENCE

Multiple Choice Questions

125 QUE

Video Explanation

SCAN ME!

PHARMACEUTICS

1. **Which of the following is NOT a thermoplastic resin**
   (a) Phenolic plastic resin (b) Polystyrene
   (c) Polyethylene (d) Polypropylene
2. **Which among the following statements describing surface activity for surfactants is INCORRECT**
   (a) Increase in length of hydrocarbon chain decreases surface activity
   (b) Increase in ethylene oxide chain of polyoxy ethylated nonionic surfactant ethylene decrease of surface activity
   (c) Increase in the surface activity results in decrease in surface tension
   (d) Relationship between hydrocarbon chain length and surface activity is expressed by Traube's rule
3. **Type IV dissolution apparatus as per USP is**
   (a) Flow through cell (b) Paddle type apparatus
   (c) Reciprocating cylinder (d) Paddle over disk apparatus
4. **(Weight in pounds/150) × Adult Dose = Child dose, The above formula is known as _____ in Posology**
   (a) Young's formula (b) Dilling's formula
   (c) Clark's formula (d) Fried's formula
5. **The type of particle diameter obtained by microscopic method of evaluation is**
   (a) Projected diameter (b) Surface – Volume diameter
   (c) Volume - Surface diameter (d) Stokes diameter
6. **Apparent volume of distribution will be highest in case of the drug with % plasma protein binding**
   (a) 10 (b) 89 (c) 50 (d) 68
7. **The useful variable form in vitro dissolution test data for IVIVC includes**
   (a) $t_{50\,\%} - t_{63.2\%}$ (b) Sampling interval
   (c) Sample volume (d) Volume of dissolution fluid
8. **For the measurement of particle size of powders, the distance measured between two tangents on opposite sides of the particle parallel to some fixed direction is called**
   (a) Feret diameter (b) Martin diameter
   (c) Projected area diameter (d) Edmundson diameter
9. **If the drug substance has been substituted wholly or in part by another drug or substance, it is called as**
   (a) Spurious drug (b) Adulterated drug
   (c) Misbranded drug (d) Mixed drug

35. Surface tension is categorized as a/an _____ factor

(a) Capacity (b) Intensive (c) Extensive (d) Tolerance

PHARMACOLOGY

36. Which among the following is a structural variant of GABA and is used as a muscle relaxant

(a) Metocurine (b) Tybamate (c) Baclofen (d) Cyclobenzaprine

37. A patient receiving warfarin develops rheumatoid arthritis. Which one of the following drugs would be contraindicated

(a) Ibuprofen (b) Tolmetin (c) Aurothioglucose (d) Aspirin

38. Which of the following statement regarding cerebral hemisphere is TRUE

(a) The right and left hemisphere are symmetrical
(b) This right more important for spoken and written language
(c) The left hemisphere is more important for musical and artistic awareness
(d) Hemispheric lateralization is more pronounced in male than in female

39. Which among the following are the salient features of Glucocorticoids

(a) Gets combined with highly specific cytosolic glucocorticoids
(b) They promote phagocytosis by macrophages
(c) Releases of lytic enzymes
(d) Increases lipid eicosanoids and prostaglandin genes

40. Match the following agents that cause cancer with the preferable sites for where it might cause

1. Arsenic	**[P] Prostate**
2. Benzene	**[Q] Angiosarcoma**
3. Cadmium Compounds	**[R] Leukemia**
4. Vinyl chloride	**[S] Hemangiosarcoma**

(a) 1 - [S], 2 - [R], 3 - [P], 4 - [Q] (b) 1 - [Q], 2 - [P], 3 - [R], 4 - [S]
(c) 1 - [R], 2 - [S], 3 - [Q], 4 - [P] (d) 1 - [P], 2 - [Q], 3 - [S], 4 - [R]

41. Insulin and Thyroxin arrive at an organ / tissue / cell at the same time. Thyroxin causes an effect on the organ but insulin does NOT because

(a) The organ cell have receptors for thyroxine but no receptor for insulin
(b) Thyroxin is a lipid -soluble hormone and insulin is water soluble
(c) The target cell in the organ have up-regulated for thyoxine
(d) Thyroxin is local hormone and insulin is a circulating hormone

42. The thymus secretes several hormones related to the immunity. These hormones promote the maturation of T lymphocyte cells. These hormones are

1. Thymosin	**2. Thymic humoral factor**
3. Thymic factor	**4. Interleukins**

(a) Only 1, 2 (b) 1, 2 and 3 (c) Only 3 (d) Only 4

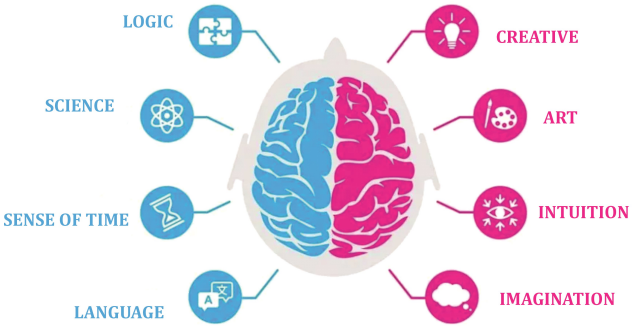
43. Match the following drugs with alteration they produces in structural-functional of kidney

1. Aminoglycoside antibiotics	**[P] Glomerular abnormality**
2. ACE inhibitors	**[Q] Tubular epithelial cell damage**
3. Methotrexate	**[R] Hemodynamic mediated kidney injury**
4. NSAIDs	**[S] Obstructive nephrophathy**

(a) 1 - [Q], 2 - [R], 3 - [S], 4 - [P] (b) 1 - [P], 2 - [Q], 3 - [R], 4 - [S]
(c) 1 - [R], 2 - [S], 3 - [P], 4 - [Q] (d) 1 - [S], 2 - [P], 3 - [Q], 4 - [R]

38. Ans (d)

- Hemispheric lateralization refers to the unequal distribution of cognitive functions between the left and right hemispheres.
- Males tend to have more lateralized brain function, whereas females tend to have more bilateral or distributed processing.



- ❖ The hemispheres are not perfectly symmetrical, with some structural and functional differences.
- ❖ The left hemisphere is more important for spoken and written language, not the right.
- ❖ The right hemisphere is more involved in musical and artistic awareness, not the left.

Reference: Essentials of medical Physiology, K Sembulingam, 6th edition, Page no. 886

39. Ans (a)

SEE THE EXPLANATION NO. 47 OF GPAT 2019

40. Ans (a)

❑ **CARCINOGEN AND THEIR TYPES OF CANCER**

CARCINOGEN	TYPES OF CANCERS
Arsenic	Skin and lung cancer, **Hemangiosarcoma** (cancer of the vascular endothelium, or the blood vessel walls)
Vinyl compounds	**Angiosarcoma** of liver, hemangiosarcoma of the liver
Asbestos	Bronchogenic carcinoma and mesothelioma
Cadmium	**Prostate cancer**
Ethylene oxide	Leukemia
Benzene	**Leukemia**
Metals	Lung cancer

Reference: Textbook of Pathology, Harsh Mohan, 7th edition, Page no. 213

41. Ans (a)

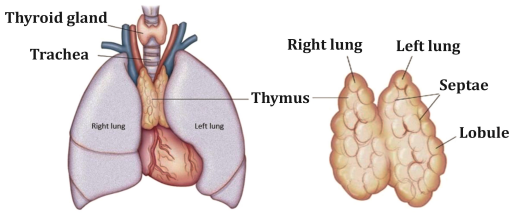
- In general, Thyroxine hormone have nuclear receptors whereas Insulin has cell membrane receptors and hence **thyroxine acts faster than insulin.** However, even if we imagine that Insulin and thyroxine arrive at an organ or tissue or cell at the same time, thyroxine causes on the organ but insulin does not.
  This is because, the organ or tissue or cell contains the receptors for thyroxine but not for insulin
- Thyroxine is lipid soluble hormones which can penetrates cell membrane at a faster rate whereas insulin is water soluble and hence the rate of permeability in cell membrane is lesser for insulin.

42. Ans (b)

❑ **THYMUS-DERIVED HORMONES**

- Promote T-lymphocyte maturation and development.
- Regulate immune function.

❖ **Thymosin:** Stimulates T-cell maturation, differentiation, and activation.



56. Ans (a)

Migration refers to the movement of cells within tissues, but it's not a primary pathway for cancer dissemination.

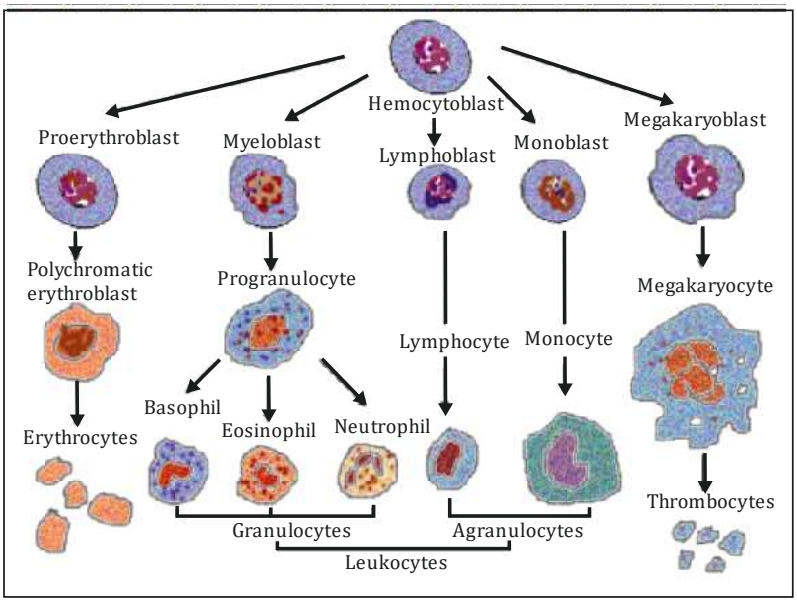
Cancer dissemination (metastasis) occurs through

- ❖ **Direct seeding:** Cancer cells directly invade adjacent tissues or organs.
- ❖ **Lymphatic spread:**
  - ✓ Cancer cells enter lymphatic vessels and travel to lymph nodes.
  - ✓ Usual for carcinomas
  - ✓ Seen in melanoma, breast and colon cancer
- ❖ **Hematogenous spread:**
  - ✓ Cancer cells enter blood vessels and travel to distant organs.
  - ✓ Usual for sarcomas.
  - ✓ Liver and lungs are the most commonly affected organs

Reference: Anatomy and Physiology in health and illness, Ross and Wilson, 12th edition, Page no. 57

57. Ans (a)

❑ **HAEMOPOIESIS**



Reference: Anatomy and Physiology in health and illness, Ross and Wilson, 12th edition, Page no. 67-68

58. Ans (a)

❑ **ACQUIRED BACTERIA RESISTANCE TO SULFONAMIDES**

- Originate by random mutation & selection or by transfer of resistance by Plasmids (this type of resistance is persistent & irreversible)
- **May be due to**
  1. Lower affinity for Sulfonamides by dihydropteroate synthase.
  2. Decrease bacteria permeability or active efflux of the drug.
  3. **Alternate metabolic pathway for synthesis of essential metabolite.**
  4. Increase production of essential metabolite or drug antagonists.
  5. Increase production of PABA is not a constant finding in sulfonamides resistance Bacteria & resistance mutants may possess enzymes that are less readily inhibited by sulfonamides.

71. Ans (c)

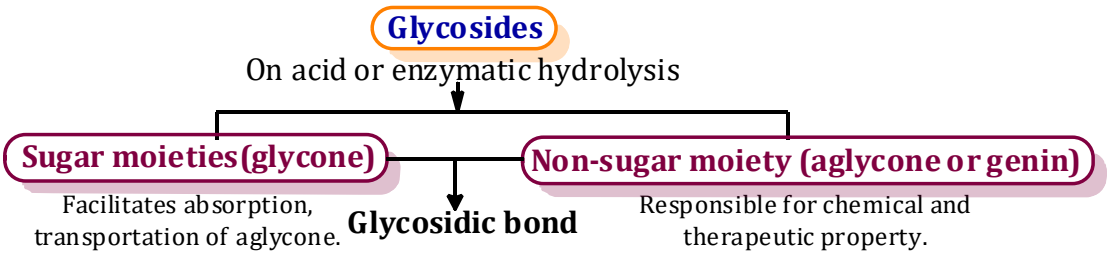
DRUG AND SYNONYMS	BIOLOGICAL SOURCES	CHEMICAL CONSTITUENTS AND THEIR USES
Ergot (St. Anthony fire) 	Ergot is the dried sclerotium of a fungus ***Claviceps purpurea*** (Family - Clavicipitaceae) developed in the ovary of rye plant ***Secale cereale*** (Family - Graminae)	Lysergic acid derivative- peptide alkaloid, **Water soluble –** • Ergometrine → Oxytocic • Ergometrinine **Water insoluble –** • **Ergotamine → Migraine** • Ergosine • Ergocornine • Ergocristine • Ergocryptine
Vinca (Catharanthus, Periwinkle) 	Whole dried plant of ***Catharanthus roseus*** **Family-** Apocynaceae	• Vincristine → Antineoplastic • Vinblastine→ Antineoplastic • Ajmalicine • Catharanthine • Vindoline
Coca 	Dried leaves of ***Erythroxylon coca*** or ***Erythroxylon truxillense*** **Family-** Erythroxylaceae	• Cocaine → Local anesthetic • Cinnamyl cocaine • Benzoyl ecgonine • α truxilline.
Belladonna (Deadly night shade) 	Leaves of ***Atropa belladonna*** (European belladonna) or ***Atropa acuminate*** (Indian Belladonna) **Family-** Solanaceae)	• L-hyoscyamine → Anti Cholinergic agent, Anti Spasmodic Agent

Reference: Textbook of Pharmacognosy, C.K. Kokate, 58th edition, Page no. 15.14, 15.31, 15.47, 15.50

72. Ans (c)

GLYCOSIDES

- Glycosides are organic compound from plant or animal sources.
- On enzymatic or acid hydrolysis yields one or more sugar moieties (Glycone) along with non-sugar moiety (Aglycone).



Reference: Textbook of Pharmacognosy, C.K. Kokate, 58th edition, Page no. 9.1

78. Ans (a)

❑ TITRATION USING CERIC AMMONIUM SULPHATE

Titration using ceric ammonium sulphate (CAS) is referred as ceriometry. Cerric ion may exist in two oxidation state +3 (cerous) or +4 (ceric) as given below while undergoing oxidation. The reaction takes place in the presence of strong acid such as Sulphuric acid.

$$Ce^{4+} + e^{-} \rightleftharpoons Ce^{3+}$$

However if ceric sulfate is used in hydrochloric acid, then elemental chlorine is formed

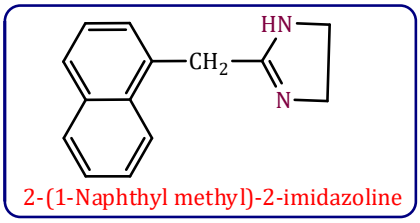
$$2Ce(SO_4)_2 + 2HCl \rightarrow Ce_2(SO_4)_3 + Cl_2 + H_2SO_4$$

Thus, Ce (IV) during reaction exist as an anionic complex in media of Sulphuric acid.

Reference: Practical Pharmaceutical Chemistry, A.H Beckett and stenlake 4th edition, Vol 1 Page no. 194

79. Ans (a)

- **Naphazoline** is selective α_2 agonist and used as nasal and ophthalmic congestion and exert vaso-constrictive effect. It is 2-aralkylimidazolines α_2-agonists and contain a one-carbon bridge between C-2 of the Imidazoline ring and a phenyl ring.



2-(1-Naphthyl methyl)-2-imidazoline

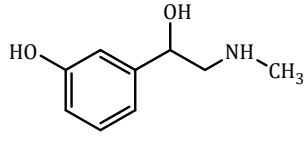
Reference: Textbook of Medicinal Chemistry, Alagarsamy Vol I 1st edition. Page no. 360

80. Ans (a)

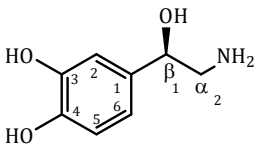
❑ ADRENERGIC DRUGS WITH THEIR RECEPTOR AFFINITY

DRUGS	OUTLINE OF STRUCTURE	AFFINITY OF RECEPTORS
Epinephrine (adrenaline)	Contain catechol with bulk group on nitrogen	$\alpha_1, \alpha_2, \beta_1$, less β_2, β_3, no Dopamine affinity
Noradrenaline	Contain catechol with no bulk group on nitrogen	$\alpha_1, \alpha_2, \beta_1$, no β_2 and Dopamine affinity
Phenylephrine	Contain phenol without catechol	Selective α_1 agonist
Dobutamine	Contain catechol with bulk group on nitrogen	α_1, β_1, less β_2, no Dopamine affinity

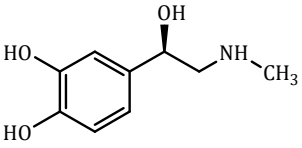
❑ STRUCTURES OF GIVEN DRUGS



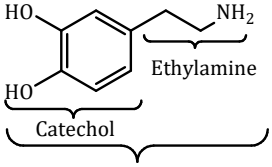
Phenylepherine
less α and β activity than NE
selective α_1 agonist
almost no β activity



Noreinephrine (NE)



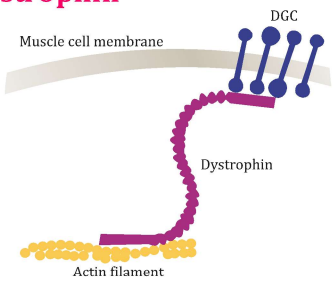
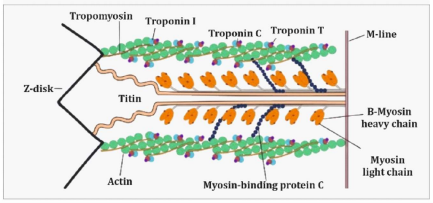
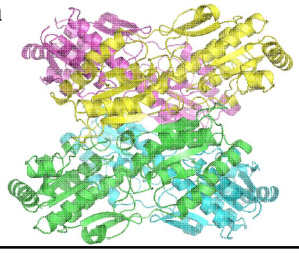
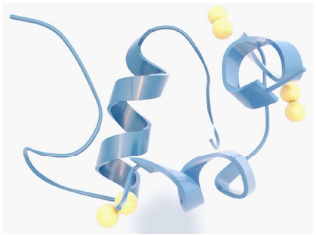
Epinephrine (E)



Catecholamine
Dopamine (DA)

Reference: Textbook of Medicinal Chemistry, Alagarsamy Vol I, 1st edition, Page no. 359/Essentials of Medical Pharmacology by K D Tripathi 8th edition, Page no. 142

122. Ans (a)

TERM	DESCRIPTION
Dystrophin 	• **Dystrophin gene is the largest known human gene with 2.4 million bases.** • **Muscular dystrophy** is a hereditary disease in which muscles progressively deteriorate. • **This is caused by mutations in the gene (located on X chromosome) coding for the protein dystrophin.**
Titin 	• **Titin is the largest known protein** in the human body and is essential for muscle elasticity and contraction. • Its gene, TTN, though large, is smaller than the dystrophin gene.
Insulin 	The **gene for insulin is much smaller** and encodes a hormone that regulates blood sugar.
Phosphofructokinase 	This is an enzyme involved in glycolysis, but its gene is not the largest.

Reference: Biochemistry U. Satyanarayan and U. Chakrapani, 4th edition, Page no. 494

123. Ans (a)

❑ **VARIOUS TERMS RELATED TO BIOTECHNOLOGY**

TERM	DESCRIPTION
PROBE	• **A labelled segment of DNA or RNA used to find as specific sequence of nucleotides in a DNA molecule.** • **A probe is a single-stranded DNA or RNA sequence** that is used to find its **complementary sequence in a sample genome. Probes are labeled with a radioactive or chemical** tag to make it easier to detect them.
RECEPTOR	• Receptors are **chemical structures, composed of protein, that receive and transduce signals that may be integrated into biological systems.**
EPITOPE	• The part of an antigen that is recognized by the antibodies, **B cell or T cells.**
TARGET	• The term "pharmacological target" refers **to the biochemical entity to which the drug first binds in the body to elicit its effect.**

Reference: Textbook of Microbiology, Dr. C P Baveja, 5th edition, Page no. 72

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