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## AIIMS DELHI 2018 PYQ

## DIGITAL EXPLANATION

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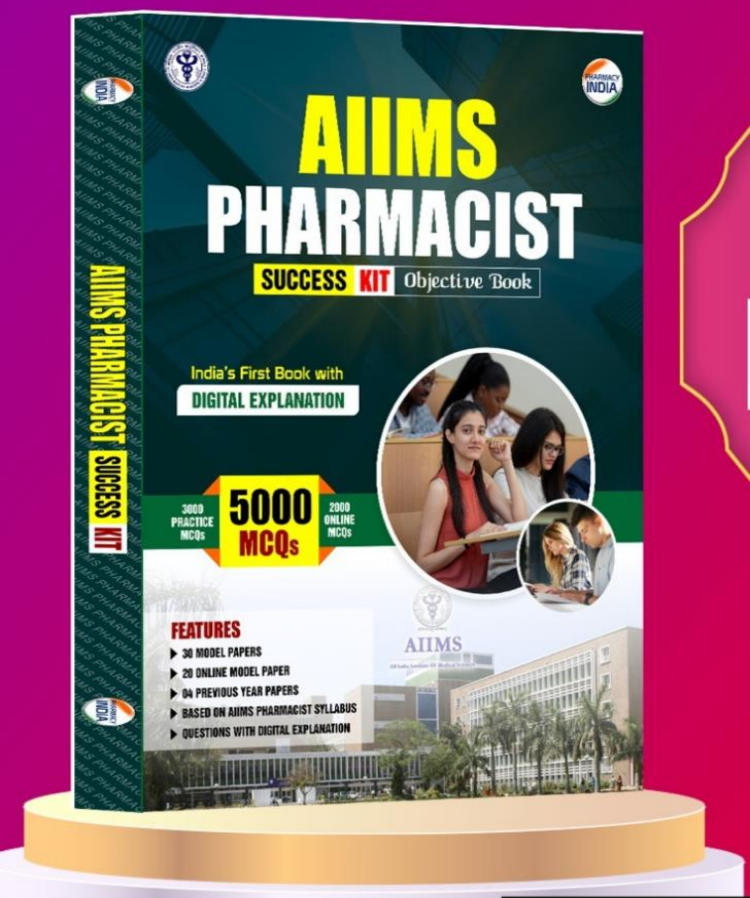


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# AIIMS Delhi 2018 | Detailed Solutions

**1. Which of the following respective Phase-1 and Phase-2 reactions are the most common drug biotransformation reactions?**

- **Correct Answer:** (a) **Oxidation and Glucuronidation**

**Explanation:**

- **Phase-1 reactions** typically involve functionalization processes like **oxidation**, **reduction**, and **hydrolysis**, with oxidation being the most common.
- **Phase-2 reactions** are conjugation reactions, with **glucuronidation** being the most common, aiding in the excretion of drugs.

**Reference:** Goodman & Gilman, *The Pharmacological Basis of Therapeutics*, 13th Edition, Page 85.

**2. Which one of the following drugs has positive inotropic and negative chronotropic action?**

- **Correct Answer:** (c) **Digoxin**

**Explanation:**

- **Digoxin** increases the force of myocardial contraction (**positive inotropy**) while slowing the heart rate (**negative chronotropy**) by enhancing vagal tone and reducing AV conduction.

**Reference:** Katzung, *Basic and Clinical Pharmacology*, 15th Edition, Page 285.

**3. Which one of the following therapeutic classes has been proved clinically as a first-line therapy for heart failure and has shown decreased hospitalization, improved symptoms, and delayed disease progression?**

- **Correct Answer:** (b) **ACE Inhibitors**

**Explanation:**

- **ACE inhibitors** are first-line therapy in heart failure as they improve symptoms, reduce mortality, and delay disease progression by decreasing afterload and preload.

**Reference:** Rang & Dale, *Pharmacology*, 9th Edition, Page 375.

**4. Which one of the following glucose transporters is the new drug target for the management of Type-2 diabetes mellitus?**

- **Correct Answer:** (a) **Sodium glucose-linked transporter-2 (SGLT2)**

**Explanation:**

- **SGLT2 inhibitors** reduce glucose reabsorption in the kidneys, leading to glycosuria and better glycemic control in patients with Type-2 diabetes mellitus.

**Reference:** Tripathi, *Essentials of Medical Pharmacology*, 8th Edition, Page 731.

**5. Which one of the following modes of HIV transmission carries the highest relative risk of infection with a single exposure?**

- **Correct Answer:** (a) **Transfusion of blood and blood products**

**Explanation:**

- **Blood transfusions** carry the highest risk of HIV transmission due to the direct introduction of a high viral load into the recipient's bloodstream.

**Reference:** Fauci, *Harrison's Principles of Internal Medicine*, 20th Edition, Page 1418.

**6. Which of the following are the critical neurotransmitters playing a major role in depression?**

- **Correct Answer:** (b) **Dopamine, Norepinephrine, and Serotonin**

**Explanation:**

- Depression is associated with the dysregulation of these neurotransmitters. Serotonin and norepinephrine influence mood and anxiety, while dopamine affects motivation and pleasure.

**Reference:** Stahl, *Essential Psychopharmacology*, 4th Edition, Page 85.

**7. A 55-year-old man is under DOTS treatment for pulmonary tuberculosis for the last four months. Now, he has developed symptoms of peripheral neuritis. Which one of the following is the right addition to his therapy to manage peripheral neuritis?**

- **Correct Answer:** (c) **Pyridoxine**

**Explanation:**

- **Isoniazid**, a drug used in DOTS, causes peripheral neuritis by interfering with vitamin B6 metabolism. Supplementation with **pyridoxine** (vitamin B6) is the standard approach to prevent and treat this side effect.

**Reference:** Tripathi, *Essentials of Medical Pharmacology*, 8th Edition, Page 752.

**8. What is the primary mechanism of action of local anesthetics?**

- **Correct Answer:** (b) **Blockade of voltage-gated sodium channels**

**Explanation:**

- Local anesthetics prevent the generation and propagation of action potentials by inhibiting voltage-gated sodium channels in nerve membranes, thus blocking nerve signal transmission.

**Reference:** Rang & Dale, *Pharmacology*, 9th Edition, Page 473.

**9. Which one of the following anti-arrhythmic drugs acts by inhibiting potassium, sodium, and calcium channels?**

- **Correct Answer:** (c) **Amiodarone**

**Explanation:**

- **Amiodarone** is a broad-spectrum anti-arrhythmic drug that inhibits potassium, sodium, and calcium channels, making it effective in treating various arrhythmias.

**Reference:** Katzung, *Basic and Clinical Pharmacology*, 15th Edition, Page 443.

**10. A 48-year-old woman is having symptoms of weight gain, cold intolerance, constipation, bradycardia, puffy face, lethargy, and dry skin. These symptoms are suggestive of which of the following?**

- **Correct Answer:** (b) **Hypothyroidism**

**Explanation:**

- The listed symptoms are classic for **hypothyroidism**, a condition characterized by insufficient thyroid hormone production. Common causes include Hashimoto's thyroiditis or iodine deficiency.

**Reference:** Fauci, *Harrison's Principles of Internal Medicine*, 20th Edition, Page 2285.

**11. Which one of the following receptors is NOT a ligand-gated ion channel receptor?**

- **Correct Answer:** (d) **H2 Receptor**

**Explanation:**

- H2 receptors are **G-protein-coupled receptors (GPCRs)** that mediate responses such as gastric acid secretion. In contrast, nicotinic, 5HT3, and GABAA receptors are ligand-gated ion channels.

**Reference:** Rang & Dale, *Pharmacology*, 9th Edition, Page 223.

**12. Which one of the following classes of drugs causes side effects like dryness of mouth, tachycardia, urinary retention, constipation, blurring of vision, precipitation of glaucoma, drowsiness, and impairment of cognition?**

- **Correct Answer:** (b) **Anti-cholinergic**

**Explanation:**

- Anti-cholinergic drugs block muscarinic receptors, leading to the listed side effects. They inhibit parasympathetic actions, which control secretions, smooth muscle function, and accommodation.

**Reference:** Tripathi, *Essentials of Medical Pharmacology*, 8th Edition, Page 100.

**13. Which of the following cytokines are the most important regulators in inflammation and are the targets for anti-inflammatory agents used in rheumatoid arthritis?**

- **Correct Answer:** (a) **Tumor necrosis factor-α and Interleukin-1**

**Explanation:**

- TNF-α and IL-1 are pro-inflammatory cytokines. Anti-TNF drugs (e.g., infliximab) and IL-1 inhibitors (e.g., anakinra) are used to treat rheumatoid arthritis.

**Reference:** Katzung, *Basic and Clinical Pharmacology*, 15th Edition, Page 566.

**14. Which one of the following is a FALSE statement for competitive antagonists?**

- **Correct Answer:** (d) **Maximum response of the agonist cannot be achieved in their presence by increasing the concentration of the agonist**

**Explanation:**

- Competitive antagonists bind reversibly to the agonist site. Their effects can be overcome by increasing the agonist concentration, allowing the maximum response to be achieved.

**Reference:** Rang & Dale, *Pharmacology*, 9th Edition, Page 152.

**15. Atypical antipsychotics differ from typical antipsychotics in various ways that define them as atypical. Which one of the following is NOT a defining property of the atypical antipsychotics?**

- **Correct Answer:** (a) **Sustained hyperprolactinemia**

**Explanation:**

- Atypical antipsychotics (e.g., clozapine, olanzapine) have a lower propensity to cause sustained hyperprolactinemia compared to typical antipsychotics. This is due to their reduced dopamine D2 receptor blockade.

**Reference:** Stahl, *Essential Psychopharmacology*, 4th Edition, Page 292.

**16. Which one of the following drugs produces significant relaxation of both venules and arterioles?**

- **Correct Answer:** (d) **Sodium nitroprusside**

**Explanation:**

- Sodium nitroprusside is a direct-acting vasodilator that relaxes both arterioles and venules by releasing nitric oxide (NO), leading to decreased vascular resistance and venous return.

**Reference:** Tripathi, *Essentials of Medical Pharmacology*, 8th Edition, Page 495.

**17. Antiviral action of purine analogues is primarily related to the following:**

- **Correct Answer:** (b) **Q is correct and S is incorrect**

**Explanation:**

- Purine analogues (e.g., acyclovir, ganciclovir) inhibit viral **DNA polymerase**, interfering with DNA synthesis. They do not inhibit viral penetration.

**Reference:** Katzung, *Basic and Clinical Pharmacology*, 15th Edition, Page 842.

**18. Which one of the following is a tyrosine kinase inhibitor indicated for a variety of malignancies?**

- **Correct Answer:** (a) **Imatinib**

**Explanation:**

- Imatinib is a tyrosine kinase inhibitor that targets BCR-ABL fusion protein in chronic myeloid leukemia (CML) and other malignancies.

**Reference:** Rang & Dale, *Pharmacology*, 9th Edition, Page 771.

**19. Which one of the following is the most likely positive sign of pregnancy when detected in urine?**

- **Correct Answer:** (c) **Human Chorionic Gonadotropin (HCG)**

**Explanation:**

- HCG is a hormone produced by the placenta during pregnancy and is detected in urine as an early and reliable marker of pregnancy.

**Reference:** Guyton and Hall, *Textbook of Medical Physiology*, 13th Edition, Page 1035.

**20. The following are some opioid analgesics:**
**Choose the correct order of respiratory depressant propensity of these agents:**

- **Correct Answer:** (d) **S > P > Q > R**

**Explanation:**

- **Fentanyl (S)** has the highest potency and respiratory depressant effect, followed by **morphine (P)**, **pethidine (Q)**, and then **pentazocine (R)**, which is a mixed agonist-antagonist with lower respiratory depressant effects.

**Reference:** Goodman & Gilman, *The Pharmacological Basis of Therapeutics*, 13th Edition, Page 450.

**21. Which one of the following alkaloids is derived from Lysine?**

- **Correct Answer:** (c) **Lobeline**

**Explanation:**

- Lobeline is derived from the amino acid lysine; the piperidine ring, which is the core structure of lobeline, is biosynthetically formed from lysine through a series of chemical transformations within the plant that produces it, like Lobelia inflata.

**Reference:** Kokate, *Pharmacognosy*, 51st Edition, Page 180.

**22. Histologically, the barks of *Cinnamomum cassia* and *Cinnamomum zeylanicum* differ in one of the following features:**

- **Correct Answer:** (d) **Cortex**

**Explanation:**
**Cinnamomum cassia:**

- Cortex: Contains numerous layers of cork cells and stone cells (sclereids).
- Phloem Fibers: Relatively few and scattered.
- Pericyclic Fibers: Present but not a prominent feature.

**Cinnamomum zeylanicum:**

- Cortex: Lacks cork cells and stone cells (sclereids).
- Phloem Fibers: More abundant and grouped in distinct strands.
- Pericyclic Fibers: Not typically present.

Therefore, the most significant histological difference lies in the structure and composition of the cortex.

**Reference:** Trease and Evans, *Pharmacognosy*, 16th Edition, Page 228.

**23. The following characteristic properties are given in the context of saponins:**

- **Correct Answer:** (d) **P is false; Q is false; R is true; S is true**

**Explanation:**

## SAPONIN GLYCOSIDES

- Saponins are glycoside compounds often referred to as a**'natural detergent'** because of their foamy texture.
- **Aglycan** part of these glycoside has **soap like action**.
- Identified by – **foam forming** and **haemolytic index**.
- Saponin drugs mainly contains cyclopentene phenantherene nucleus.
- Triterpenoid ($C_{30}$) in nature.
  (a) Tetracyclic triterpenoids (steroidal saponin)
  (b) Pentacyclic triterpenoids

**A. Tetracyclic triterpenoids**

- Raw material for various medicinally useful agents like vitamin D, cardiac glycoside, corticoids.
- Examples- **dioscorea, ginseng**

**B. Pentacyclic triterpenoids**

- Examples- **liquorice, senega, ginseng**

**Reference:** Kokate, *Pharmacognosy*, 51st Edition, Page 356.

**24. Read the given statements about the constituents of Shellac:**

- **Correct Answer:** (c) P is false; Q is false; R is true; S is true

**Explanation:**

Shellac is compounds of aleuritic acid, shellolic acid, Laccaic acid, jalaric acid and other aliphatic acids.

| | SHELLOLIC ACID | LACCAIC ACID | ALEURATIC ACID |
|---|---|---|---|
| Chemical Name | 2,3,4,7,8a-hexa-hydro-4-Tetra hydroxy hydroxy-8-(hydroxy- methyl)-8-methyl-1H- 3a, 7-methanoazulene-3,6-dicarboxylic acid | Tetra hydroxyl Antraquinone derivative | 9, 10, 16-trihydroxypalmitic acid |
| Interpretation | Aliphatic and alicyclic component | Aliphatic constituent | Aliphatic constituent |
| Uses | Pharmaceutical aid | Primary colorant in lac dye | Starting material in the perfume. industry for the preparation of musk aroma |

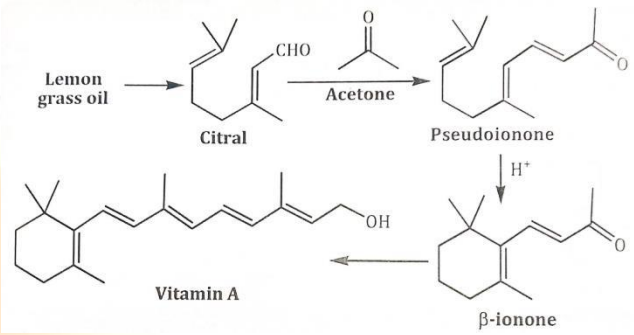
**Reference:** Trease and Evans, *Pharmacognosy*, 16th Edition, Page 520.

**25. The major component of *Cymbopogon citratus* is citral, which is utilized commercially for the following:**

- **Correct Answer:** (b) P is false; Q is true; R is false; S is true

**Explanation:**

- Cymbopogon citratus yield citral which is used as a raw material for the synthesis of Vitamin A.
- Initially citral is converted to y -ionone followed by conversion to ß-ionone which is an important intermediate for carotenoid synthesis




**Reference:** Kokate, *Pharmacognosy*, 51st Edition, Page 432.

**26. Which one of the following constituents is reported to have anti-hepatotoxic activity?**

- **Correct Answer:** (b) **Andrographolide**

**Explanation:**

- Andrographolide, derived from *Andrographis paniculata*, is a diterpene lactone known for its potent anti-hepatotoxic activity.

**Reference:** Kokate, *Pharmacognosy*, 51st Edition, Page 468.

**27. All of the following statements about lignans are correct except one. Identify the INCORRECT statement:**

- **Correct Answer:** (c) **Lignans can be formed by cyclization of the phenylpropane nucleus.**

**Explanation:**

- Lignans are formed by **dimerization** of phenylpropane units but do not involve direct cyclization of the phenylpropane nucleus.

**Reference:** Trease and Evans, *Pharmacognosy*, 16th Edition, Page 278.

**28. Rhizomes of *Zingiber officinale* contain some sesquiterpene hydrocarbons. Identify the correct pair of constituents present in the rhizomes:**

- **Correct Answer:** (a) **P and S (β-Bisabolene and Zingiberene)**

**Explanation:**

- The rhizomes of ginger contain **β-Bisabolene** and **Zingiberene** as major sesquiterpenes. Gingerol and gingerone are not sesquiterpenes but pungent phenolic ketones.

**Reference:** Kokate, *Pharmacognosy*, 51st Edition, Page 552.

**29. Listed below are the chemical tests used to identify some groups of phytoconstituents. Identify the test for the detection of purine alkaloids:**

- **Correct Answer:** (b) **Murexide Test**

**Explanation:**

- The **Murexide Test** is specific for detecting **purine alkaloids**, such as caffeine and theobromine, due to the formation of a purple color.

**Reference:** Trease and Evans, *Pharmacognosy*, 16th Edition, Page 349.

**30. Atropine biosynthesis involves a pair of precursors. Identify the correct pair:**

- **Correct Answer:** (a) **Ornithine and Phenylalanine**

**Explanation:**

- Atropine is synthesized via the **tropane alkaloid pathway**, which involves **ornithine** for the pyrrolidine ring and **phenylalanine** for the phenylacetate moiety.

**Reference:** Kokate, *Pharmacognosy*, 51st Edition, Page 601.

**31. Study the following statements and choose the correct answer:**

- **Correct Answer:** (b) **Q and R are correct, while P and S are incorrect**

**Explanation:**

- Lutein and zeaxanthin are **xanthophylls**, not flavonoids.
- Both compounds are essential for controlling **age-related macular degeneration**.

**Reference:** Trease and Evans, *Pharmacognosy*, 16th Edition, Page 154.

**32. Identify the constituent(s) present in *Aloe vera*:**

- **Correct Answer:** (b) **Q and R (Glucomannan and Barbaloin)**

**Explanation:**

- *Aloe vera* contains **glucomannan** (a polysaccharide) and **barbaloin** (an anthraquinone derivative).
- Galactomannan is found in guar gum, and phyllanthin is from *Phyllanthus amarus*.

**Reference:** Kokate, *Pharmacognosy*, 51st Edition, Page 678.

**33. Binomial nomenclature of fruits of star-anise:**

- **Correct Answer:** (b) **Illicium verum**

**Explanation:**

- *Illicium verum* is the correct name for the fruits of star-anise.
- *Pimpinella anisum* refers to anise, a different plant.

**Reference:** Trease and Evans, *Pharmacognosy*, 16th Edition, Page 421.

**34. Peruvoside is naturally obtained from one of the following plants. Identify the correct name:**

- **Correct Answer:** (d) **Thevetia**

**Explanation:**

- Peruvoside, a cardiac glycoside, is derived from *Thevetia peruviana*.

**Reference:** Kokate, *Pharmacognosy*, 51st Edition, Page 481.

**35. One of the following is NOT required for the initiation and maintenance of plant tissue culture. Identify that:**

- **Correct Answer:** (d) **Abscisic acid**

**Explanation:**

- Sucrose, kinetin, and auxin are critical for tissue culture.
- Abscisic acid is associated with plant dormancy, not growth or tissue culture.

**Reference:** Trease and Evans, *Pharmacognosy*, 16th Edition, Page 216.

**36. For the equation PV = nRT to hold true for a gas, all of the following conditions are necessary EXCEPT for ONE. Identify that:**

- **Correct Answer:** (c) **The velocities of all molecules must be equal**

**Explanation:**

- The equation PV = nRT is the ideal gas law, assuming:
  - Gas molecules have negligible volume.
  - Collisions are perfectly elastic.
  - The gas is not decomposing.
- However, molecular velocities vary as per the Maxwell-Boltzmann distribution.

**Reference:** Atkins, *Physical Chemistry*, 11th Edition, Page 141.

**37. Atracurium besylate, a neuromuscular blocking agent, is metabolized through one of the following reactions. Identify that:**

- **Correct Answer:** (a) **Hoffman elimination**

**Explanation:**

- Atracurium undergoes **Hoffman elimination**, a chemical reaction involving base-catalyzed decomposition, independent of enzyme activity.

**Reference:** Rang & Dale, *Pharmacology*, 8th Edition, Page 156.

**38. Identify the metabolite of prontosil responsible for its antibacterial activity:**

- **Correct Answer:** (b) **Sulphanilamide**

**Explanation:**

- Prontosil is a prodrug that is metabolized to **sulphanilamide**, the active antibacterial agent.

**Reference:** Tripathi, *Essentials of Medical Pharmacology*, 8th Edition, Page 707.

**39. The central bicyclic ring in penicillin is named as one of the following. Find the correct name:**

- **Correct Answer:** (b) **4-Thia-1-azabicyclo[3.2.0]heptane**

**Explanation:**

- Penicillin has a **4-Thia-1-azabicyclo[3.2.0]heptane** core, comprising a β-lactam and a thiazolidine ring.

**Reference:** Foye, *Principles of Medicinal Chemistry*, 7th Edition, Page 849.

**40. Quantification of a minute quantity of a drug from a complex matrix, without prior separation, can be done using one of the following techniques. Identify that:**

- **Correct Answer:** (d) **Radioimmunoassay**

**Explanation:**

- **RADIOIMMUNOASSAY** - The technique can be extremely sensitive and is used to detect wide range of pharmaceutical products such as cannabis, lysergic acid diethylamide, Digoxin. It can able to detect the analyte found in very low concentrations (even minute quantity).
- On the other hand, disadvantages include the need for expensive reagents and equipment and the inconveniences associated with the safe disposal of radioactive material and the availability of those radiolabels.

**Reference:** Lippincott, *Illustrated Reviews in Pharmacology*, 6th Edition, Page 210.

**41. Read the following statements carefully about Volhard's method:**

- **Correct Answer:** (a) **P, Q, and R are true, and S is false**

**Explanation:**

- Volhard's method is an indirect titration technique for halides, involving titration of excess silver ions with thiocyanate in acidic solution.
- Ferric ions are used as indicators, forming reddish-brown ferric thiocyanate.
- It is an indirect titration method, not a direct one.

**Reference:** Vogel, *Textbook of Quantitative Chemical Analysis*, 6th Edition, Page 580.

**42. Read the following statements about SN1 reactions:**

**Correct Answer:** (c) Q and R are true, while P and S are false

**Explanation:**

| S.NO. | $S_N2$ Reaction | $S_N1$ Reaction |
|---|---|---|
| 1. | $S_N2$ reaction takes place in one step. | $S_N1$ reaction takes place in two step. |
| 2. | Most of the $S_N2$ reaction are of the second order but sometimes when the nucleophilic reagent is present in excess quantity the reaction is of first order but still proceed by $S_N2$ mechanism. | All the $S_N1$ reaction are of first order. |
| 3. | $S_N2$ reactions are bimolecular. | $S_N1$ reactions are unimolecular. |
| 4. | The nucleophilic attacks the carbon of substrate exclusively from the back side. | The nucleophilic can attack the carbon of subtract both on the back and front side although the back side attack predominates. |
| 5. | Complete inversion of configuration takes place. | In case of optically active alkyl halides, partial racemisation takes place. |
| 6. | No rearranged product is formed. | Rearranged product formation is possible. |
| 7. | The order of reactivity of alkyl halide is: Methyl > 1 >2 >3 halides. | The order of reactivity of alkyl halide is : 3 > 2 >1> Methyl halides. |
| 8. | Favoured by strong nucleophiles. | Favoured by mild nucleophiles. |
| 9. | Favoured by high concentration of nucleophiles. | Favoured by low concentration of nucleophiles. |
| 10. | Favoured by solvents of low polarity. | Favoured by solvents of high polarity. |
| 11. | Reaction rate determined mainly by electronic steric factor. | Reaction rate determined mainly by electronic factor. |
| 12. | Not catalysed by any catalyst. | Catalysed by Lewis acids.<br>Eg: Ag +,Alcl, Zncl2, ect. |

**Reference:** Morrison and Boyd, *Organic Chemistry*, 7th Edition, Page 402.

**43. The following are some drug derivatives used to increase/decrease the water solubility of the parent drugs:**

- **Correct Answer:** (b) **P, Q, and R are used to increase water solubility, while S is used to decrease it**

**Explanation:**

- **Rolitetracycline**, **Erythromycin lactobionate**, and **Chloramphenicol succinate** increase water solubility due to their salt forms.
- **Erythromycin stearate** decreases solubility, making it more lipid-soluble for oral administration.

**Reference:** Foye, *Principles of Medicinal Chemistry*, 7th Edition, Page 893.

**44. One of the following ring systems can be used as the bioisosteric replacement for the benzene ring in drug design:**

- **Correct Answer:** (a) **P (Thiophene)**

**Explanation:**

- **Thiophene**, a heteroaromatic compound, is a common bioisostere for benzene due to similar electronic and steric properties.

**Reference:** Patrick, *An Introduction to Medicinal Chemistry*, 6th Edition, Page 250.

**45. Some of the following statements describe the properties of Dropping Mercury Electrode (DME) correctly:**

- **Correct Answer:** All statements P, Q, R, and S are correct

**Explanation:**

Dropping mercury electrode acts as a polarizabile electrode in Polarography It offers few advantages and disadvantages

**ADVANTAGES:**

- Mercury yields reproducible current potential data. This reproducibility can be attributed to the continuous exposure of fresh surface on the growing mercury drop.
- With any other electrode (such as Pt in various forms), the potential depends on its surface condition and therefore on its previous treatment
- Mercury makes many metal ions easily reducible.
- At a Platinum surface, reduction of solvent is expected to compete with reduction of many analyte species, especially in acidic solutions
- The high over potential for $H^+$ reduction at the mercury surface. Therefore. $H^+$ reduction does not interfere with many reductions.
- The large hydrogen over potential on mercury renders the possibility of deposition of substances difficult to reduce
- Mercury forms amalgam with many metals and reduces the reduction potential

- Constant renewal of surface eliminates poisoning effects

**DISADVANTAGE:**

- A mercury electrode is not very useful for performing oxidations, because mercury is too easily oxidized
- The electrode cannot be used over +0.4 V (vs S.C.E), because Hg dissolves and anodic wave is recorded Lesser than -1.8 V, hydrogen is liberated

**Reference:** Skoog, *Principles of Instrumental Analysis*, 7th Edition, Page 621.

**46. Penicillin ring system is derived from two of the following amino acids:**

- **Correct Answer:** (b) **Q (Cysteine and valine)**

**Explanation:**

- The β-lactam ring and thiazolidine ring system in penicillin are biosynthetically derived from **L-cysteine** and **L-valine**.

**Reference:** Foye, *Principles of Medicinal Chemistry*, 7th Edition, Page 858.

**47. Statements about clavulanic acid, sulbactam, and tazobactam:**

- **Correct Answer:** (d) **P, Q, and S are true, while R is false**

**Explanation:**

- **P:** All three lack the 6-acylamino side chain typical of penicillins.
- **Q:** They are potent **β-lactamase inhibitors**.
- **S:** They exhibit weak antibacterial activity on their own.
- **R:** These are not prodrugs of penicillin but β-lactamase inhibitors used in combination with β-lactam antibiotics.

**Reference:** Katzung, *Basic and Clinical Pharmacology*, 14th Edition, Page 798.

**48. Detector used in gas chromatography for halogen-containing compounds:**

- **Correct Answer:** (b) **Electron capture detector (ECD)**

**Explanation:**

- **ECD** is highly sensitive to halogenated compounds due to its ability to detect species that capture electrons.

**Reference:** Skoog, *Principles of Instrumental Analysis*, 7th Edition, Page 803.

**49. Precessional frequency of a nucleus depends on the following:**

- **Correct Answer:** (a) **P and Q are true**

**Explanation:**

- **P:** Precessional frequency depends on the **strength of the external magnetic field** applied.
- **Q:** The **electron density** around the nucleus affects the shielding and, consequently, the frequency.
- **R and S:** Frequency of applied electromagnetic radiation and electronegativity do not directly determine the precessional frequency.

**Reference:** Hollas, *Modern Spectroscopy*, 4th Edition, Page 214.

**50. Statements about disodium edetate:**

- **Correct Answer:** (c) [S] only is true

**Explanation:**

- When a complexing agent form more than one bond with polyvalent ion is referred as polydentate and the agent is called chelating agent. If the complex formed is soluble in water, then it is called as sequestering agent.
- Disodium edetate is a complexing agent, chelating agent and sequestering agent. Disodium edetate can be used for the assay of divalent compounds such as zinc sulphate, bismuth sub carbonate, calcium carbonate, Cobalt oxide, Magnesium sulphate, etc.

**Reference:** Beckett and Stenlake, *Practical Pharmaceutical Chemistry*, 4th Edition, Page 143.

**51. Which one of the following amino acids is the most effective contributor of protein buffer?**

- **Correct Answer:** (c) **Histidine**

**Explanation:**

- Histidine has an imidazole side chain with a pKa close to physiological pH, making it an excellent buffer in the protein buffering system.

**Reference:** Lehninger, *Principles of Biochemistry*, 6th Edition, Page 308.

**52. Study the following statements on alkylating agents as antineoplastics:**

- **Correct Answer:** (a) **P and Q are correct**

**Explanation:**

- **P:** Alkylating agents like nitrogen mustards form **aziridinium ions**, which covalently bind DNA, especially the **7th nitrogen of guanine**, disrupting replication.
- **Q:** Both **nitrogen mustards** (e.g., cyclophosphamide) and **sulfur mustards** belong to this class.
- **R and S:** These statements describe other classes of drugs, not alkylating agents.

**Reference:** Katzung, *Basic and Clinical Pharmacology*, 14th Edition, Page 932.

**53. Following are some statements about Captopril:**

- **Correct Answer:** (c) **P and R are true, while Q and S are false**

**Explanation:**

- **P:** Captopril is the **prototype ACE inhibitor**.
- **R:** It contains a **proline moiety**, which enhances its binding to ACE.
- **Q:** It does not have a sulphonyl group but a **sulfhydryl (-SH)** group.
- **S:** There is no ester linkage in its structure.

**Reference:** Foye, *Principles of Medicinal Chemistry*, 7th Edition, Page 641.

**54. Cetirizine as an antihistaminic agent has a low sedative potential due to one of the following reasons.**

- **Correct Answer:** (c) **It has high polarity**

**Explanation:**

- Cetirizine, a second-generation antihistamine, has **high polarity**, preventing it from crossing the blood-brain barrier significantly, resulting in low sedation potential.

**Reference:** Goodman & Gilman, *The Pharmacological Basis of Therapeutics*, 13th Edition, Page 910.

**55. Titanium dioxide is used in sunscreen products as a topical protective. The topical protective effect of titanium dioxide arises due to one of the following properties.**

- **Correct Answer:** (d) **It has a high refractive index**

**Explanation:**

- Titanium dioxide has a **high refractive index**, which scatters and reflects UV radiation, protecting the skin from harmful effects.

**Reference:** Martin, *Physical Pharmacy and Pharmaceutical Sciences*, 6th Edition, Page 562.

**56. Parachor and Molar refraction can be categorized under one of the following properties.**

- **Correct Answer:** (d) **Additive and constitutive properties**

**Explanation:**

- **Parachor** and **Molar refraction** are influenced by the **number of atoms (additive)** and their **structural arrangement (constitutive)** in a molecule.

**Reference:** Atkins, *Physical Chemistry*, 11th Edition, Page 346.

**57. Rast's camphor method is used for the determination of molecular weight of solutes soluble in molten camphor.**

- **Correct Answer:** (c) **Lowering of freezing point of camphor by the solute**

**Explanation:**

- Rast's method measures the molecular weight of a solute by utilizing the **depression of freezing point** of camphor due to the solute dissolved in it.

**Reference:** Vogel, *Practical Organic Chemistry*, 5th Edition, Page 261.

**58. In polarography, when the limiting current is achieved, one of the following processes takes place.**

**Correct Answer:** (d) The rate of electron transfer far exceeds the rate of mass transfer

**Explanation:**

- The limiting current is also called the diffusion current which is measured using either the maximum current, or from the average current, $i_{max}$ In polarography, when the

limiting $i_{avg}$ current is achieved, the rate of electron transfer far exceeds the rate of mass transfer..

**Reference:** Bard & Faulkner, *Electrochemical Methods: Fundamentals and Applications*, 2nd Edition, Page 228.

**59. Starch-iodide paste/paper is used as an external indicator in one of the following titrations.**

- **Correct Answer:** (c) Diazotization titration of sulfadiazine using sodium nitrite as titrant

**Explanation:**

| | |
|---|---|
| **Principle** | It is based on the principle that aromatic compounds containing amino group react with sodium nitrite in acidic medium to form Diazonium salt which can be determine quantitatively. |
| **Titrant** | Sodium nitrite ($NaNO_3$) |
| **Titrate** | Substance containing aromatic primary amine group |
| **Medium** | HCI (acidic medium) |
| **Indicator** | Starch Iodine paper or paste as external Indicator (OR) Dead stop End Point using Amperometric. |
| **Endpoint** | Appearance of blue colour upon addition of external Indicator |
| **Applications** | Assay of sulpha drugs such as sulphadiazine. |

**Reference:** Vogel, *Quantitative Chemical Analysis*, 6th Edition, Page 321.

**60. For a dye to be used as a metal indicator in complexometric titrations, some properties are listed below:**

- **Correct Answer:** (c) P and R are correct, while Q is not

**Explanation:**

- The end point in Complexometric titrations can be determined by means of specific indicators which are commonly referred as pM indicators.
- The pM indicator is a dye which act as chelating agent to form dye-metal complex.
- The dye-metal complex is differ from the dye in colour as well as having low stability constant than the chelate-metal complex. The color of the solution and the dye complex remains constant until the end point achieved where an equivalent amount of sodium EDTA has been added As soon as there is the slightest excess of EDTA, the metal-dye complex decomposes to produce a free dye that is accomplished by a change in color. The dye shoul be capable of complexing with the metals ion.

**Reference:** Christian, *Analytical Chemistry*, 7th Edition, Page 501.

**61. In amperometry, rotating platinum electrode (RPE) is used as the indicating electrode.**

- **Correct Answer:** (d) **P, Q, and R are all advantages of using RPE in amperometry**

**Explanation:**

Rotating platinum micro sbctrode is used as Indicator microelectrode in Amperometric Titration

**ADVANTAGES OF ROTATING PLATINUM ELECTRODE**

- Diffusion current is 20 times larger than DME which allows measuring the small concentration of ion.
- The rotating platinum electrode can be used at positive potential up to 0.9 Volt whereas DME can be used only +0.4 volt to -20 Volt
- The electrode is simple to construct
- Steady diffusion state is reached quickly
- The micro concentration of material can be determined because of the larger currents attend at rotating electrodes.
- It causes greatly reduced residual current due to lack of condenser effect.

**DISADVANTAGES:**

- It has low hydrogen over potential

**Reference:** Bard & Faulkner, *Electrochemical Methods: Fundamentals and Applications*, 2nd Edition, Page 290.

**62. Statements related to the protein binding of drugs:**

**Correct Answer:** (d) P and S are true, while Q and R are false

**Explanation:**

**COMPARISON BETWEEN PLASMA PROTEIN-DRUG BINDING AND TISSUE-DRUG BINDING**

| S.NO | PLASMA PROTEIN-DRUG BINDING | TISSUE-DRUG BINDING |
|---|---|---|
| 1. | Binding involves weak bonds and thus reversible | Binding generally involves strong and covalent bonds and thus irreversible |
| 2. | Drugs that bind to plasma proteins have small apparent volume of distribution. | Drugs that bind to extravascular tissues have large apparent volume of distribution. |
| 3. | Half-life of plasma protein bound | Half-life of extravascular tissue bound |

| | | |
|---|---|---|
| | drug is relatively short | drug is relatively long. |
| 4. | Does not result in toxicity. | Tissue toxicity is common. |
| 5. | Displacement from binding sites is possible by other drugs. | Displacement by other drugs generally does not occur. |
| 6. | Competition between drugs for binding to plasma proteins can occur | Tissue-drug binding is generally non-competitive. |

- Protein binding is directly related to lipophilicity. When the lipophilicity of the drug is high, the extent of binding also get increased.
- Protein binding decreases the free drug concentration in the system.
- Protein binding of one drug can be affected by the presence of other drug.

**Reference:** Goodman & Gilman, *The Pharmacological Basis of Therapeutics*, 13th Edition, Page 114.

**63. Based on the Henderson-Hasselbalch equation, at what pH value would a weak acid be 99.9% ionized?**

- **Correct Answer:** (a) **At pH equivalent to pKa + 3**

**Explanation:**

Option (a) is correct

According to Henderson-Hassel batch equations, the following can be obtained

For weak acids,

% drug lionized = $\frac{10(pH-pKa)}{1+10(pH-pKa)} \times 100$

| pH-pKa | % Acid | % Unionized | % Ionized |
|---|---|---|---|
| 4 | 0.01 | 0.01 | 99.99 |
| 3 | 0.1 | 0.1 | 99.9 |
| 2 | 1 | 1 | 99 |
| 1 | 9 | 9 | 91 |
| 0 | 50 | 50 | 50 |
| -1 | 91 | 91 | 9 |
| -2 | 99 | 99 | 1 |
| -3 | 99.9 | 99.9 | 0.1 |
| -4 | 99.99 | 99.99 | 0.01 |

Option (b) is incorrect

- Acid drugs – become more NON ionized in acidic pH

- Basic drugs – become more NON ionized in basic pH (alkaline pH)
- pH less than 7 are acidic while pH greater than 7 are alkaline (basic)

Option (c) is incorrect

Because in general, the acidic drugs are more soluble in alkaline solution

Option (d) is incorrect

The relation between acid or base with pKa is given below

| DRUGS | pKa | NATURE |
|---|---|---|
| Acids | | |
| A | 2.0 | Strong |
| B | 6.0 | Weak |
| C | 10.0 | Very weak |
| Bases | | |
| D | 12.0 | Strong |
| E | 8.0 | Weak |
| F | 4.0 | Very weak |

It is found that higher the pKa of a weak base, weaker is acid

**Reference:** Martin, *Physical Pharmacy*, 5th Edition, Page 130.

**64. Which one of the following is NOT used in the preparation of baby powders?**

- **Correct Answer:** (a) **Stearic acid**

**Explanation:**

- Baby powder usually consists of tale (main ingredient) with small proportion of metallic stearate like zinc or aluminium stearate and precipitated calcium carbonate, magnesium carbonate.
- To impart absorbency, kaolin, magnesium carbonate, precipitated chalk and starch are used in order to suppress growth of micro-organisms some antimicrobial agents such as boric acid, chlorhexidine acetate, bithionol are used.
- It is recommended to avoid formulation of boric acid containing baby powder in infants below 3 years.
- Because Boric acid causes eye irritation, and other allegic reaction to infants. On high dose, it causes CNS related side effects.

**Reference:** Lachman, *The Theory and Practice of Industrial Pharmacy*, 4th Edition, Page 623.

**65. According to the Kozeny-Carmen equation, a 10% change in porosity can produce:**

- **Correct Answer:** (d) **None of the above**

**Explanation:**

- Poisueille's equation is made applicable to porous bed of filtration based on capillary type structure by including some additional parameters result in introduction of Kozeny Carman equation.
- Kozeny carman equation represent relationship between permeability versus porosity, grain size, and tortuosity and this is used in the field of fluid dynamics to calculate the pressure drop of a fluid flowing through a packed bed of solids.
- According to Kozeny carman equation

$$V = \frac{A}{\eta S^2} \text{ X } \frac{\Delta P}{KL} \text{ X } \frac{\varepsilon^3}{(1-\varepsilon)^2}$$

Where

K = Kozeny constant
A = Surface area of bed
ΔP = Pressure difference across the filter
L= Thickness of filter cake
η = Viscosity of filtrate
$\varepsilon$ = Porosity of cake or bed
S = Specific surface area of particles consist of cake

- For random packaging of incompressible bed, Kozeny constant is generally taken as 5.
- It is found that 10% change in porosity can cause almost 3 fold changes in rate of flow.
- This equation is not applicable in actual condition where the depth of granular bed in less than actual length of path transverse by fluid, since actual flow path is sinuous instead of straight throughout the bed.

**Reference:** Perry, *Chemical Engineers' Handbook*, 7th Edition, Page 230.

**66. Containers used for aerosols should withstand a pressure of:**

- **Correct Answer:** (c) **140-180 Psig at 130 °F**

**Explanation:**

- Aerosol containers must be strong enough to handle internal pressures generated by the propellant at elevated temperatures, ensuring safety and performance. The range of **140–180 Psig at 130 °F** is standard for aerosol containers.

**Reference:** Lachman, *The Theory and Practice of Industrial Pharmacy*, 4th Edition, Page 472.

**67. Study the following two statements:**

- **Correct Answer:** (a) Both X and Y are correct

**Explanation:**

- The critical temperature of a substance is the temperature at and above which vapor of the substance cannot be liquefied, no matter how much pressure is applied while critical pressure of a substance is the pressure required to liquefy a gas at its critical temperature.
- Critical Pressure is the highest vapour pressure that the liquid can have. In other words, if the gas is cooled below its critical temperature, less pressure is required to liquefy it.
- No amount of pressure applied togas at or above critical temperature, will cause the gas to liquefy. At or below critical temperature, however, the gas can be liquefied provided when sufficient (less) pressure is applied.

**Reference:** Atkins & de Paula, *Physical Chemistry*, 10th Edition, Page 345.

**68. Assertion [A] and Reason [R]:**

- **Correct Answer:** (c) **Both [A] and [R] are true, and [R] is the correct reason for [A]**

**Explanation:**

**ANGLE OF REPOSE:** It is the maximum angle possible between surface of the pile of the powder and horizontal plane.

$$\theta = \tan^{-1} h/r$$

Where, 0 = Angle of repose, h = Height of pile, r = Radius of the base of pile

**Measurement method:**

a. Fixed cone method
b. Rotating cylinder method
c. Tilted box method

- Addition of glidant, may improve flow of powder but in low concentration •
- Free flowing powders show a flatter cone and have Smaller angle of repose. •
- The rougher and more irregular the surface of the particles, the higher will be the angle of repose

**Reference:** Martin, *Physical Pharmacy*, 6th Edition, Page 212.

**69. Formula for the calculation of retail price of a formulation:**

- **Correct Answer:** (b) R.P. = (M.C. + C.C. + P.M. + P.C.) × (1 + MAPE/100) + E.D.

**Explanation:**

| S.NO. | DPCO 1995 | DPCO 2013 |
|---|---|---|
| 1. | Governed by essential commodity act-1995 | It is governed by National Pharmaceutical Pricing Authorities (NPAA).<br>(DPCO has enable NPPA regulate price of 348 drugs that come under national list of essential medicines) |
| 2. | They regulate price of only 74 drugs | They regulate price of 652 drugs |
| 3. | If once price is 3 fixed they cannot change according to act | Pricing is mainly based on simple average price be bowered dependency upon margin |
| 4. | Government fix price<br>"industries cannot dominate"<br>↓<br>price were fixed accordingly to manufacture cost only | Price are fixed both by mutual agreement of government and industries |
| 5. | Formula: Calculation of Retail price<br>R.P = (M.C+C.C+P.M+P.C) X $\frac{1+MAPE}{100}$ + ED<br>Where,<br>R.P = Retail price<br>M.C= Material cost<br>C.C= Conversion price<br>P.M= Packing material cost<br>P.C = Packing charges<br>MAPE = Maximum allowable post manufacturing expenses (NMT 100%)<br>E.D= Excise duty | New pricing in 2015 is<br>MRP Ceiling price + Local taxes<br>Ceiling Price = Ps $\frac{1+m}{100}$ |

**Reference:** Government of India Drug Price Control Order Guidelines, 2013.

**70. Which one of the following statements is FALSE about Interferons?**

- **Correct Answer:** (c) **Interferons are virus-specific agents that can interfere either with DNA or RNA viruses.**

**Explanation:**

- Interferons are small proteins belonging to the group cytokinins.

- They are low molecular weight glycoprotein cytokines produced by host cells in response to viral infections.
- Interferons inhibit many RNA and DNA viruses, but they are host specific and produced as potent broad spectrum antiviral agent.
- They increase the ability of the uninfected host to resist the new viral infection.
- They also activate the macrophages, B cells and alter the T cells and promote.

**Reference:** Goodman & Gilman, *The Pharmacological Basis of Therapeutics*, 13th Edition, Page 1213.

**71. Which one of the following statements is NOT true for stainless steel 316?**

- **Correct Answer:** (d) **It is not affected by acids**

**Explanation:**

- **Stainless Steel 316** is resistant to many acids due to its high chromium content and molybdenum, but it can still be affected by concentrated acids like hydrochloric acid.
- The other statements about chromium content (10.5–11%), passivation, and being called inox steel are correct.

**Reference:** Shreve, *Chemical Process Industries Handbook*, 5th Edition, Page 76.

**72. Precise control of flow is obtained by which one of the following?**

- **Correct Answer:** (a) **Needle valve**

**Explanation:**

- **Needle valves** allow fine adjustments of flow due to their long, tapered needle-like structure, providing precise control.
- Other valves, like **butterfly**, **gate**, and **globe valves**, are designed for less precise flow control or bulk flow management.

**Reference:** Perry, *Chemical Engineers' Handbook*, 8th Edition, Page 54-13.

**73. Heat-sensitive materials like fruit juice are evaporated in which one of the following?**

- **Correct Answer:** (c) **Falling film type evaporator**

**Explanation:**

- Falling film evaporators operate at low residence times and lower temperatures, making them ideal for heat-sensitive materials like fruit juice.
- Other evaporators (e.g., long tube vertical and calandria) may involve higher residence times, leading to degradation of sensitive materials.

**Reference:** Coulson & Richardson, *Chemical Engineering Volume 2*, 6th Edition, Page 368.

**74. Which of the following conditions favor the formation of large crystals?**

- **Correct Answer:** (b) **Low nucleation rate**

**Explanation:**

- A **low nucleation rate** allows fewer crystal nuclei to form, providing more space for existing crystals to grow larger.
- High nucleation rates and rapid cooling typically result in smaller crystals.

**Reference:** McCabe, *Unit Operations of Chemical Engineering*, 7th Edition, Page 523.

**75. Which one of the following properties is characteristic of microemulsions?**

- **Correct Answer:** (a) **These are transparent systems with droplet size less than 1 micrometer**

**Explanation:**

- Microemulsions are transparent, thermodynamically stable systems with **droplet sizes below 1 micrometer**.
- Systems with droplet sizes above 1 micrometer are typically non-transparent and not classified as microemulsions.

**Reference:** Lachman, *The Theory and Practice of Industrial Pharmacy*, 4th Edition, Page 550.

**76. Which of the following statements is INCORRECT?**

- **Correct Answer:** (c) **Rideal-Walker test uses organic matter in media**

**Explanation:**

- The **Chick Martin test** uses organic matter in the media, and **S. typhi** is the test organism.
- The **Rideal-Walker test**, however, does not include organic matter in the media.
- The incorrect statement is related to the media composition in the Rideal-Walker test.

**Reference:** Hugo and Russell, *Pharmaceutical Microbiology*, 7th Edition, Page 89.

**77. Which of the following forces contribute to the stability of charge-transfer complexes?**

- **Correct Answer:** (d) **Resonance forces and dipole-dipole interactions**

**Explanation:**

- Charge-transfer complexes are stabilized by **resonance forces** (electron sharing between donor and acceptor) and **dipole-dipole interactions**, enhancing their stability.

**Reference:** Morrison and Boyd, *Organic Chemistry*, 6th Edition, Page 412.

**78. Which of the following isotherms are produced when the heat of condensation of successive layers is more than the heat of adsorption of the first layer?**

- **Correct Answer:** (d) **Type III and V**

**Explanation:**

- Adsorption Isotherms describe the relationship between the amount of gas adsorbed by a solid adsorbent and the equilibrium pressure of the gas at constant temperature.
- Heat of Adsorption is the energy released when a molecule adsorbs onto the surface of a solid.
- Heat of Condensation is the energy released when a gas condenses into a liquid.

When the heat of condensation of successive layers is more than the heat of adsorption of the first layer:

- Weak adsorbate-adsorbent interactions: The initial adsorption is weak, leading to a low initial uptake.
- Favorable multilayer formation: The higher heat of condensation for subsequent layers promotes the formation of multiple layers.

**Type III and V isotherms exhibit these characteristics:**

- Type III: Gradual increase in adsorption with increasing pressure, indicating weak adsorbate-adsorbent interactions.
- Type V: Similar to Type III but with a hysteresis loop, often observed in mesoporous materials with ink-bottle shaped pores.
- Therefore, when the heat of condensation exceeds the heat of adsorption, Type III and V isotherms are typically observed.

**Reference:** Adamson and Gast, *Physical Chemistry of Surfaces*, 6th Edition, Page 214.

**79. Which of the following pumps is used in the handling of corrosive liquids?**

- **Correct Answer:** (d) **Peristaltic pump**

**Explanation:**

- **Peristaltic pumps** handle corrosive liquids effectively because the liquid is contained entirely within the flexible tubing, avoiding contact with the pump mechanism.

**Reference:** Coulson & Richardson, *Chemical Engineering Volume 1*, 6th Edition, Page 157.

**80. The Reynolds number, widely used to classify the flow behavior of fluids, is the ratio of which one of the following?**

- **Correct Answer:** (b) **Inertial forces to viscous forces**

**Explanation:**

- The **Reynolds number** is a dimensionless parameter that represents the ratio of inertial forces to viscous forces in a fluid flow system.

**Reference:** McCabe, *Unit Operations of Chemical Engineering*, 7th Edition, Page 45.

**81. The first bunch of bananas has ¼ again as many bananas as a second bunch. If the second bunch has 3 bananas less than the first bunch, then the number of bananas in the first bunch is:**

- **Correct Answer:** (d) **15**

**Explanation:**
Let the number of bananas in the second bunch = x.
The first bunch has $x + \frac{1}{4}x = \frac{5}{4}x$
The second bunch has 3 bananas less:

So, $\frac{5}{4}x - x \Longrightarrow 5x - 4x = 12 \Longrightarrow x = 12$

Thus, the first bunch has $\frac{5}{4} \times 12 = 15$

**82. Rimmy's pulse rate is 19 beats every 15 seconds. What is her rate in beats per minute?**

- **Correct Answer:** (a) **76**

**Explanation:**
Pulse rate per minute = 19 × 4 = 76
Since there are 60 seconds in a minute, 15×4=60. Multiplying by 4 gives the pulse rate per minute.

**83. Which space agency, along with the European Space Agency, has sent a spacecraft on a 7-year journey to explore Mercury?**

- **Correct Answer:** (c) **JAXA**

**Explanation:**
The **BepiColombo mission**, launched jointly by **JAXA** (Japan Aerospace Exploration Agency) and **ESA** (European Space Agency), is a 7-year mission to Mercury.

**84. Which bank became India's first PSU bank to introduce comprehensive wealth business services for its clients?**

- **Correct Answer:** (a) **SBI**
- **Explanation:**
  **State Bank of India (SBI)** became the first PSU bank in India to introduce comprehensive wealth business services for its clients. They launched this initiative under the brand name "SBI Wealth."
- This move aimed to cater to the growing needs of high-net-worth individuals (HNIs) and provide them with a range of specialized wealth management services.

**85. The first hormone epinephrine was synthesized in the year:**

- **Correct Answer:** (b) **1904**

**Explanation:**
Epinephrine was first synthesized in the laboratory by Friedrich Stolz and Henry Drysdale Dakin, independently, in 1904.

**86. Prime Minister Narendra Modi launched the Union Government's Support and Outreach Initiative for which sector?**

- **Correct Answer:** (b) **MSME (Micro, Small, and Medium Enterprises)**

**Explanation:**
PM Narendra Modi launched the **Support and Outreach Initiative** for the MSME sector in

2018 to strengthen this vital sector, offering incentives like loans, subsidies, and simplified business processes.

**87. The Government has announced that it will be refunding the employers the pay for how many weeks of maternity leave given to employees?**

- **Correct Answer:** (a) **7 weeks**

**Explanation:**
The government has announced that it will refund employers for the first seven weeks of maternity leave. This is in reference to the Maternity Benefit Act of 1961, which states that women are entitled to a maximum of 26 weeks of maternity leave.

**88. According to the commercial satellite network 'Planet,' which statue is visible from space?**

- **Correct Answer:** (b) **Statue of Unity**

**Explanation:**
The **Statue of Unity**, located in Gujarat, India, is the world's tallest statue (182 meters) and is visible from space as confirmed by the commercial satellite network 'Planet.'

**89. Which state has passed the Maratha Reservation Bill?**

- **Correct Answer:** (c) **Maharashtra**

**Explanation:**
The **Maharashtra Government** passed the **Maratha Reservation Bill** to provide a 16% reservation for the Maratha community in jobs and education under the **Socially and Educationally Backward Classes (SEBC)** category.

**90. Which branch of IIT has developed India's first microprocessor, 'Shakti'?**

- **Correct Answer:** (d) **IIT Madras**

**Explanation:**
**IIT Madras** developed **'Shakti,'** India's first indigenous microprocessor, to reduce dependence on foreign-made processors and to enhance security in technology development.

**91. Which state has launched the technology-driven and citizen-friendly 'Mo Bus' service?**

- **Correct Answer:** (d) **Odisha**

**Explanation:**
The **Odisha Government** launched the **'Mo Bus'** service to provide affordable, sustainable, and safe transportation in Bhubaneswar and nearby areas, incorporating smart card systems and a mobile app for convenience.

**92. The government of Maharashtra launched the Automated Multi-modal Biometric Identification System for which of the following purposes?**

- **Correct Answer:** (c) **Crime Detection**

**Explanation:**
The **Automated Multi-modal Biometric Identification System (AMBIS)** was introduced in Maharashtra to enhance the capabilities of the police for **crime detection** using biometric data like fingerprints and facial recognition.

**93. Who is the author of the book 'History of Dharmasastra'?**

- **Correct Answer:** (c) **Pandurang Vaman Kane**

**Explanation:**
**Pandurang Vaman Kane**, a prominent Sanskrit scholar, authored the monumental work **'History of Dharmasastra,'** a detailed study of ancient Indian law, ethics, and philosophy.

**94. Who established SNDT Women's University, the first university for women in India?**

- **Correct Answer:** (d) **Dondo Kesav Karve**

**Explanation:**
**Dondo Kesav Karve**, a social reformer, established **SNDT Women's University** in 1916 to promote women's education and empowerment in India.

**95. Which city is known as the Oxford of the East?**

- **Correct Answer:** (d) **Pune**

**Explanation:**
**Pune** is referred to as the **Oxford of the East** due to its numerous prestigious educational institutions, including universities and research centers, attracting students from all over the country.

**96. In which city is the Bhandarkar Oriental Research Institute located?**

- **Correct Answer:** (a) **Pune**

**Explanation:**
The **Bhandarkar Oriental Research Institute (BORI)** is a prestigious research institute in **Pune**, dedicated to the study of Indology, ancient manuscripts, and oriental studies.

**97. Which state is the third largest state in India by area?**

- **Correct Answer:** (a) **Maharashtra**
- **Explanation:**
    - Maharashtra is the third largest state in India by area. It covers an area of 307,713 square kilometers.
    - Rajasthan is the largest state in India by area, covering 342,239 square kilometers.
    - Madhya Pradesh is the second largest state in India by area, covering 308,252 square kilometers.
    - Uttar Pradesh is the fourth largest state in India by area, covering 240,928 square kilometers.

**98. Octane number is used for measuring the quality of:**

- **Correct Answer:** (b) **Petrol**

**Explanation:**
The **Octane number** measures a fuel's ability to resist knocking during combustion. Higher octane numbers indicate better quality petrol.

**99. The list of approved drugs and their associated IPR is available in:**

- **Correct Answer:** (b) **Orange Book**

**Explanation:**
The **Orange Book**, published by the **U.S. FDA**, provides a list of **approved drugs** and their **patent details** to guide healthcare professionals.

**100. If NOIDA is written as OPJEB, then what will be the code for DELHI?**

- **Correct Answer:** (c) **EFMIJ**

**Explanation:**
In the given code:

- Each letter is shifted forward by 1 in the alphabet:
  N → O, O → P, I → J, D → E, A → B.

- Applying this pattern to "DELHI":
  D → E, E → F, L → M, H → I, I → J.
  **Result:** EFMIJ.