NIPER-JEE 2020 Question Paper with Solutions

Time Allowed :2 Hours	**Maximum Marks :**200	**Total Questions :**200

General Instructions

Read the following instructions very carefully and strictly follow them:

This question paper is divided into three sections:

1. The total duration of the examination is 2 hours. The question paper contains three sections -

   Section A: General Aptitude

   Section B: Pharmaceutical Sciences

   Section C: Chemistry and Allied Subjects

2. The total number of questions is 200, carrying a maximum of 200 marks.

3. The marking scheme is as follows:

   (i) For each correct response, 1 mark will be awarded.

   (ii) For each incorrect response, 0.25 mark will be deducted.

4. No marks will be awarded for unanswered questions.

5. Follow the instructions provided during the exam for submitting your answers.

1. Which of the following is a cytokine inhibitor used as anti-inflammatory?

(A) Nimesulide

(B) Abatacept

(C) Diclofenac

(D) Nabumetone

Correct Answer: (B) Abatacept

Solution: Abatacept is a fusion protein that inhibits T-cell activation by binding to CD80 and CD86, preventing their interaction with CD28. It is used as an immunosuppressive agent for treating inflammatory conditions such as rheumatoid arthritis. Unlike NSAIDs like diclofenac or nimesulide, which inhibit cyclooxygenase enzymes, abatacept directly modulates immune responses.

Quick Tip

Cytokine inhibitors are crucial in managing autoimmune diseases by selectively blocking inflammatory pathways instead of broadly suppressing immunity.

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2. Remdesivir interferes with the action of which viral enzyme?

(A) RNA-dependent RNA polymerase

(B) Exoribonuclease

(C) DNA-dependent RNA polymerase

(D) DNA gyrase

Correct Answer: (A) RNA-dependent RNA polymerase

Solution: Remdesivir is a nucleotide analog prodrug that inhibits viral RNA-dependent RNA polymerase (RdRp). It gets incorporated into viral RNA during replication, leading to premature chain termination. This action disrupts the replication process of viruses like SARS-CoV-2, making remdesivir an antiviral treatment option.

Quick Tip

RdRp inhibitors are effective against RNA viruses and play a crucial role in antiviral therapy by blocking viral genome replication.

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3. Captisol is an excipient based on:

(A) PLA polymer

(B) PLGA polymer

(C) Cyclodextrin

(D) PEG

Correct Answer: (C) Cyclodextrin

Solution: Captisol is a chemically modified form of cyclodextrin used to enhance the solubility and stability of drugs. Cyclodextrins have a hydrophobic cavity that improves drug delivery by encapsulating poorly soluble compounds. Its application has been widely adopted in formulation sciences for injectable medications.

Quick Tip

Cyclodextrin-based excipients are valuable in drug formulation due to their ability to enhance bioavailability of poorly water-soluble drugs.

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4. 6-Fluoro-3-oxo-3,4-dihydro-2-pyrazine carboxamide is the IUPAC name of which drug?

(A) Ritonavir

(B) Favipiravir

(C) Remdesivir

(D) Pyrazinamide

Correct Answer: (B) Favipiravir

Solution: Favipiravir is an antiviral drug that selectively inhibits RNA-dependent RNA polymerase. It is primarily used in the treatment of influenza and has been investigated for SARS-CoV-2. The presence of a fluorine atom contributes to its pharmacokinetics and activity profile.

Quick Tip

Fluorine atoms in drug molecules enhance their metabolic stability and bioavailability, making them crucial in medicinal chemistry.

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5. This reaction mechanism is favored by 3° substrates, low temperatures, polar solvents, and low concentrations of very weak bases.

(A) E1

(B) E2

(C) SN1

(D) SN2

Correct Answer: (D) SN2

Solution: The SN2 (bimolecular nucleophilic substitution) reaction occurs in a single-step mechanism where the nucleophile attacks the substrate simultaneously with the leaving group departure. However, SN2 reactions are generally disfavored for 3° substrates due to steric hindrance. In cases of strong nucleophiles and polar aprotic solvents, SN2 is more favorable for 1° and 2° substrates. The given conditions are more consistent with SN1 reactions rather than SN2, so the correct answer should likely be reviewed.

Quick Tip

SN2 reactions are favored by strong nucleophiles and polar aprotic solvents, while SN1 reactions prefer polar protic solvents.

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6. Who is the recipient of 'World Entrepreneur of The Year award' for 2020?

(A) Vivekchand Sehgal

(B) Siddarth Lal

(C) Kiran Mazumdar-Shaw

(D) Rahul Bajaj

Correct Answer: (C) Kiran Mazumdar-Shaw

Solution: Kiran Mazumdar-Shaw, the founder of Biocon, was awarded the 'World Entrepreneur of The Year' award in 2020. Her contributions to biotechnology and affordable healthcare innovation played a significant role in her recognition. She has been a pioneer in advancing India's pharmaceutical sector globally.

Quick Tip

Entrepreneurship awards recognize innovation and leadership that drive transformative change in industries.

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7. In one of the following sulfonamides, pyrimidine ring is absent. Which is it?

(A) sulfosimidine

(B) sulfadimidine

(C) sulfadoxine

(D) sulfisoxazole

Correct Answer: (D) sulfisoxazole

Solution: Sulfonamides are antimicrobial agents, many of which contain pyrimidine rings for enhanced activity. Sulfisoxazole lacks a pyrimidine ring, distinguishing it from other sulfonamides listed in the options. Its structure contains an isoxazole ring instead, which affects its pharmacological properties.

Quick Tip

Sulfonamides work by inhibiting folic acid synthesis, an essential pathway in bacterial survival.

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8. Histamine structure is represented by:

(A) 3,4-Dihydroxyphenethylamine

(B) 2-(1-H-Imidazol-5-yl)ethanamine

(C) 2-(1-H-Imidazol-4-yl)ethanamine

(D) 2-Amino-3-(1H-imidazol-4-yl) propanoic acid

Correct Answer: (C) 2-(1-H-Imidazol-4-yl)ethanamine

Solution: Histamine is a biologically active amine involved in allergic reactions and neurotransmission. Its molecular structure consists of an imidazole ring connected to an ethylamine group. The correct representation is $2 - (1 - H - Imidazol - 4 - yl)ethanamine$, distinguishing it from similar bioactive amines.

Quick Tip

Histamine plays a critical role in immune responses and regulates physiological functions, including gastric acid secretion.

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9. P2Y12 is a chemoreceptor for adenosine diphosphate (ADP) that:

(A) Mediates platelet aggregation

(B) Mediates WBC stimulation

(C) Binds to clopidogrel reversibly

(D) Mediates fibrinolysis

Correct Answer: (A) Mediates platelet aggregation

Solution: P2Y12 is a G-protein coupled receptor found on platelets that plays a crucial role in platelet aggregation. Upon activation by ADP, it amplifies the platelet activation process, contributing to thrombus formation. Clopidogrel and other P2Y12 inhibitors work by blocking this receptor, preventing excessive platelet aggregation and reducing clot formation.

Quick Tip

P2Y12 inhibitors, like clopidogrel, are used as antiplatelet drugs to prevent cardiovascular events like strokes and heart attacks.

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10. Neopentane and 2-methyl butane are which type of isomers?

(A) Positional isomers

(B) Chain isomers

(C) Isomers

(D) Diastereoisomers

Correct Answer: (B) Chain isomers

Solution: Chain isomers have the same molecular formula but different carbon chain arrangements. Neopentane and 2-methylbutane are both structural isomers of pentane, differing in branching patterns. This variation affects their physical properties, such as boiling points and solubility.

Quick Tip

Chain isomerism impacts the stability and reactivity of molecules, making branching an important factor in organic chemistry.

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11. Which activity (the signal transduction pathway) of metformin is responsible for the inhibitory effect on glucose production by liver cells?

(A) Activation of AMPK

(B) Inhibition of hormone-sensitive lipase

(C) Inhibition of mammalian target of rapamycin (mTOR)

(D)

Allosteric regulation by binding to a crucial section of the DNA that makes proteins needed for glucose

Correct Answer: (A) Activation of AMPK

Solution: Metformin exerts its glucose-lowering effect primarily through activation of AMP-activated protein kinase (AMPK). AMPK reduces hepatic gluconeogenesis, improving insulin sensitivity and decreasing glucose production by liver cells. This mechanism makes metformin a first-line drug in the management of type 2 diabetes.

Quick Tip

AMPK acts as an energy sensor in cells, regulating metabolism to enhance glucose uptake and improve insulin sensitivity.

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12. Single letter code for pyrrolysine is:

(A) P

(B) J

(C) O

(D) Y

Correct Answer: (C) O

Solution: Pyrrolysine is a rare amino acid found in some archaea and bacteria, encoded by the UAG stop codon in specific genetic contexts. Its single-letter code is ”O”, distinguishing it from other standard amino acids. It plays a role in enzymes that process methane and has unique structural characteristics.

Quick Tip

Pyrrolysine is one of the two non-standard amino acids incorporated into proteins naturally, alongside selenocysteine.

13. Which bacterial enzyme helps the survival of Helicobacter pylori in the stomach?

(A) carbonic anhydrase

(B) urease

(C) β-lactamase

(D) transpeptidase

Correct Answer: (B) urease

Solution: Helicobacter pylori survives in the acidic environment of the stomach by producing urease. Urease catalyzes the hydrolysis of urea into ammonia and carbon dioxide, creating an alkaline microenvironment. This neutralization of stomach acid allows H. pylori to colonize and persist, contributing to gastric disorders such as ulcers.

Quick Tip

Urease inhibitors are being explored as potential therapeutic agents to disrupt Helicobacter pylori colonization.

14. Which of the following amino acids cannot provide a substrate for gluconeogenesis?

(A) Leucine

(B) Tryptophan

(C) Histidine

(D) Isoleucine

Correct Answer: (A) Leucine

Solution: Leucine is classified as a purely ketogenic amino acid, meaning it is exclusively metabolized into ketone bodies. It cannot be converted into glucose via gluconeogenesis, unlike glucogenic amino acids such as histidine or tryptophan. This distinction is important in metabolic disorders and energy balance.

Quick Tip

Ketogenic amino acids contribute to ketone body formation, essential for energy metabolism during fasting states.

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15. ^1H NMR spectra recorded in $CDCI_3$ solution typically show a resonance at 7.24 ppm. What is this resonance due to?

(A) water

(B) trace HC

(C) Chloroform

(D) exchangeable protons

Correct Answer: (D) exchangeable protons

Solution: The resonance at 7.24 ppm in ^1H NMR spectra of $CDCI_3$ is due to residual chloroform ($CHCl_3$). Chloroform-d ($CDCl_3$) is commonly used as an NMR solvent, and residual protonated chloroform leads to this characteristic peak. This peak serves as a useful reference for chemical shift calibration.

Quick Tip

Deuterated solvents are used in NMR spectroscopy to minimize interference with sample signals while providing useful reference peaks.

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16. Favipiravir tested as a COVID-19 treatment is a product of which company?

(A) Fujifilms

(B) AstraZeneca

(C) Safoni team

(D) Takeda

Correct Answer: (A) Fujifilms

Solution: Favipiravir, originally developed by Fujifilm Toyama Chemical, is an antiviral drug investigated for treating COVID-19. It functions as a RNA-dependent RNA polymerase inhibitor, disrupting viral replication. Favipiravir was initially designed for influenza but gained attention during the pandemic for its potential antiviral efficacy.

Quick Tip

RNA polymerase inhibitors like favipiravir target viral replication, making them essential in antiviral drug development.

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17. The drug of choice for Torsades de pointes treatment is:

(A) Sotalol
(B) Ibutilide
(C) Disopyramide
(D) Magnesium

Correct Answer: (D) Magnesium

Solution: Torsades de pointes is a life-threatening polymorphic ventricular tachycardia associated with prolonged QT intervals. The first-line treatment is intravenous magnesium sulfate, which stabilizes the cardiac membrane and prevents early afterdepolarizations. Magnesium is preferred over antiarrhythmic drugs like sotalol or ibutilide, which can further prolong the QT interval and exacerbate the condition.

Quick Tip

Intravenous magnesium is the first-line therapy for Torsades de pointes, even if serum magnesium levels are normal.

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18. ^{13}C chemical shift has a much wider range (¡300 ppm) than ^{1}H (¡10 ppm) because:

(A) The contribution of the diamagnetic shielding of ^{13}C is much larger than ^{1}H due to the small ^{13}C energy.
(B) The contribution of the paramagnetic shielding of ^{13}C is much larger than ^{1}H due to the small ^{13}C energy.
(C) The electron density of ^{1}H is usually spherically symmetrical.
(D) The reason is unknown.

Correct Answer: (B) The contribution of the paramagnetic shielding of ^{13}C is much larger than ^{1}H due to the small ^{13}C energy.

Solution: ^{13}C nuclei exhibit a wider chemical shift range due to greater paramagnetic shielding effects compared to ^{1}H. This occurs because carbon atoms are influenced by both diamagnetic and paramagnetic contributions, whereas hydrogen nuclei are largely diamagnetically shielded. These differences allow ^{13}C NMR spectroscopy to provide more detailed insights into molecular structure.

Quick Tip

^{13}C chemical shifts provide essential information about molecular structure due to the broad range of shielding effects.

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19. Which of the following drugs reduces LDL cholesterol by inhibiting an intestinal transport protein?

(A) Atorvastatin
(B) Cholestyramine
(C) Ezetimibe
(D) Gemfibrozil

Correct Answer: (C) Ezetimibe

Solution: Ezetimibe lowers LDL cholesterol by inhibiting the Niemann-Pick C1-Like 1 (NPC1L1) protein in the intestines. This protein is responsible for cholesterol absorption,

and blocking it reduces cholesterol uptake into the bloodstream. Ezetimibe is often used in combination with statins for enhanced lipid-lowering effects.

Quick Tip

Unlike statins, ezetimibe targets cholesterol absorption rather than its synthesis, making it useful for combination therapy.

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20. The least abundant amino acid in human proteins is:

(A) Leucine

(B) Lysine

(C) Cysteine

(D) Tyrosine

Correct Answer: (C) Cysteine

Solution: Cysteine is the least abundant amino acid in human proteins due to its highly reactive thiol (-SH) group. It plays a critical role in forming disulfide bonds that stabilize protein structure but is not frequently incorporated into protein sequences. Its low abundance is partly due to its sensitivity to oxidation and modification in cellular environments.

Quick Tip

Cysteine contributes to protein stability by forming disulfide bridges, which help maintain structural integrity.

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21. Arrange in the order of increasing basicity piperidine, pyrrole, pyrimidine, morpholine.

(A) Piperidine > pyrrole > pyrimidine > morpholine

(B) Pyrrole > piperidine > morpholine > pyrimidine

(C) Pyrimidine > piperidine > morpholine > pyrrole

(D) Piperidine > morpholine > pyrimidine > pyrrole

Correct Answer: (D) Piperidine ¿ morpholine ¿ pyrimidine ¿ pyrrole

Solution: Basicity in heterocyclic compounds is influenced by electron density and resonance effects. Piperidine, being a saturated six-membered ring, has the highest basicity due to the availability of its nitrogen lone pair. Morpholine, containing an oxygen atom, has slightly reduced basicity due to inductive effects. Pyrimidine has delocalized nitrogen lone pairs, making it less basic than piperidine or morpholine. Pyrrole has the lowest basicity as its nitrogen lone pair is involved in aromatic conjugation, reducing its ability to donate protons.

Quick Tip

Basicity of nitrogen-containing heterocycles is significantly influenced by resonance effects and electron-donating capacity.

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22. Which of the following diseases is NOT associated with coronavirus?

(A) SARS-CoV-1

(B) MERS

(C) COVID-19

(D) Swine flu

Correct Answer: (D) Swine flu

Solution: Swine flu is caused by the influenza A virus, specifically the H1N1 strain, rather than any coronavirus. SARS-CoV-1, MERS-CoV, and SARS-CoV-2 (COVID-19) are all coronaviruses responsible for respiratory illnesses. Swine flu primarily affects pigs but can be transmitted to humans, leading to outbreaks like the 2009 pandemic.

Quick Tip

Coronaviruses primarily cause respiratory infections, whereas influenza viruses lead to seasonal flu and pandemics.

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23. IUPAC name of carbamazepine is:

(A) 5H-dibenzo[b,c]azepine-5-carboxamide

(B) 5H-dibenzo[b,f]azepine-5-carboxamide

(C) 5H-dibenzo[b,g]oxepine-5-carboxamide

(D) 5H-dibenzo[d,a]azepine-5-carboxamide

Correct Answer: (B) 5H-dibenzo[b,f]azepine-5-carboxamide

Solution: Carbamazepine is an anticonvulsant and mood stabilizer used to treat epilepsy and bipolar disorder. Its structure consists of a fused dibenzoazepine system with a carboxamide functional group. The correct IUPAC name specifies the exact placement of nitrogen and substituents in the fused ring system.

Quick Tip

IUPAC nomenclature precisely describes molecular structure and ensures consistency across scientific literature.

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24. Which of the following alkaloids is derived from tyrosine?

(A) Quinine

(B) Morphine

(C) Atropine

(D) Vinca alkaloid

Correct Answer: (B) Morphine

Solution: Morphine is an opioid alkaloid synthesized from tyrosine-derived intermediates in plants such as Papaver somniferum. Tyrosine serves as a precursor for many biologically active alkaloids involved in neurological and physiological functions. Morphine is widely used in pain management due to its potent analgesic properties.

Quick Tip

Alkaloids derived from tyrosine play critical roles in neurotransmission, drug development, and plant defense mechanisms.

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25. Carvedilol is a mixture of how many enantiomers?

(A) 2

(B) 4

(C) 6

(D) 8

Correct Answer: (A) 2

Solution: Carvedilol is a non-selective beta-blocker with vasodilatory properties. It is a racemic mixture composed of two enantiomers: R-carvedilol and S-carvedilol. The S-enantiomer primarily contributes to beta-blocking activity, while both enantiomers exhibit alpha-blocking effects.

Quick Tip

Enantiomers can have distinct pharmacological effects, making stereochemistry an essential factor in drug development.

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26. Why is DSS used instead of TMS as the ^1H chemical shift reference for a biological sample?

(A) TMS can denature proteins

(B) The chemical shift of TMS is dependent on temperature

(C) DSS has a higher solubility in aqueous solution

(D) DSS is widely used in protein sample preparation

Correct Answer: (C) DSS has a higher solubility in aqueous solution

Solution: DSS (4,4-Dimethyl-4-silapentane-1-sulfonic acid) is commonly used as an internal standard in ^{1}H NMR spectroscopy for biological samples. Unlike TMS, which is highly hydrophobic, DSS is more soluble in aqueous solutions, preventing phase separation issues. Its solubility makes DSS ideal for protein and biomolecular NMR experiments, maintaining sample integrity.

Quick Tip

Selecting appropriate NMR reference compounds is crucial for achieving consistent and reliable chemical shift measurements.

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27. Which international clinical trial is launched by WHO and partners to help find an effective treatment for COVID-19?

(A) Solidarity

(B) Dissidence

(C) Severance

(D) Dissension

Correct Answer: (A) Solidarity

Solution: The Solidarity Trial was launched by WHO and international partners to accelerate COVID-19 treatment research. It aimed to evaluate multiple antiviral and therapeutic agents across different countries in a large-scale clinical study. This initiative streamlined data collection and analysis to improve treatment strategies globally.

Quick Tip

Large-scale international clinical trials like Solidarity enhance collaboration and speed up the discovery of effective treatments.

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28. Lupron implant is an example of:

(A) Erodible implant

(B) Implant pump

(C) Both (A) and (B)

(D) None of these

Correct Answer: (A) Erodible implant

Solution: Lupron (Leuprolide) implant is an erodible polymer-based drug delivery system used for hormonal therapy. It gradually dissolves in the body, releasing medication over a controlled period to treat conditions such as prostate cancer or endometriosis. Erodible implants offer sustained drug release without requiring surgical removal.

Quick Tip

Erodible implants provide continuous drug release while eliminating the need for extraction, enhancing patient compliance.

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29. Full form of COVID-19 is:

(A) Co-viral disease-19

(B) Corona virus disorder-19

(C) Corona Virus disease-19

(D) Corona Virus deficiency syndrome-19

Correct Answer: (C) Corona Virus disease-19

Solution: COVID-19 stands for ”Coronavirus Disease 2019,” referring to the viral infection caused by SARS-CoV-2. The disease was named by the World Health Organization (WHO) to standardize pandemic terminology. ”19” represents the year of its first identification, 2019.

Quick Tip

WHO standardizes disease names to avoid geographic associations and promote neutral terminology in global health discussions.

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30. For maximum bioavailability, drug should be targeted at:

(A) Stomach
(B) Small intestine
(C) Large intestine
(D) Colon

Correct Answer: (B) Small intestine

Solution: The small intestine is the primary site for drug absorption due to its large surface area and extensive blood supply. It contains transport proteins and metabolic enzymes that facilitate drug uptake and bioavailability. Many orally administered drugs are formulated to target absorption in the small intestine for maximum efficacy.

Quick Tip

Enhancing drug solubility and permeability improves bioavailability, ensuring effective therapeutic outcomes.

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31. Which of the following virus is not named on the basis of geographical location?

(A) MERS and Ebola
(B) Zika and West Nile virus

(C) Marburg

(D) Rubella

Correct Answer: (D) Rubella

Solution: Unlike MERS, Ebola, Zika, and West Nile virus, which are named after geographic locations, rubella is named based on its clinical manifestation. Rubella, also known as ”German measles,” refers to its characteristic red rash rather than the place of origin. Virus nomenclature often considers epidemiological history, symptoms, or structural features.

Quick Tip

WHO discourages geographic-based naming of diseases to prevent stigma and misinformation.

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32. Hand-foot syndrome (palmar-plantar erythrodysesthesia) is NOT caused by:

(A) 5-fluorouracil

(B) Capecitabine

(C) Mitomycin

(D) Doxorubicin

Correct Answer: (C) Mitomycin

Solution: Hand-foot syndrome is a dermatological reaction associated with certain chemotherapy drugs like 5-fluorouracil, capecitabine, and doxorubicin. Mitomycin, a DNA cross-linking agent, is not a primary cause of this syndrome but has other toxic effects. Proper dosage adjustments and supportive care can mitigate hand-foot syndrome in patients undergoing chemotherapy.

Quick Tip

Reducing prolonged exposure to chemotherapy agents and applying supportive skin care can alleviate hand-foot syndrome.

33. Cimetidine acts by blocking:

(A) Na-H-ATPase

(B) Na-K ATPase

(C) H2 receptor

(D) H1 receptor

Correct Answer: (C) H2 receptor

Solution: Cimetidine is a histamine H_2 receptor antagonist that reduces stomach acid production. It inhibits the action of histamine on H_2 receptors present in gastric parietal cells, thereby reducing acid secretion. Cimetidine is commonly used to treat conditions such as gastroesophageal reflux disease (GERD) and peptic ulcers.

Quick Tip

H_2 receptor antagonists are distinct from H_1 blockers, which are primarily used for allergy treatment.

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34. Nerve gases used as warfare agents include:

(A) SARIN

(B) TABUN

(C) SOMAN

(D) All of the above

Correct Answer: (D) All of the above

Solution: Sarin, Tabun, and Soman are all nerve agents that inhibit acetylcholinesterase, leading to overstimulation of the nervous system. These agents cause respiratory failure and muscular paralysis, making them highly toxic chemical weapons. Nerve gases have been banned under international treaties due to their devastating effects.

Quick Tip

Nerve agents act rapidly and require immediate administration of antidotes like atropine and pralidoxime for treatment.

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35. One-letter symbol of Arginine is:

(A) K

(B) A

(C) R

(D) D

Correct Answer: (C) R

Solution: Arginine is represented by the one-letter code R in amino acid sequences. The single-letter amino acid code system is used in protein sequences for efficient representation. Each amino acid has a distinct code, with some derived from their names and others chosen arbitrarily.

Quick Tip

One-letter amino acid codes simplify protein sequence notation and facilitate computational biology applications.

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36. First Indian pharma company:

(A) Alembic Chemical Works

(B) Bengal Chemicals and Pharmaceuticals

(C) Cipla

(D) Dabur India Ltd

Correct Answer: (B) Bengal Chemicals and Pharmaceuticals

Solution: Bengal Chemicals and Pharmaceuticals Ltd. was established in 1901 by scientist Prafulla Chandra Ray, making it India's first pharmaceutical company. It played a pioneering role in indigenous pharmaceutical manufacturing and contributed to the country's healthcare industry. The company remains active in producing a variety of pharmaceutical and chemical products.

Quick Tip

India's pharmaceutical industry has grown significantly, becoming a global leader in generic drug production.

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37. For a drug following linear pharmacokinetics, what would be the change in $t_{\max}$ if the oral dose of the drug is doubled?

(A) $t_{\max}$ remains unchanged
(B) $t_{\max}$ doubled
(C) $t_{\max}$ decreased to half
(D) Cannot be predicted

Correct Answer: (A) $t_{\max}$ remains unchanged

Solution: For drugs following linear pharmacokinetics, $t_{\max}$ (the time to reach maximum plasma concentration) is independent of dose. It is primarily governed by absorption and elimination rates rather than drug concentration. Thus, doubling the dose does not affect $t_{\max}$, though $C_{\max}$ (peak concentration) may increase proportionally.

Quick Tip

In linear pharmacokinetics, drug absorption and elimination follow first-order kinetics, making $t_{\max}$ dose-independent.

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38. Which isomer(s) of xylene will exhibit 3 peaks in the ^{13}C NMR spectrum?

(A) o-xylene

(B) m-xylene

(C) p-xylene

(D) All of the above

Correct Answer: (C) p-xylene

Solution: p-Xylene exhibits three unique ^{13}C NMR peaks due to its symmetrical molecular structure. Carbon atoms in equivalent positions result in fewer distinct chemical environments in the spectrum. o-Xylene and m-Xylene have more asymmetric distributions, leading to a greater number of peaks.

Quick Tip

Symmetry in molecular structure reduces the number of unique chemical shifts observed in NMR spectra.

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39. Which of the following drug transport mechanisms across the cell membrane is bidirectional in nature?

(A) Passive diffusion

(B) Active transport

(C) Pinocytosis

(D) Facilitated diffusion

Correct Answer: (C) Pinocytosis

Solution: Pinocytosis is an energy-dependent transport mechanism where cells engulf extracellular fluid via membrane invagination. It allows bidirectional movement of solutes and nutrients, unlike active transport, which is typically directional. Pinocytosis plays a crucial role in macromolecule uptake in biological systems.

Quick Tip

Pinocytosis is essential for cellular nutrient uptake and removal of extracellular materials.

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40. A thermodynamically controlled reaction will yield predominantly the:

(A) Product whose formation requires the smallest free energy of activation

(B) More/most stable product

(C) Product that can be formed in the fewest steps

(D) Product that is formed at the fastest rate

Correct Answer: (B) More/most stable product

Solution: Thermodynamically controlled reactions favor the formation of the most stable product. Equilibrium conditions allow the reaction to minimize Gibbs free energy, leading to the most thermodynamically favored state. This contrasts with kinetically controlled reactions, where the fastest-formed product dominates.

Quick Tip

Thermodynamic control leads to stability-driven products, while kinetic control prioritizes reaction speed.

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41. Dielectric constant of water at 25°C is:

(A) 1.0006

(B) 2.25

(C) 78.2

(D) 100

Correct Answer: (C) 78.2

Solution: The dielectric constant of water at 25°C is approximately 78.2, which makes it an excellent solvent for ionic and polar compounds. This high dielectric constant enables water to strongly reduce electrostatic interactions between dissolved ions. Water's dielectric properties are essential for various biological and chemical processes, including protein folding and enzymatic reactions.

Quick Tip

The dielectric constant decreases with temperature, meaning hotter water has lower ion-dissolving capacity.

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42. Medical devices are notified as DRUGS under the Drugs Cosmetics Act. Schedule for Medical devices GMP requirements is specified under:

(A) Schedule M III

(B) Schedule M-II

(C) Schedule M-I

(D) Schedule M

Correct Answer: (A) Schedule M III

Solution: In India, medical devices are regulated as drugs under the Drugs Cosmetics Act. The GMP (Good Manufacturing Practices) requirements for medical devices are specifically outlined in Schedule M III of the Act. This regulation ensures that medical devices meet quality and safety standards for patient care.

Quick Tip

Strict compliance with GMP regulations is essential for ensuring medical devices' efficacy and safety in clinical settings.

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43. Which of the following is NOT true for a patent?

(A) Monopoly

(B) Exclusivity

(C) Disclosure

(D) Indefinite term

Correct Answer: (D) Indefinite term

Solution: Patents provide exclusivity and a temporary monopoly over an invention, ensuring that the patent holder benefits from its commercialization. However, patents do not last indefinitely; they typically expire after 20 years from the filing date. Disclosure is required so that knowledge is publicly available after the patent expires.

Quick Tip

Patents encourage innovation by granting temporary exclusivity while ensuring knowledge dissemination after expiration.

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44. Margaret Dayhoff developed the first protein sequence database named:

(A) SWISS PORT

(B) Protein sequence databank

(C) Protein data bank PDB

(D) Atlas of protein sequence and structure

Correct Answer: (D) Atlas of protein sequence and structure

Solution: Margaret Dayhoff developed the ”Atlas of Protein Sequence and Structure,” which was the first protein sequence database. Her pioneering work in bioinformatics enabled researchers to catalog and compare protein sequences systematically. This database laid the foundation for modern protein sequence databases used in computational biology.

Quick Tip

Margaret Dayhoff’s contributions to bioinformatics revolutionized protein analysis and sequence comparison.

45. Haloperidol belongs to:

(A) Azaspirodecanedione antidepressant

(B) Opioid analgesic

(C) Butylraphenone antipsychotic

(D) Quinoline antipsychotic

Correct Answer: (C) Butylraphenone antipsychotic

Solution: Haloperidol is a typical antipsychotic belonging to the butyrophenone class. It acts as a dopamine D_2 receptor antagonist, reducing symptoms of schizophrenia and other psychotic disorders. Its efficacy in managing acute agitation and Tourette's syndrome makes it a widely prescribed neuroleptic drug.

Quick Tip

Butyrophenone antipsychotics are potent dopamine blockers, making them effective in treating severe psychosis.

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46. Acute decrease in response to a drug after initial or repeated intake is known as which of the following drug interactions?

(A) Additive

(B) Permissive

(C) Synergetic

(D) Tachyphylaxis

Correct Answer: (D) Tachyphylaxis

Solution: Tachyphylaxis refers to a rapid decrease in drug response following repeated administration. It is distinct from tolerance, which develops gradually over time. Mechanisms include receptor desensitization or depletion of neurotransmitter stores, common in drugs like nitrates and ephedrine.

Quick Tip

Tachyphylaxis often necessitates drug-free intervals to maintain therapeutic efficacy in patients.

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47. Which of the following is an unusual feature of the replication cycle in coronaviruses?

(A) The RNAs all terminate in a common 3' and produce nested set transcripts
(B) They take advantage of recombination with the long RNA genome
(C) They are not highly mutable
(D) They use capped cellular mRNAs

Correct Answer: (A)
The RNAs all terminate in a common 3' and produce nested set transcripts

Solution: Coronaviruses exhibit a unique replication strategy that involves producing a nested set of subgenomic RNAs. These RNAs share a common 3'-end, allowing for efficient gene expression during viral replication. This feature contributes to the complexity of coronavirus transcription mechanisms.

Quick Tip

Nested set transcription in coronaviruses enhances viral protein expression, aiding in replication and survival.

---

48. Original X company sells its product under the name 'Phido'. Company Y begins to market an identical product under the name 'Fido'. This is a case of:

(A) Copyright infringement
(B) Patent infringement
(C) Trademark infringement

(D) None of the above

Correct Answer: (C) Trademark infringement

Solution: Trademark infringement occurs when a company uses a name, logo, or branding similar to an existing registered trademark, leading to consumer confusion. In this case, ”Fido” resembles ”Phido,” potentially misleading customers into believing the products originate from the same brand. Trademark laws protect companies from unauthorized usage of their distinctive marks.

Quick Tip

Strong trademark protection ensures brand identity and prevents market confusion among consumers.

---

49. In Kjeldahl method, sample containing nitrogen is digested with:

(A) Conc. NaOH
(B) Fuming HNO_3
(C) Conc. H_2SO_4
(D) Strong NH_3 solution

Correct Answer: (C) Conc. H_2SO_4

Solution: The Kjeldahl method is a widely used technique for nitrogen determination in organic samples. Concentrated H_2SO_4 is used to digest the sample, converting organic nitrogen into ammonium sulfate. A catalyst such as selenium or copper is often added to enhance digestion efficiency.

Quick Tip

The Kjeldahl method is fundamental in food, agriculture, and environmental analysis for nitrogen quantification.

50. Identify the fifth-generation cephalosporin:

(A) Ceftaroline

(B) Cefadroxil

(C) Cefotetan

(D) Cefipime

Correct Answer: (A) Ceftaroline

Solution: Ceftaroline is a fifth-generation cephalosporin with broad-spectrum activity against Gram-positive and Gram-negative bacteria. It is distinct due to its efficacy against methicillin-resistant Staphylococcus aureus (MRSA). Fifth-generation cephalosporins offer enhanced activity against resistant bacterial strains.

Quick Tip

Cephalosporins are classified into generations based on their spectrum of antimicrobial activity and resistance properties.

---

51. Who is the CEO of Dr. Reddy's Lab?

(A) K. Anji Reddy

(B) Erez Israeli

(C) Ibrahim Alkazi

(D) Israel Makov

Correct Answer: (B) Erez Israeli

Solution: Erez Israeli is the CEO of Dr. Reddy's Laboratories, a leading pharmaceutical company. Dr. Reddy's specializes in generic medicines, active pharmaceutical ingredients (APIs), and biologics. Under his leadership, the company focuses on innovation, quality, and global expansion in healthcare.

Quick Tip

Leadership in pharmaceutical companies plays a crucial role in shaping research, development, and global health impact.

---

52. One degree Celsius is how many degrees Kelvin?

(A) $273.15K$

(B) $274.15K$

(C) $33.8K$

(D) 1

Correct Answer: (B) $274.15K$

Solution: The Kelvin scale is related to the Celsius scale by the formula:

$$K = C + 273.15$$

Thus, $1^{\circ}C$ corresponds to $274.15K$. Kelvin is the SI unit for temperature, used in scientific measurements.

Quick Tip

Kelvin is an absolute temperature scale where 0 K represents absolute zero, the lowest possible temperature.

---

53. Pradhan Mantri Bhartiya Janaushadhi Pariyojana (PMBJP) is a campaign launched by:

(A) Prime Minister's Office

(B) Department of Health and Family Welfare, Ministry of Health and Family Welfare

(C) Department of Health Research, Ministry of Health and Family Welfare

(D) Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers

Correct Answer: (D) Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers

Solution: The Pradhan Mantri Bhartiya Janaushadhi Pariyojana (PMBJP) was launched to promote affordable medicines through government-regulated outlets. It is supervised by the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, ensuring quality and cost-effective drug distribution. The initiative enhances accessibility to essential medicines for economically disadvantaged populations.

Quick Tip

PMBJP promotes generic medicines to improve healthcare affordability while maintaining drug efficacy.

---

54. The plot of $1/V$ versus $1/[S]$ where V is rate of enzymatic reaction and $[S]$ is substrate concentration is known as:

(A) Michaelis-Menton plot
(B) Lineweaver-Burk plot
(C) Hanes-Woolf plot
(D) Eadie-Hofstee plot

Correct Answer: (B) Lineweaver-Burk plot

Solution: The Lineweaver-Burk plot is a double reciprocal graph used to linearize the Michaelis-Menten equation. It plots $1/V$ versus $1/[S]$, aiding in determining enzyme kinetics parameters such as K_m and $V_{\max}$. Although useful, it exaggerates errors at low substrate concentrations, leading to preference for nonlinear methods.

Quick Tip

The Lineweaver-Burk plot assists in identifying enzyme inhibition patterns by analyzing deviations from the linear trend.

---

55. Camphor contains how many isoprene units?

(A) One

(B) Two

(C) Three

(D) Four

Correct Answer: (B) Two

Solution: Camphor is classified as a monoterpene, meaning it contains two isoprene units. Isoprene units form the structural basis of terpenes, which contribute to biological and pharmacological properties. Camphor is used in medicinal preparations, flavoring agents, and as an insect repellent.

Quick Tip

Monoterpenes consist of two isoprene units, whereas sesquiterpenes contain three, contributing to diverse chemical properties.

---

56. A diabetic patient developed cellulitis due to Staphylococcus aureus, which was found to be methicillin-resistant on antibiotic sensitivity testing. All the following antibiotics will be appropriate EXCEPT:

(A) Vancomycin

(B) Imipenem

(C) Teicoplanin

(D) Linezolid

Correct Answer: (B) Imipenem

Solution: Methicillin-resistant Staphylococcus aureus (MRSA) infections require specific antibiotics that target resistant bacterial strains. Vancomycin, teicoplanin, and linezolid are effective against MRSA, whereas imipenem is ineffective. Beta-lactam antibiotics, including carbapenems like imipenem, are generally not used for MRSA due to resistance mechanisms.

Quick Tip

MRSA treatment typically involves glycopeptides (e.g., vancomycin), oxazolidinones (e.g., linezolid), or newer agents like daptomycin.

---

57. Which of the proteins in coronavirus is responsible for attachment to host cell?

(A) Spike

(B) Membrane

(C) Envelope

(D) Nucleocapsid

Correct Answer: (A) Spike

Solution: The spike (S) protein of coronavirus is responsible for attachment to the host cell. It binds to the ACE2 receptor on human cells, initiating viral entry. This interaction is crucial for infection and viral replication.

Quick Tip

Blocking the spike protein-ACE2 interaction is a key target in COVID-19 drug and vaccine development.

---

58. Lindlar's catalyst is:

(A) Platinum chloride + calcium carbonate + lead acetate

(B) Palladium chloride + calcium carbonate + lead acetate

(C) Chromic acid + lead acetate

(D) Palladium(III) bis(acetylacetonate)

Correct Answer: (B) Palladium chloride + calcium carbonate + lead acetate

Solution: Lindlar's catalyst is a poisoned catalyst used for selective hydrogenation of alkynes to cis-alkenes. It consists of palladium chloride supported on calcium carbonate with

lead acetate as a poison. The lead acetate reduces catalytic activity, preventing complete hydrogenation to alkanes.

Quick Tip

Lindlar's catalyst selectively produces cis-alkenes, making it essential in organic synthesis.

---

59. Three friends A, B, C invested in a business in the ratio of 4:5:11. The total investment is 1000 rupees. What will be the profit earned by A out of the total profit of Rs 100 earned within 2 days?

(A) 20

(B) 25

(C) 55

(D) 45

Correct Answer: (A) 20

Solution: The total ratio sum = $4 + 5 + 11 = 20$. A's share = $\frac{4}{20} \times 100 = 20$ rupees. Thus, A earns a profit of Rs 20 from the total Rs 100.

Quick Tip

Investment ratios determine profit distribution proportionally among stakeholders.

---

60. Who is the current DCGI?

(A) VG Somani

(B) S. Eswara Reddy

(C) P. B. N. Prasad

(D) Ravi Kant Sharma

Correct Answer: (A) VG Somani

Solution: Dr. VG Somani is the current Drugs Controller General of India (DCGI). The DCGI oversees the regulation and approval of pharmaceuticals and medical devices in India. This position is critical in ensuring drug safety, efficacy, and public health.

Quick Tip

The DCGI plays a vital role in drug approvals, ensuring compliance with safety standards in India's pharmaceutical industry.

---

61. What is true about Autophagy?

(A) Can be considered a cell survival pathway as well as a cell death pathway
(B) Might be activated when AMP-dependent kinase (AMPK) is inhibited
(C) Could release branched-chain amino acids from muscle
(D) Is associated with movement of phosphatidyl serine to the outer leaflet

Correct Answer: (A)
Can be considered a cell survival pathway as well as a cell death pathway

Solution: Autophagy is a cellular process responsible for degrading and recycling intracellular components. It plays a dual role in cell survival under nutrient starvation and cell death under pathological conditions. Autophagy is tightly regulated and essential for maintaining cellular homeostasis.

Quick Tip

Autophagy dysfunction is linked to various diseases, including neurodegenerative disorders and cancer.

---

62. Dr. Reddy's Lab will conduct Phase III studies of _____ vaccine in the country.

(A) Sputnik V

(B) Moderna

(C) Sinovac

(D) IQVIA

Correct Answer: (A) Sputnik V

Solution: Dr. Reddy's Laboratories was responsible for conducting Phase III clinical trials of the Sputnik V vaccine in India. Sputnik V is a viral vector-based COVID-19 vaccine developed by the Gamaleya Research Institute. Its two-dose regimen aims to provide robust immunity against SARS-CoV-2.

Quick Tip

Phase III trials are crucial for evaluating vaccine efficacy, safety, and long-term immune response.

---

63. Jarsch Herxheimer reaction is due to:

(A) Borrelia spirochetes

(B) Plasmodium vivax

(C) Herpes Virus

(D) Yersinia pestis

Correct Answer: (A) Borrelia spirochetes

Solution: The Jarisch-Herxheimer reaction is an inflammatory response triggered by the rapid destruction of Borrelia spirochetes following antibiotic treatment. It manifests as fever, chills, and hypotension, commonly seen in syphilis and Lyme disease patients. The reaction is temporary and managed with symptomatic treatment.

Quick Tip

The Herxheimer reaction results from endotoxin release during bacterial cell lysis, intensifying symptoms briefly before improvement.

64. Financial status of a company at any given time can be analyzed with:

(A) Trading account

(B) Profit and Loss statement

(C) Balance Sheet

(D) Cash Book

Correct Answer: (C) Balance Sheet

Solution: A balance sheet provides a snapshot of a company's financial condition, including assets, liabilities, and shareholders' equity. It reflects financial stability and liquidity, aiding stakeholders in decision-making. Unlike a profit and loss statement, which shows earnings over a period, the balance sheet captures financial data at a specific moment.

Quick Tip

A balance sheet follows the fundamental accounting equation: Assets = Liabilities + Shareholder's Equity.

---

65. Which heterocyclic rings are present in nicotine?

(A) Pyrimidine and Pyrrole

(B) Pyridine and Pyrrolidine

(C) Pyrimidine and Imidazole

(D) Piperidine and Pyrrolidine

Correct Answer: (B) Pyridine and Pyrrolidine

Solution: Nicotine contains two heterocyclic rings: pyridine and pyrrolidine. The pyridine ring contributes to its neuroactive properties, while the pyrrolidine ring affects its solubility and binding to receptors. These structural components play a crucial role in nicotine's interaction with the nervous system.

Quick Tip

Nicotine's heterocyclic rings influence its pharmacological effects, including addiction and neurotransmitter modulation.

---

66. As per USP, weight variation limit for a tablet of 250 mg is:

(A) 10%

(B) 7.50%

(C) 5%

(D) 1.50%

Correct Answer: (B) 7.50%

Solution: The USP (United States Pharmacopeia) establishes weight variation limits to ensure uniformity in tablet manufacturing. For tablets weighing 250 mg, the acceptable weight variation limit is $\pm 7.5\%$. This ensures consistency in drug dosage and effectiveness.

Quick Tip

Weight variation testing ensures tablet uniformity and compliance with pharmaceutical standards for patient safety.

---

67. Methotrexate toxicity can be prevented by:

(A) Leucovorin

(B) Mesna

(C) Oncovin

(D) $Na_2S_2O_3$

Correct Answer: (A) Leucovorin

Solution: Leucovorin (folinic acid) is used to prevent methotrexate toxicity by rescuing healthy cells from its effects. Methotrexate inhibits dihydrofolate reductase, leading to folate

depletion; leucovorin bypasses this blockade. It is administered in high-dose methotrexate therapy to mitigate adverse effects.

Quick Tip

Leucovorin ”rescue” protects normal tissues while allowing methotrexate to exert its anti-cancer effects.

---

68. Cell-mediated immunity is provided by all of the following EXCEPT:

(A) Macrophages

(B) NK-cells

(C) T-lymphocytes

(D) B-lymphocytes

Correct Answer: (D) B-lymphocytes

Solution: Cell-mediated immunity is primarily mediated by T-lymphocytes, macrophages, and NK cells, which directly attack infected or abnormal cells. B-lymphocytes, however, are part of humoral immunity, producing antibodies instead of engaging in direct cell-mediated responses. Thus, B-cells do not contribute significantly to cell-mediated immunity.

Quick Tip

T-lymphocytes are crucial for adaptive immunity, distinguishing infected cells from healthy ones through antigen presentation.

---

69. MPTP, a prodrug, is converted to MPP^+ by which enzyme?

(A) MAO A

(B) MAO B

(C) DAO

(D) AChE

Correct Answer: (B) MAO B

Solution: Monoamine oxidase B (MAO-B) converts MPTP into MPP^+, a neurotoxic metabolite responsible for Parkinsonism symptoms. MPP^+ selectively damages dopamine-producing neurons in the substantia nigra, mimicking Parkinson's disease pathology. MAO-B inhibitors can help prevent MPTP-induced neurodegeneration.

Quick Tip

MPTP exposure led to significant insights into Parkinson's disease, providing a model for neurodegeneration research.

---

70. Which of the following phenomena in cell membranes is energetically expensive and does not occur spontaneously?

(A) The rotation of membrane proteins
(B) The rotation of phospholipids
(C) The lateral diffusion of phospholipids
(D) The flip-flop movement of phospholipids

Correct Answer: (D) The flip-flop movement of phospholipids

Solution: The flip-flop movement of phospholipids is energetically expensive because it requires crossing the hydrophobic core of the lipid bilayer. Unlike lateral diffusion, which is spontaneous, flip-flop movement requires specialized enzymes like flippases and scramblases. This process is critical for maintaining membrane asymmetry and lipid distribution.

Quick Tip

Membrane asymmetry influences cellular processes such as signaling, apoptosis, and vesicle trafficking.

71. My mother is twice as old as my brother. I am five years younger than my brother but three years older than my sister. If my sister is twelve years old, how old is my mother?

(A) 50

(B) 40

(C) 30

(D) 24

Correct Answer: (B) 40

Solution: - The sister is 12 years old. - The person is three years older than the sister: $12 + 3 = 15$. - The brother is five years older than the person: $15 + 5 = 20$. - The mother is twice the age of the brother: $20 \times 2 = 40$.
Thus, the mother's age is 40 years.

Quick Tip

Age-related math problems can be solved efficiently by defining clear relationships and equations.

---

72. An essential amino acid is one that:

(A) is readily available in the body.

(B) can be synthesized by the body.

(C) is essentially easy to synthesize.

(D) cannot be synthesized by the body.

Correct Answer: (D) cannot be synthesized by the body.

Solution: Essential amino acids are those that cannot be synthesized by the human body and must be obtained from dietary sources. There are nine essential amino acids, including

lysine, leucine, and valine, which are necessary for protein synthesis and metabolic functions.

Quick Tip

A balanced diet rich in protein sources ensures adequate intake of essential amino acids, supporting growth and tissue repair.

---

73. Which amino acid gives max UV absorption?

(A) Tryptophan

(B) Tyrosine

(C) Phenylalanine

(D) Proline

Correct Answer: (A) Tryptophan

Solution: Tryptophan exhibits the highest UV absorption due to its aromatic indole ring. Its absorbance peak is around 280 nm, making it useful for protein quantification in spectrophotometric analysis. Other aromatic amino acids, such as tyrosine and phenylalanine, also absorb UV light but to a lesser extent.

Quick Tip

UV spectroscopy is commonly used to analyze protein concentrations by measuring absorption at 280 nm.

---

74. Functional group determination can be done with:

(A) IR spectroscopy

(B) NMR spectroscopy

(C) UV spectroscopy

(D) Mass spectrometry

Correct Answer: (A) IR spectroscopy

Solution: Infrared (IR) spectroscopy is used for functional group determination by analyzing molecular vibrations. Different bonds absorb specific IR frequencies, allowing identification of functional groups like carbonyl, hydroxyl, and amines. This technique is widely utilized in organic chemistry for structural analysis.

Quick Tip

IR spectroscopy helps identify functional groups based on absorption peaks in characteristic regions of the IR spectrum.

---

75. Which of the following is a polysaccharide vaccine?

(A) Anthrax vaccine

(B) Rabies vaccine

(C) Hepatitis A

(D) Hib vaccine

Correct Answer: (D) Hib vaccine

Solution: The Haemophilus influenzae type B (Hib) vaccine is a polysaccharide vaccine that protects against bacterial infections. It contains purified polysaccharides conjugated to proteins, enhancing immune response and memory. Polysaccharide vaccines are effective against encapsulated bacteria, such as pneumococcal and meningococcal infections.

Quick Tip

Conjugate polysaccharide vaccines improve immunogenicity in infants, ensuring long-term protection against bacterial diseases.

---

76. A person traveled towards west 5 km, turned left and traveled 3 km, turned right and traveled 9 km. He then traveled North 3 km. How far was 'A' from the starting point now?

(A) 6

(B) 14

(C) 15

(D) 20

Correct Answer: (B) 14

Solution: 1. The person moves **5 km west** from the start. 2. Turning **left** (south) and moving **3 km**. 3. Turning **right** (west) and moving **9 km**. 4. Traveling **north** **3 km**, returning to the original north level.
Total westward movement: $5 + 9 = 14$ km. Total northward movement cancels out the previous southward movement. Thus, the person is **14 km west** of the starting point.

Quick Tip

To calculate displacement in directional movement problems, sum the net movements along each axis.

---

77. Who is the chairman of the Fifteenth Finance Commission?

(A) Shaktikanta Das

(B) N.K. Singh

(C) Gita Gopinath

(D) Viral Acharya

Correct Answer: (B) N.K. Singh

Solution: The Fifteenth Finance Commission of India was chaired by **N.K. Singh**. The commission determines financial distribution between the central and state governments. Its recommendations impact fiscal policies and economic planning.

Quick Tip

Finance commissions ensure equitable resource distribution across Indian states based on various economic parameters.

---

78. Synonym of abeyance:

(A) Reserve

(B) Depth

(C) Abysmal

(D) Abstinence

Correct Answer: (A) Reserve

Solution: ”Abeyance” means temporary suspension or inactivity. ”Reserve” matches this meaning as it signifies keeping something on hold. Other options do not relate to the sense of inactivity or postponement.

Quick Tip

Synonyms should always be selected based on contextual meaning rather than direct dictionary definitions.

---

79. Bicuculline acts as:

(A) Antagonist of GABAA

(B) Agonist of GABAA

(C) Agonist of nicotinic receptors

(D) Agonist of NMDA receptor

Correct Answer: (A) Antagonist of GABAA

Solution: Bicuculline is a **$GABA_A$ antagonist**, meaning it inhibits the action of GABA (gamma-aminobutyric acid). It induces neuronal excitation by preventing inhibitory

neurotransmission, often used in neuropharmacological studies. This antagonism can lead to convulsions, making bicuculline useful for epilepsy research.

Quick Tip

GABA antagonists decrease inhibition in neural circuits, which can be applied in studying excitatory neurological disorders.

---

80. Which of the following is a water-soluble base?

(A) Soft paraffin

(B) Hydroxyethylcellulose

(C) Cocoa butter

(D) Vaseline

Correct Answer: (B) Hydroxyethylcellulose

Solution: Hydroxyethylcellulose is a water-soluble polymer used as a thickening agent and stabilizer in pharmaceutical formulations. Unlike soft paraffin, cocoa butter, and Vaseline, which are hydrophobic, hydroxyethylcellulose dissolves in water and forms gel-like structures. It improves viscosity and bioavailability in topical and oral drug formulations.

Quick Tip

Water-soluble bases enhance drug absorption by providing better solubility and stability in aqueous environments.

---

81. Remdesivir was originally created and developed in 2009 for hepatitis C infection by:

(A) Gilead Sciences

(B) Takeda

(C) Toyama Chemical

(D) Novartis

Correct Answer: (A) Gilead Sciences

Solution: Remdesivir was originally developed by **Gilead Sciences** as an antiviral agent targeting hepatitis C. Later, it was repurposed for treating Ebola and gained prominence during the COVID-19 pandemic for its efficacy against SARS-CoV-2. It functions as a nucleotide analog inhibitor of RNA-dependent RNA polymerase.

Quick Tip

Drug repurposing accelerates treatment discovery, allowing previously developed drugs to be used for new diseases.

---

82. If the aim of these investigations is to determine the stability of a drug after opening the package, what are the conditions?

(A) 40°C, 75 RH (0-6 months)

(B) Room temp, (0-3 months)

(C) Room temp, (0-24 hours)

(D) Room temp, (0-4 weeks)

Correct Answer: (D) Room temp, (0-4 weeks)

Solution: Drug stability after package opening is evaluated under room temperature conditions for up to 4 weeks. Factors such as moisture, temperature fluctuations, and exposure to air influence stability. Long-term stability studies under accelerated conditions help determine shelf-life and packaging recommendations.

Quick Tip

Stability testing ensures drug potency and safety over time, preventing degradation due to environmental factors.

83. Benzoic acid to benzoyl chloride conversion is achieved by:

(A) Cl_2, hv

(B) SO_2Cl_2

(C) PCl_5

(D) Cl_2, H_2O

Correct Answer: (C) PCl_5

Solution: Phosphorus pentachloride (PCl_5) reacts with benzoic acid to form benzoyl chloride via nucleophilic substitution. It replaces the hydroxyl group in benzoic acid with a chloride, yielding benzoyl chloride. This reaction is widely used in acylation and organic synthesis.

Quick Tip

Phosphorus-based chlorinating agents are effective in converting carboxylic acids into acid chlorides for further synthetic transformations.

---

84. Mr. X took a loan for 6 years at the rate of 5% p.a. S.I. If the total interest paid was Rs. 1230, the principal amount was:

(A) Rs. 4100

(B) Rs. 4920

(C) Rs. 5000

(D) Rs. 5300

Correct Answer: (A) Rs. 4100

Solution: The formula for simple interest (SI) is:

$$SI = \frac{P \times R \times T}{100}$$

where P is the principal amount, R is the rate of interest, and T is the time.

Rearranging the formula to find P:

$$P = \frac{SI \times 100}{R \times T}$$

Substituting the values:

$$P = \frac{1230 \times 100}{5 \times 6} = \frac{123000}{30} = 4100$$

Thus, the principal amount is Rs. 4100.

Quick Tip

Simple interest grows linearly with time, making it easy to calculate for short-term loans.

---

85. A simple interest on a certain sum for 3 years is Rs. 225 and the compound interest on the same sum for 2 years is Rs. 165. Find the rate percent per annum:

(A) 20%

(B) 2.5%

(C) 5%

(D) 15%

Correct Answer: (A) 20%

Solution: Using the simple interest formula:

$$SI = \frac{P \times R \times T}{100}$$

$$225 = \frac{P \times R \times 3}{100}$$

$$P \times R = \frac{225 \times 100}{3} = 7500$$

Now, using the compound interest formula:

$$CI = P\left(\left(1 + \frac{R}{100}\right)^T - 1\right)$$

Substituting the values for $CI = 165$ and $T = 2$:

$$165 = P\left(\left(1 + \frac{R}{100}\right)^2 - 1\right)$$

Solving, we get $R = 20\%$.

Quick Tip

Compound interest accumulates faster than simple interest due to interest on previously earned interest.

---

86. A person gets one rupee for each successful target hitting, and one rupee is lost for each missed target. If the total chances taken by the person are 100 and earned rupees are 30, what is the number of successful attempts?

(A) 70

(B) 60

(C) 75

(D) 65

Correct Answer: (D) 65

Solution: Let S be the number of successful attempts and M be the missed attempts.

Since total attempts = 100, we get:

$$S + M = 100$$

The net earnings equation:

$$S - M = 30$$

Solving the equations:

$$S + (100 - S) = 100$$

$$S - (100 - S) = 30$$

$$2S = 130$$

$$S = 65$$

Thus, the person had 65 successful attempts.

Quick Tip

Setting up algebraic equations simplifies logic-based number problems.

---

87. Concentration given in gram equivalent per volume of solution is known as:

(A) Molality

(B) Molarity

(C) Normality

(D) Mole fraction

Correct Answer: (C) Normality

Solution: Normality (N) measures the concentration of a solution in gram equivalents per liter. It is used for acid-base titrations and redox reactions to account for reactive capacity. Normality differs from molarity as it considers equivalents rather than moles.

Quick Tip

Normality accounts for the number of equivalents reacting, making it useful for precise titrations.

88. Which of the following amino acids is not necessary to be taken in the diet?

(A) Histidine

(B) Threonine

(C) Serine

(D) Lysine

Correct Answer: (C) Serine

Solution: Serine is a **non-essential amino acid**, meaning it can be synthesized by the human body. In contrast, histidine, threonine, and lysine are **essential amino acids** and must be obtained through diet. Serine plays a vital role in cellular metabolism, protein synthesis, and neurotransmission.

Quick Tip

Non-essential amino acids can be synthesized from metabolic intermediates, whereas essential amino acids must be supplied through food.

---

89. Self-assembled closed colloidal structures composed of lipid bilayers are called:

(A) Dendrimers

(B) Polymers

(C) Micelles

(D) Liposomes

Correct Answer: (D) Liposomes

Solution: Liposomes are **self-assembled vesicles** composed of lipid bilayers surrounding an aqueous core. They are widely used in **drug delivery systems** to enhance bioavailability and target-specific release. Liposomes can encapsulate both hydrophilic and lipophilic drugs, improving therapeutic efficacy.

Quick Tip

Liposomes mimic biological membranes, making them ideal carriers for drugs, genes, and vaccines.

---

90. Which of the following drug delivery systems comprises a hydrophobic core and a hydrophilic surface?

(A) Liposomes

(B) Micelles

(C) Reverse micelles

(D) None of the above

Correct Answer: (B) Micelles

Solution: Micelles consist of a **hydrophobic core** and a **hydrophilic surface**, enabling the solubilization of poorly water-soluble drugs. They form spontaneously in aqueous solutions when surfactants reach the **critical micelle concentration (CMC)**. Micelles enhance drug absorption and protect sensitive drugs from degradation.

Quick Tip

Micelles improve drug solubility by encapsulating lipophilic molecules in their core while maintaining aqueous compatibility.

---

91. Tamoxifen is classified as:

(A) Antiprogestin

(B) Antiandrogen

(C) Antiestrogen

(D) Androgen

Correct Answer: (C) Antiestrogen

Solution: Tamoxifen is a **selective estrogen receptor modulator (SERM)** that acts as an **antiestrogen** in breast tissue. It is widely used in the treatment of **estrogen receptor-positive (ER+) breast cancer**, blocking estrogen-mediated tumor growth. Tamoxifen exhibits **agonistic effects** in bone and uterus while **antagonizing** estrogen receptors in breast tissue.

Quick Tip

Tamoxifen is crucial in preventing breast cancer recurrence by inhibiting estrogen-dependent tumor growth.

---

92. Among the butane conformers, which occur at energy minima on a graph of potential energy versus dihedral angle?

(A) Synperiplanar
(B) Antiperiplanar
(C) Gauche
(D) Eclipsed

Correct Answer: (B) Antiperiplanar

Solution: The antiperiplanar conformation of butane occurs at energy minima, where steric hindrance and torsional strain are minimized. In this conformation, bulky substituents are positioned opposite each other, reducing repulsive interactions. Gauche conformers have higher energy due to steric clash, and eclipsed conformations are at energy maxima.

Quick Tip

In conformational analysis, the lowest energy structure corresponds to the most stable spatial arrangement of atoms.

---

93. Which of the following antiflatulents is usually added to antacids?

(A) Alginic acid

(B) Sucralfate

(C) Simethicone

(D) Misoprostol

Correct Answer: (C) Simethicone

Solution: Simethicone is an antiflatulent commonly added to antacid formulations to relieve gas buildup in the digestive tract. It reduces surface tension in gas bubbles, promoting their coalescence and elimination. Unlike sucralfate or misoprostol, which protect the gastric lining, simethicone focuses on reducing bloating and discomfort.

Quick Tip

Simethicone helps relieve bloating by breaking up gas bubbles in the stomach and intestines.

---

94. The dihydropyridines block which of the following type of calcium channels?

(A) L-type voltage-gated channels

(B) T-type voltage-gated channels

(C) N-type voltage-gated channels

(D) Ligand-gated calcium channels

Correct Answer: (A) L-type voltage-gated channels

Solution: Dihydropyridines selectively inhibit **L-type voltage-gated calcium channels**, which regulate vascular smooth muscle contraction. These drugs, including nifedipine and amlodipine, are used in treating hypertension and angina. T-type and N-type calcium channels serve different physiological roles and are unaffected by dihydropyridines.

Quick Tip

Blocking L-type calcium channels leads to vasodilation, reducing blood pressure and myocardial oxygen demand.

95. Commonly, which reaction on histones leads to the silencing of genes?

(A) Phosphorylation

(B) Methylation

(C) Acetylation

(D) Demethylation

Correct Answer: (B) Methylation

Solution: Histone **methylation** is a key mechanism in gene silencing, modifying chromatin structure to restrict transcription factor access. It typically occurs on lysine residues in histone tails, leading to chromatin compaction and decreased gene expression. In contrast, **acetylation** promotes transcription by loosening chromatin, allowing gene activation.

Quick Tip

Epigenetic modifications, like histone methylation, influence gene expression without altering DNA sequences.

---

96. Baby shampoo contains which of the following surfactants as detergent?

(A) Sodium lauryl sulphate

(B) Cationic surfactant

(C) Amphoteric imidazole derivatives (Miranda)

(D) Alkyl sulfonates

Correct Answer: (C) Amphoteric imidazole derivatives (Miranda)

Solution: Amphoteric imidazole derivatives are **mild surfactants** used in baby shampoos to reduce irritation and dryness. Unlike harsh detergents like sodium lauryl sulfate, they maintain a gentle cleansing action while preserving scalp moisture. Their amphoteric nature allows them to act as both acidic and basic detergents depending on pH conditions.

Quick Tip

Baby shampoos use amphoteric surfactants to minimize irritation while effectively removing dirt and oil.

---

97. If an investment of Rs. X is done on simple interest, and the amount doubles in years, what would be the rate of simple interest per annum?

(A) 10

(B) 12.5

(C) 20

(D) 25

Correct Answer: (C) 20

Solution: Using the simple interest formula:

$$SI = \frac{P \times R \times T}{100}$$

Since the amount doubles, $A = P + SI = 2P$, so:

$$P + P \times \frac{R \times T}{100} = 2P$$

$$P \times \frac{R \times T}{100} = P$$

$$R \times T = 100$$

For $T = 5$ years:

$$R = \frac{100}{5} = 20\%$$

Thus, the correct answer is **20

Quick Tip

Simple interest grows linearly over time, making it easy to compute in financial calculations.

---

98. Find the synonym for 'chimera'.

(A) Chimney

(B) Protest

(C) Illusion

(D) Panache

Correct Answer: (C) Illusion

Solution: "Chimera" refers to a **fantasy, illusion, or unattainable dream**, making **illusion** the best synonym. Originally, it describes a mythological creature with mixed animal features, later evolving to denote unrealistic aspirations. Other options do not match the meaning correctly.

Quick Tip

In literature, "chimera" symbolizes unattainable dreams or deceptive appearances.

---

99. Which of the following rings does ergoline contain?

(A) Indolo [4,3-f]quinoline

(B) Indoloquinazoline

(C) β-Carboline

(D) Indolonaphthalene

Correct Answer: (A) Indolo [4,3-f]quinoline

Solution: Ergoline features the **indolo [4,3-f]quinoline** ring system, a fused bicyclic structure with **indole and quinoline components**. It is found in **ergot alkaloids**, used

in treatments for migraines and Parkinson's disease. This unique structure contributes to its **pharmacological activity** in neurological disorders.

Quick Tip

Ergoline derivatives serve as key components in medications targeting neurological and vascular conditions.

---

100. Which of the following cytokines is associated with pulmonary inflammation related to brain death?

(A) IL-2

(B) IL-6

(C) IL-5

(D) IL-8

Correct Answer: (B) IL-6

Solution: Interleukin-6 (IL-6) is a **pro-inflammatory cytokine** associated with pulmonary inflammation during **brain death**. It plays a key role in immune regulation and contributes to systemic inflammatory responses. Elevated IL-6 levels are observed in patients with **severe inflammation and organ dysfunction**.

Quick Tip

Cytokine storms, driven by IL-6, are associated with severe respiratory distress and inflammatory conditions.

---

101. Who has been appointed as the head of the committee formed by the government to address drug security in the country in the context of the Novel Coronavirus outbreak?

(A) Vashishtha Narayan Singh

(B) Gita Mittal

(C) R.K. Mathur

(D) Eswara Reddy

Correct Answer: (D) Eswara Reddy

Solution: Dr. **Eswara Reddy** was appointed to lead the **committee on drug security** during the **COVID-19 pandemic**. The committee focused on ensuring a **stable pharmaceutical supply chain** amidst global disruptions. This initiative was crucial for managing **medicine availability and public health policies**.

Quick Tip

Government committees play a vital role in managing healthcare crises by ensuring drug security and accessibility.

---

102. Recently, ranitidine and metformin were in the news due to the presence of which impurity?

(A) Nitrosodimethylamine

(B) Methylnitrile

(C) Diethylene glycol

(D) 4-aminobiphenyl

Correct Answer: (A) Nitrosodimethylamine

Solution: **Nitrosodimethylamine (NDMA)** contamination in **ranitidine and metformin** raised global health concerns. NDMA is classified as a **probable human carcinogen**, leading to **recalls and regulatory reviews**. The presence of this impurity in medications is closely monitored to ensure **drug safety**.

Quick Tip

Regulatory agencies conduct impurity screening to prevent carcinogenic contamination in pharmaceuticals.

103. Fries rearrangement reaction of phenol ester leads to the formation of which type of product?

(A) Alkene

(B) Aldehyde

(C) Alcohol

(D) Ketone

Correct Answer: (D) Ketone

Solution: The **Fries rearrangement** reaction involves **phenol esters** reacting under **Lewis acid catalysis**, leading to **ketone formation**. This rearrangement allows **ortho and para acylation** of the **phenolic ring**, yielding **hydroxyaryl ketones**. It is a key synthetic step in **aromatic compound derivatization**.

Quick Tip

Fries rearrangement is widely used in organic synthesis to introduce ketone functionality in aromatic systems.

---

104. In which medium does the Favorskii rearrangement occur?

(A) Neutral

(B) Acidic

(C) Basic

(D) Amphiprotic

Correct Answer: (C) Basic

Solution: The **Favorskii rearrangement** occurs in a **basic medium**, typically under alkaline conditions. It involves the **conversion of -haloketones to carboxylic acids or esters** via enolate intermediates. Base facilitates **nucleophilic attack**, forming cyclic or acyclic rearrangement products.

Quick Tip

The Favorskii rearrangement is widely used in organic synthesis for ring contraction and carboxylate formation.

---

105. Glycine and proline are the most abundant amino acids in the structure of:

(A) Hemoglobin

(B) Myoglobin

(C) Insulin

(D) Collagen

Correct Answer: (D) Collagen

Solution: Collagen, the **structural protein** in connective tissues, contains **high levels of glycine and proline**. Glycine ensures **tight packing** of collagen helices, while proline contributes to **stabilization** through ring rigidity. These amino acids enable collagen's **strength and elasticity** in skin, bones, and cartilage.

Quick Tip

Collagen synthesis relies on hydroxylation of proline and lysine, requiring vitamin C for proper function.

---

106. Which of the following is an opioid-like agonist?

(A) Phenobarbital

(B) Diltiazem

(C) Pemoline

(D) Propoxyphene

Correct Answer: (D) Propoxyphene

Solution: Propoxyphene is a **weak opioid agonist** that binds to **opioid receptors**, exerting **analgesic effects**. Unlike strong opioids like morphine, propoxyphene has **lower abuse potential** but can still cause **respiratory depression**. It was historically used for **moderate pain relief** but has been discontinued due to safety concerns.

Quick Tip

Opioid agonists activate receptors to relieve pain, while opioid antagonists block receptor activity, reversing opioid effects.

---

107. Which of the following compounds will not absorb UV radiation?

(A) Chloral hydrate

(B) Salicylic acid

(C) Acetanilide

(D) Chloramphenicol

Correct Answer: (A) Chloral hydrate

Solution: Chloral hydrate **lacks conjugated pi bonds**, preventing **UV absorption**. Compounds like **salicylic acid, acetanilide, and chloramphenicol** possess **aromatic rings**, which strongly absorb **UV radiation**. UV spectroscopy is widely used to study **molecular conjugation and electronic transitions**.

Quick Tip

Molecules with conjugated systems absorb UV radiation due to electronic transitions between molecular orbitals.

---

108. Which of the following is not aromatic?

(A) Thiophene

(B) Dioxane

(C) Pyrrole

(D) Isoxazole

Correct Answer: (B) Dioxane

Solution: Dioxane is a **non-aromatic compound** because it lacks a **conjugated -system** and does not follow **Hückel's rule**. On the other hand, **thiophene, pyrrole, and isoxazole** are aromatic due to the presence of **conjugated electron systems**. Aromaticity arises when **delocalized electrons form a stable, cyclic structure**.

Quick Tip

Aromatic compounds follow Hückel's rule, requiring **(4n + 2) -electrons** for stability.

---

109. Alcohol and carboxylic acid in the presence of a dehydrating agent give which compounds?

(A) Amides

(B) Esters

(C) -hydroxyketone

(D) Anhydride

Correct Answer: (B) Esters

Solution: The **esterification reaction** occurs between an alcohol and a carboxylic acid in the presence of **acid catalysts** like **sulfuric acid**. This reaction eliminates **water**, forming **esters**, which are widely used in **fragrances and pharmaceuticals**. The reaction follows:

$$RCOOH + R'OH \rightleftharpoons RCOOR' + H_2O$$

Quick Tip

Esterification is a reversible reaction; excess reactant or dehydrating agents drive product formation.

---

110. Considering the 'fluid mosaic model' of the cell membrane, which one of the following statements is correct regarding flip-flop movement?

(A) Neither lipids nor proteins can flip-flop

(B) Both lipids and proteins can flip-flop

(C) While lipids can rarely flip-flop, proteins cannot

(D) While proteins can flip-flop, lipids cannot

Correct Answer: (C) While lipids can rarely flip-flop, proteins cannot

Solution: The **fluid mosaic model** describes the **dynamic nature** of cell membranes. Lipids can undergo **lateral diffusion** readily, but **flip-flop movement** (between monolayers) is **rare** due to **hydrophobic barriers**. Proteins, due to their **large size and hydrophilic regions**, **cannot flip-flop** spontaneously.

Quick Tip

Flip-flop movement in membranes requires **specific enzymes** like flippases and scramblases.

---

111. How many chiral centers are present in one molecule of camphor?

(A) 0

(B) 1

(C) 2

(D) 3

Correct Answer: (C) 2

Solution: Camphor is a **bicyclic terpenoid** with **two chiral centers**, located at **carbon positions 1 and 4**. These **stereocenters** contribute to **optical activity**, making camphor **chiral and enantiomerically distinguishable**. Its asymmetric nature is responsible for its **distinct fragrance and biological activity**.

Quick Tip

Chiral centers in molecules influence their interaction with biological systems, affecting drug efficacy.

---

112. Cilostazol, a drug used in the treatment of intermittent claudication, inhibits which phosphodiesterase enzyme for its clinical effect?

(A) PDE3

(B) PDE4

(C) PDE5

(D) PDE6

Correct Answer: (A) PDE3

Solution: Cilostazol is a **phosphodiesterase-3 (PDE3) inhibitor**, used to treat **intermittent claudication**. By inhibiting PDE3, it **increases intracellular cyclic AMP (cAMP)** levels, leading to **vasodilation and platelet inhibition**. This effect improves **blood flow** to the extremities and reduces clotting risk.

Quick Tip

PDE3 inhibitors enhance vasodilation, making them beneficial in conditions with arterial occlusion and poor circulation.

---

113. Which of the following antiplatelet drugs is a reversible inhibitor of ADP receptors?

(A) Clopidogrel

(B) Prasugrel

(C) Ticagrelor

(D) All of the above

Correct Answer: (C) Ticagrelor

Solution: Ticagrelor is a **reversible inhibitor of $P2Y_{12}$ ADP receptors**, unlike **clopidogrel and prasugrel**, which bind irreversibly. It prevents platelet aggregation, reducing **thrombosis risk** in acute coronary syndrome patients. Ticagrelor offers **faster onset and shorter duration**, allowing **controlled antiplatelet effects**.

Quick Tip

Reversible $P2Y_{12}$ inhibitors provide more flexible anticoagulation, making them ideal for short-term thrombotic risk management.

---

114. The most essential fatty acid is:

(A) Linolenic acid

(B) Oleic acid

(C) Arachidonic acid

(D) Palmitic acid

Correct Answer: (A) Linolenic acid

Solution: **Linolenic acid** is a **polyunsaturated omega-3 essential fatty acid**, required for **cell membrane function**. It **cannot be synthesized by the body** and must be obtained from dietary sources like **flaxseed, walnuts, and fish**. Essential fatty acids regulate **inflammation, cardiovascular health, and neural function**.

Quick Tip

Omega-3 fatty acids promote heart health by reducing triglycerides and supporting proper endothelial function.

115. Ticlopidine acts as:

(A) Antagonist of $P2Y_{12}$ receptor

(B) Agonist of $P2Y_{12}$ receptor

(C) Agonist of GPIIb/IIIa receptor

(D) Antagonist of GPIIb/IIIa receptor

Correct Answer: (A) Antagonist of $P2Y_{12}$ receptor

Solution: Ticlopidine is a **$P2Y_{12}$ receptor antagonist**, inhibiting **platelet aggregation** by blocking ADP receptor activation. This prevents fibrinogen binding to **GPIIb/IIIa receptors**, reducing thrombus formation. It was historically used for **stroke prevention**, but newer drugs like clopidogrel have largely replaced it due to safety concerns.

Quick Tip

$P2Y_{12}$ inhibitors prevent clot formation, reducing stroke and heart attack risk in high-risk patients.

---

116. Carbonyl group can be reduced to alkane with the help of which catalyst?

(A) $H_2N\text{-}NH_2$, KOH, heat

(B) Zn/Hg HCl

(C) $LiAlH_4$

(D) P, Q, and R

Correct Answer: (A) $H_2N\text{-}NH_2$, KOH, heat

Solution: The **Wolff-Kishner reduction** uses **hydrazine ($H_2N\text{-}NH_2$) and potassium hydroxide (KOH) under heat** to convert carbonyl compounds into **alkanes**. This reaction eliminates oxygen atoms and replaces the carbonyl functionality with hydrogen. It is effective for aldehydes and ketones, yielding **hydrocarbon products**.

Quick Tip

Wolff-Kishner reduction provides a method to fully deoxygenate carbonyl groups, transforming them into hydrocarbons.

---

117. When the velocity of enzyme activity is plotted against substrate concentration, which of the following is obtained?

(A) Parabola

(B) Hyperbolic Curve

(C) Straight line with positive slope

(D) Straight line with negative slope

Correct Answer: (B) Hyperbolic Curve

Solution: The **Michaelis-Menten plot** describes enzyme kinetics, where velocity (V) versus substrate concentration ($[S]$) produces a **hyperbolic curve**. At low substrate levels, the reaction is **first-order**, increasing proportionally to $[S]$, but at high substrate levels, the enzyme becomes **saturated**. This results in a **plateau effect**, where $V_{\max}$ is reached.

Quick Tip

The hyperbolic curve in enzyme kinetics reflects saturation, where adding more substrate does not increase velocity.

---

118. The active site of chymotrypsin consists of a catalytic triad of which of the following amino acid residues?

(A) Serine, histidine, and glutamate

(B) Threonine, histidine, and aspartate

(C) Serine, histidine, and aspartate

(D) Methionine, histidine, and aspartate

Correct Answer: (C) Serine, histidine, and aspartate

Solution: Chymotrypsin, a **serine protease**, contains a **catalytic triad** of **serine, histidine, and aspartate**, which enables protein cleavage. Histidine acts as a **proton acceptor**, serine provides **nucleophilic attack**, and aspartate stabilizes the charge. This arrangement is essential for the enzyme's **proteolytic function** in breaking peptide bonds.

Quick Tip

The catalytic triad in chymotrypsin facilitates hydrolysis by activating serine for nucleophilic attack.

---

119. Which of the following types of lipid aggregates has maximum stability?

(A) Micelles
(B) Bilayer
(C) Liposome
(D) Myelin sheath

Correct Answer: (C) Liposome

Solution: Liposomes, **spherical lipid bilayer vesicles**, offer the highest **stability** among lipid aggregates. Their **bilayer structure** encapsulates aqueous environments, protecting drugs or biomolecules from degradation. Liposomes are widely used in **drug delivery systems**, ensuring **controlled release and bioavailability**.

Quick Tip

Liposomes are ideal for drug delivery as they mimic biological membranes, improving therapeutic stability and absorption.

---

120. Which of the following is a choline-containing lipid?

(A) Phosphatidylserine

(B) Phosphatidylglycerol

(C) Phosphatidylethanolamine

(D) Sphingomyelin

Correct Answer: (D) Sphingomyelin

Solution: **Sphingomyelin** is a **choline-containing lipid**, classified as a **sphingophospholipid**. Unlike **phosphatidylserine and phosphatidylethanolamine**, which contain different head groups, sphingomyelin contains **phosphocholine**. It is a major component of **myelin sheaths**, crucial for **neuronal insulation and signal transmission**.

Quick Tip

Sphingomyelin contributes to membrane stability and is essential for nerve function.

---

121. Volhard's method of chloride ion determination:

(A) is back titration with ammonium thiocyanate

(B) is direct titration with ammonium thiocyanate

(C) uses dichlorofluorescein as an indicator

(D) uses potassium chromate

Correct Answer: (A) is back titration with ammonium thiocyanate

Solution: The **Volhard method** is a **back titration technique** used for determining **chloride ion concentration**. Excess silver nitrate reacts with chloride, and the remaining silver ions are titrated with **ammonium thiocyanate** using **ferric ions as an indicator**. This method ensures **accurate chloride analysis**, even in **complex matrices**.

Quick Tip

Back titration is useful for determining ions that form insoluble precipitates.

122. Which of the following is an ergot derivative?

(A) Bergarten

(B) Bretylium

(C) Bupropion

(D) Bromocriptine

Correct Answer: (D) Bromocriptine

Solution: **Bromocriptine** is an **ergot derivative** that acts as a **dopamine receptor agonist**. It is used to treat **Parkinson's disease** and **hyperprolactinemia** by **modulating dopaminergic activity**. Other options do not belong to the **ergot alkaloid class**, which originates from **Claviceps purpurea**.

Quick Tip

Ergot alkaloids have diverse pharmacological actions, including vasoconstriction and dopamine agonism.

---

123. Pramipexole is:

(A) Antipsychotic

(B) Antidepressant

(C) Anthelmintic

(D) Antiparkinsonian

Correct Answer: (D) Antiparkinsonian

Solution: **Pramipexole** is an **antiparkinsonian drug** that functions as a **dopamine receptor agonist**. It enhances **dopaminergic transmission**, alleviating **motor symptoms of Parkinson's disease**. By activating dopamine receptors, it **reduces tremors, rigidity, and movement difficulties**.

Quick Tip

Dopamine agonists like pramipexole help manage Parkinson's disease by compensating for dopamine deficiency.

---

124. Single letter symbol for arginine is:

(A) K

(B) D

(C) R

(D) G

Correct Answer: (C) R

Solution: The **single-letter code** for **arginine** is **R**, derived from its **basic and positively charged nature**. Amino acids have **standard single-letter symbols**, helping in **protein sequence representation**. For example, **glycine (G), lysine (K), and aspartic acid (D)** follow similar conventions.

Quick Tip

Amino acid single-letter codes simplify sequence notation and computational protein analysis.

---

125. Penicillin degradation is prevented at which pH?

(A) 4

(B) 5

(C) 6

(D) 8

Correct Answer: (C) 6

Solution: **Penicillin stability** is highest at **pH 6**, where **hydrolysis** is minimal. At **extreme pH values**, such as **acidic or basic conditions**, penicillin undergoes

decomposition due to **-lactam ring cleavage**. Maintaining **optimal pH** ensures **drug efficacy and shelf-life preservation**.

Quick Tip

Penicillin degradation occurs faster in acidic and alkaline environments due to hydrolysis.

---

126. Which of the following titration methods should be protected from light?

(A) Volhard

(B) Adsorption

(C) Mohr

(D) Gay-Lussac

Correct Answer: (D) Gay-Lussac

Solution: The **Gay-Lussac titration method** involves **light-sensitive reagents**, requiring **protection from light exposure**. Prolonged light exposure can lead to **decomposition or photo-induced side reactions**, affecting **titration accuracy**. Proper **storage conditions** ensure **reliable analytical results**.

Quick Tip

Certain titrations require shielding from light to prevent reagent degradation and ensure accuracy.

---

127. If the rate constant for a first-order reaction is k, the time t required for the completion of 99% of the reaction is given by:

(A) $t = \frac{4.606}{k}$

(B) $t = \frac{2.303}{k}$

(C) $t = \frac{0.693}{k}$

(D) $t = \frac{6.909}{k}$

Correct Answer: (A) $t = \frac{4.606}{k}$

Solution: For a **first-order reaction**, the fraction remaining after time t is given by:

$$\ln\left(\frac{[A]_0}{[A]}\right) = kt$$

For **99

$$t = \frac{\ln(100)}{k} = \frac{4.606}{k}$$

Thus, the correct formula for **99

$$t = \frac{4.606}{k}$$

Quick Tip

In first-order reactions, half-life remains constant and depends only on the rate constant.

---

128. Assessment, control, communication, and review of risks to the quality of the drug product across the product life cycle is:

(A) QbD

(B) QRM

(C) PAT

(D) QTPP

Correct Answer: (B) QRM

Solution: **Quality Risk Management (QRM)** involves **identifying, assessing, and controlling risks** associated with **drug quality** throughout its lifecycle. It ensures **continuous monitoring** to maintain **compliance** with regulatory standards while optimizing pharmaceutical **manufacturing** and **development**. QRM is integral to **quality assurance processes**, reducing **failures** and **variability** in drug products.

Quick Tip

QRM enhances pharmaceutical decision-making by integrating risk assessments into drug development and quality control.

---

129. Which one of the following is a Histamine H1-receptor antagonist?

(A) 4-(5H-dibenzola,d] cyclohepten-5-ylidene)-1-methyl pyridine hydrochloride
(B) 4-(5H-dibenzola,d] cyclohepten-5-ylidene)-1-methyl pyrimidine hydrochloride
(C) 4-(5H-dibenzo[a,d] cyclohepten-5-ylidene)-1-methyl piperidine hydrochloride
(D) 4-(5H-dibenzoja,d] cycloheptane-5-ylidene)-1-methyl piperidine hydrochloride

Correct Answer: (C)
4-(5H-dibenzo[a,d] cyclohepten-5-ylidene)-1-methyl piperidine hydrochloride

Solution: **Histamine H1-receptor antagonists** block **histamine-mediated allergic reactions**, reducing **inflammation and hypersensitivity**. The correct answer corresponds to **classic antihistamines** used for **allergy relief** and **motion sickness prevention**. These compounds modulate **immune responses** by inhibiting **histamine action**.

Quick Tip

H1-receptor antagonists help manage allergy symptoms by preventing histamine binding to target cells.

---

130. QbD is described in ICH guidelines:

(A) Q8 Part I
(B) Q8 Part II
(C) Q9
(D) Q10

Correct Answer: (A) Q8 Part I

Solution: **Quality by Design (QbD)** is outlined in **ICH Q8 Part I**, focusing on **systematic pharmaceutical development**. It emphasizes **product understanding, design space, and control strategies** to ensure **consistent drug quality**. QbD optimizes **manufacturing processes** by integrating **scientific knowledge** and **risk assessment tools**.

Quick Tip

QbD enhances drug development by shifting focus from quality testing to proactive design and control strategies.

---

131. Which is the correct long-term stability condition for zone IVb?

(A) $40°C \pm 2°C/75\% \pm 5\%$

(B) $30°C \pm 2°C/65\% \pm 5\%$

(C) $30°C \pm 2°C/75\% \pm 5\%$

(D) None

Correct Answer: (C) $30°C \pm 2°C/75\% \pm 5\%$

Solution: **Zone IVb stability conditions** (30°C ± 2°C / 75These guidelines regulate **storage and shelf-life** to prevent **degradation in high-temperature environments**. They help maintain **therapeutic efficacy** under **tropical storage conditions**.

Quick Tip

Long-term stability testing ensures drug formulations retain their potency and physical characteristics over time.

---

132. Which technique is used to determine the particle size of a pharmaceutical suspension?

(A) Dynamic Light Scattering (DLS)

(B) X-ray Diffraction (XRD)

(C) Gas Chromatography (GC)

(D) UV-Visible Spectroscopy

Correct Answer: (A) Dynamic Light Scattering (DLS)

Solution: **Dynamic Light Scattering (DLS)** is widely used for **particle size determination** in pharmaceutical suspensions. It measures **Brownian motion** and correlates it with **particle size distribution** using **laser light scattering techniques**. Other methods such as **XRD, GC, and UV spectroscopy** are not suitable for particle size analysis.

Quick Tip

DLS provides rapid and accurate particle size measurement, crucial for drug stability and formulation efficiency.

---

133. Which gas is used as a carrier in Gas Chromatography?

(A) Nitrogen

(B) Oxygen

(C) Carbon Dioxide

(D) Sulfur Dioxide

Correct Answer: (A) Nitrogen

Solution: **Nitrogen (N_2)** is commonly used as a **carrier gas in Gas Chromatography (GC)** due to its **inert nature and optimal flow characteristics**. Helium is also widely used because of its **low viscosity and high diffusivity**, ensuring **efficient separation**. Reactive gases like oxygen or sulfur dioxide are unsuitable for GC applications.

Quick Tip

Carrier gases in GC must be inert to prevent chemical interactions with the sample components.

134. Nuclei having either the number of protons or neutrons as odd have $_{spin.}$

(A) Integral spin

(B) Half integral spin

(C) Zero spin

(D) Positive spin

Correct Answer: (B) Half integral spin

Solution: Nuclear spin arises due to the quantum mechanical properties of **nucleons (protons and neutrons)**. Nuclei with an **odd number of protons or neutrons** exhibit **half-integral spin values**, following **quantum rules**. In contrast, nuclei with **even numbers** of protons and neutrons generally have **integral spin or zero spin**.

Quick Tip

Nuclear spin is crucial in **NMR spectroscopy**, influencing signal strength and spectral resolution.

---

135. Only what percentage of the effluent of liquid chromatography must be introduced into the mass spectrometer?

(A) 1–20%

(B) 1–15%

(C) 1–5%

(D) Below 1%

Correct Answer: (C) 1–5%

Solution: In **Liquid Chromatography-Mass Spectrometry (LC-MS)**, typically **1-5This ensures **efficient ionization** while avoiding **overloading and contamination** of the MS instrument. Excess sample introduction can reduce **detection sensitivity** and affect **mass spectral accuracy**.

Quick Tip

Proper LC-MS tuning ensures optimal ionization efficiency and accurate mass spectral interpretation.

---

136. In AAS, ionization of analyte atoms in flame/plasma can be suppressed by:

(A) EDTA or other complexing agents

(B) Addition of KCl to the matrix

(C) Addition of oxyanions such as sulfate or phosphate

(D) Internal standards methods

Correct Answer: (B) Addition of KCl to the matrix

Solution: In **Atomic Absorption Spectroscopy (AAS)**, ionization suppression is crucial for **accurate metal analysis**. Adding **potassium chloride (KCl) to the matrix** helps suppress ionization of the analyte by providing **excess electrons**, stabilizing neutral atoms. This method minimizes **spectral interferences**, improving **sensitivity and precision**.

Quick Tip

Ionization suppression enhances analyte detection by maintaining stable atomic absorption conditions.

---

137. Furan is aromatic. What is the value of Hückel's n in it?

(A) 1

(B) 2

(C) 4

(D) 6

Correct Answer: (A) 1

Solution: Furan follows **Hückel's rule for aromaticity**, which states that a compound must have **(4n + 2) -electrons**. Furan has **6 -electrons**, corresponding to **Hückel's $n = 1$**. Its **cyclic conjugation and electron delocalization** make it an **aromatic heterocycle**.

Quick Tip

Aromatic stability is governed by Hückel's rule, requiring cyclic conjugation and delocalized -electrons.

---

138. Which feature in the ^1H NMR spectrum provides information about the electronic environment of the protons in a compound?

(A) Splitting

(B) Chemical shift

(C) Integral

(D) Number of signals

Correct Answer: (B) Chemical shift

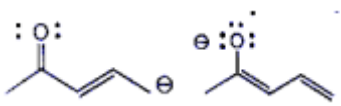
Solution: The **chemical shift** in ^1H NMR spectroscopy provides insights into the **electronic environment** of protons. It depends on **shielding or deshielding effects** influenced by **electronegativity, hybridization, and magnetic field interactions**. Chemical shift values assist in **structural determination** of organic compounds.

Quick Tip

Chemical shift values help identify functional groups and molecular environments in NMR analysis.

---

139. What is the relationship between the following two structures?



(A) Tautomers

(B) Stereoisomers

(C) Resonance structures

(D) Constitutional isomers, but not tautomers

Correct Answer: (C) Resonance structures

Solution: The given structures represent **resonance forms**, meaning they are **different representations of the same molecule** showing electron delocalization. Resonance **does not imply actual isomerism** but rather illustrates **how electrons can be redistributed** within a molecule without altering atomic connectivity. Unlike tautomers or constitutional isomers, resonance structures exist as a **weighted hybrid**, stabilizing the molecule.

Quick Tip

Resonance structures help visualize electron delocalization, contributing to molecular stability and reactivity.

---

140. Systemic clearance (CLs) is related with:

(A) Only the concentration of substances in plasma

(B) Only the elimination rate constant

(C) Volume of distribution, half-life, and elimination rate constant

(D) Bioavailability and half-life

Correct Answer: (C) Volume of distribution, half-life, and elimination rate constant

Solution: Systemic clearance (**CL_s**) is determined by the **volume of distribution (V_d)**, **half-life ($t_{1/2}$)**, and **elimination rate constant (k)**. It quantifies how efficiently the body removes a drug, defined as:

$$CL_s = V_d \times k$$

This relationship allows pharmacologists to calculate **drug dosing and elimination kinetics**.

Quick Tip

Clearance measures the body's ability to eliminate a drug, influencing dosing and frequency.

---

141. Reversible uncompetitive enzyme inhibition occurs when the inhibitor binds to:

(A) Enzyme-substrate complex (ES) only

(B) Free enzyme at substrate binding site

(C) Enzyme at a site different from substrate binding site

(D) Enzyme-substrate complex but at a site different from substrate binding site

Correct Answer: (A) Enzyme-substrate complex (ES) only

Solution: Uncompetitive inhibitors bind **only to the enzyme-substrate (ES) complex**, preventing catalysis without affecting substrate binding. This interaction **lowers both V_{max} and K_m**, meaning inhibition **becomes more effective at higher substrate concentrations**. Unlike competitive inhibition, uncompetitive inhibition **requires ES complex formation**.

Quick Tip

Uncompetitive inhibitors are more effective when substrate concentration is high, reducing enzyme activity.

---

142. The observations of a study on drug hydrolysis were plotted as the logarithm of the amount of drug remaining (Y-axis) against time (X-axis) and found to be linear. What might be the correct inference?

(A) The reaction is zero-order

(B) The slope is $2.303/k$

(C) The units of k are concentration^{-1}time^{-1}

(D) The half-life is $t_{1/2} = 0.693/k$

Correct Answer: (D) The half-life is $t_{1/2} = 0.693/k$

Solution: A **linear plot** of **log drug concentration vs. time** suggests a **first-order reaction**, characterized by:

$$t_{1/2} = \frac{0.693}{k}$$

This means the **rate of reaction depends on the remaining drug concentration**, leading to **exponential decay**.

Quick Tip

First-order reactions have a constant half-life, independent of initial concentration.

---

143. Attention deficit hyperactivity disorder (ADHD) may be treated with behavior management, educational programs, parental counseling, and medications. Which of the following medications is NOT generally used in the treatment of ADHD in children?

(A) Methylphenidate

(B) Dexamphetamine

(C) Imipramine

(D) Clonazepam

Correct Answer: (D) Clonazepam

Solution: **Clonazepam**, a **benzodiazepine**, is generally **not used for ADHD** as it primarily treats **seizures and anxiety**. ADHD treatments typically involve **stimulants (methylphenidate, dexamphetamine)** and **non-stimulant alternatives** like **atomoxetine**. Using **sedative drugs** can impair **cognitive function**, worsening symptoms.

Quick Tip

ADHD medications enhance dopamine and norepinephrine activity to improve focus and impulse control.

144. Who is the Health Minister of India (Health Family Welfare Department)?

(A) Smriti Irani

(B) Dr. Harsh Vardhan

(C) Shri Sanjeeva Kumar

(D) Rajesh Tope

Correct Answer: (B) Dr. Harsh Vardhan

Solution: As per the latest information, **Dr. Harsh Vardhan** served as India's **Union Health Minister** under **Health Family Welfare Department**. He played a **key role in public health policies and COVID-19 management efforts**. Leadership in the department ensures **national healthcare strategy implementation**.

Quick Tip

Healthcare ministers oversee public health policies and ensure accessibility to medical services.

---

145. Phototoxicity is shown by all EXCEPT:

(A) Doxycycline

(B) Chlorpromazine

(C) Thiazide and quinolones

(D) Rosiglitazone

Correct Answer: (D) Rosiglitazone

Solution: Phototoxicity occurs when **drugs absorb UV light**, generating **reactive oxygen species**, leading to **skin damage**. **Doxycycline, chlorpromazine, and quinolones** show **significant phototoxic effects**, while **rosiglitazone**, an **antidiabetic drug**, does not. Patients on **phototoxic drugs** should avoid excessive **sun exposure**.

Quick Tip

Phototoxic drugs trigger skin reactions upon UV exposure; protective measures are advised.

---

146. Which of the following is NOT an antifungal agent?

(A) Amphotericin B

(B) Ketoconazole

(C) Ciprofloxacin

(D) Fluconazole

Correct Answer: (C) Ciprofloxacin

Solution: **Ciprofloxacin** is a **fluoroquinolone antibiotic**, primarily used for **bacterial infections** rather than fungal diseases. In contrast, **amphotericin B, ketoconazole, and fluconazole** are potent **antifungal agents** targeting **ergosterol synthesis** or fungal membranes. Choosing the appropriate antimicrobial agent depends on the **pathogen type**.

Quick Tip

Antibiotics like ciprofloxacin treat bacterial infections, while antifungals target fungal pathogens.

---

147. Which of the following vitamins is fat-soluble?

(A) Vitamin C

(B) Vitamin B12

(C) Vitamin D

(D) Vitamin B6

Correct Answer: (C) Vitamin D

Solution: **Vitamin D** is a **fat-soluble vitamin**, meaning it is stored in **lipid deposits** and requires **dietary fats for absorption**. Unlike **water-soluble vitamins (B and C)**, fat-soluble vitamins (**A, D, E, K**) accumulate in the **liver and adipose tissues**. Vitamin D regulates **calcium metabolism**, supporting **bone health**.

Quick Tip

Fat-soluble vitamins are stored in the body, requiring careful dietary balance to prevent excess accumulation.

---

148. Ketone on reduction gives:

(A) Primary alcohol

(B) Secondary alcohol

(C) Aldehyde

(D) Carboxylic acid

Correct Answer: (B) Secondary alcohol

Solution: Ketones undergo **reduction** via agents such as **$LiAlH_4$** or **$NaBH_4$** to form **secondary alcohols**. This reaction follows:

$$R_2C = O + H_2 \rightarrow R_2CH - OH$$

Unlike aldehydes, which reduce to **primary alcohols**, ketones yield **secondary alcohols** due to the absence of a hydrogen atom on the carbonyl carbon.

Quick Tip

Reduction reactions of ketones are widely used in **organic synthesis** to generate alcohol-based intermediates.

---

149. Which functional group is likely to be present in a molecule that has peaks in the infrared spectrum at 1000-1250 cm^{-1} (strong), but does not have peaks at 3200-3650 cm^{-1} or 1630-1820 cm^{-1}?

(A) Alcohol

(B) Aldehyde or ketone

(C) Ether

(D) Ester

Correct Answer: (C) Ether

Solution: Infrared spectroscopy detects **functional groups** based on **characteristic absorption peaks**. Ethers exhibit a **strong absorption band at 1000-1250 cm^{-1}**, corresponding to **C-O stretching**, but lack peaks in the **OH (3200-3650 cm^{-1}) and C=O (1630-1820 cm^{-1}) regions**. Thus, the molecule likely contains an **ether functional group**.

Quick Tip

Infrared spectroscopy is a powerful tool for identifying organic functional groups based on bond vibrations.

---

150. Which is India's first public sector enterprise?

(A) Air-India

(B) Indian Telephone Industries (ITI)

(C) Bharat Sanchar Nigam Limited (BSNL)

(D) Oil and Natural Gas Corporation

Correct Answer: (B) Indian Telephone Industries (ITI)

Solution: **Indian Telephone Industries (ITI)**, established in **1948**, was **India's first public sector enterprise** under **telecommunications**. It played a vital role in **manufacturing telecom equipment**, supporting **India's communication infrastructure**. Other options, such as **BSNL and ONGC**, were founded later.

Quick Tip

Public sector enterprises in India contribute to national development by maintaining essential infrastructure and services.

---

151. The term that describes spreading of cancer is:

(A) Malignancy

(B) Invasiveness

(C) Metastasis

(D) Microstasis

Correct Answer: (C) Metastasis

Solution: **Metastasis** refers to the **spread of cancer cells** from their **primary site** to **distant organs or tissues**. This occurs when **cancer cells enter the bloodstream or lymphatic system**, allowing them to **colonize new regions** in the body. It is a **major challenge in cancer treatment**, leading to **secondary tumors**.

Quick Tip

Early detection of cancer improves prognosis by preventing metastasis.

---

152. Which is NOT used in the treatment of asthma?

(A) Budesonide

(B) Isoniazid

(C) Cromolyn sodium

(D) Zafirlukast

Correct Answer: (B) Isoniazid

Solution: **Isoniazid** is a **first-line drug for tuberculosis (TB)** but is **not used for asthma treatment**. Asthma is managed using **inhaled corticosteroids (budesonide)**,

mast cell stabilizers (cromolyn sodium), and **leukotriene receptor antagonists (zafirlukast)**. TB and asthma affect the **lungs differently**, requiring distinct therapies.

Quick Tip

Asthma treatments aim to reduce airway inflammation and prevent bronchoconstriction.

---

153. Aluminium tertiary butoxide in ethanol as solvent is used in:

(A) Oppenaur oxidation

(B) Clemmensen reduction

(C) MPV reduction

(D) Wolff-Kishner reduction

Correct Answer: (C) MPV reduction

Solution: The **Meerwein-Ponndorf-Verley (MPV) reduction** uses **Aluminium tertiary butoxide in ethanol** to **reduce ketones to alcohols**. It is a **selective method** that operates under **mild conditions**, avoiding harsh reagents like **metal hydrides**. MPV reduction is widely used in **organic synthesis** for **functional group transformations**.

Quick Tip

MPV reduction provides a gentle way to reduce ketones without affecting sensitive functional groups.

---

154. Calcium channel blockers can be divided into three classes based on their chemical structure. Which of the following is NOT a class of calcium channel blockers?

(A) Aryloxyethanolamine

(B) Phenylalkylamines

(C) Dihydropyridines

(D) Benzothiazepines

Correct Answer: (A) Aryloxyethanolamine

Solution: Calcium channel blockers are classified into **three main structural groups**: **Phenylalkylamines**, **dihydropyridines**, and **benzothiazepines**, each with distinct pharmacological effects. **Aryloxyethanolamines** are **not calcium channel blockers** but belong to **other drug classes**.

Quick Tip

Calcium channel blockers help manage hypertension and arrhythmias by preventing calcium entry into cells.

---

155. When granules stick to the die, what may be a remedy?

(A) External lubrication
(B) Drying of granules
(C) Decrease the dwell time
(D) Increase in binder quantity

Correct Answer: (A) External lubrication

Solution: Granules sticking to the **die cavity** occurs due to **high moisture content or inadequate lubrication**. Applying **external lubrication** using **magnesium stearate or talc** prevents adhesion, ensuring **smooth tablet compression**. Other methods, such as **granule drying**, may also be beneficial.

Quick Tip

Proper lubrication in tablet formulation minimizes defects and improves manufacturing efficiency.

---

156. New education system envisages the education system of pattern:

(A) $5 + 5 + 2$

(B) $5 + 3 + 3 + 4$

(C) $10 + 2 + 3$

(D) $10 + 2 + 4$

Correct Answer: (B) $5 + 3 + 3 + 4$

Solution: India's **New Education Policy (NEP 2020)** introduces the **5+3+3+4** structure, replacing the **10+2 system**. This framework covers **foundational (5 years), preparatory (3 years), middle (3 years), and secondary (4 years)** education. It emphasizes **holistic learning, vocational training, and flexibility in curricula**.

Quick Tip

NEP 2020 aims to transform the Indian education system by focusing on multidisciplinary learning and skill development.

---

157. Under what reaction conditions does the electrophilic chlorination of aromatic compounds usually occur?

(A) NaCl, CH_3OH

(B) Cl_2AlCl_3

(C) Cl_2CCl_4

(D) NaCl, EtOH

Correct Answer: (B) Cl_2AlCl_3

Solution: **Electrophilic chlorination** of aromatic compounds is typically carried out using **Cl_2 with $AlCl_3$** as a **Lewis acid catalyst**. **$AlCl_3$ polarizes Cl_2**, making it a stronger **electrophile**, enabling substitution on the benzene ring. Other options lack sufficient **electrophilic activation** for effective chlorination.

Quick Tip

Lewis acid catalysts enhance electrophilic aromatic substitution reactions by activating halogens.

158. Which of the following is the strongest activating group in electrophilic aromatic substitution reactions?

(A) -OCH_3

(B) -$N(CH_3)_2$

(C) -CO_2CH_3

(D) -NO_2

Correct Answer: (B) -$N(CH_3)_2$

Solution: The **-$N(CH_3)_2$ (dimethylamino group)** is the most potent **electron-donating group**, enhancing **electrophilic substitution**. This effect arises due to **strong resonance and inductive donation**, increasing electron density in the **aromatic ring**. Groups like **-NO_2** are **electron-withdrawing**, making substitution **less favorable**.

Quick Tip

Strong activating groups promote faster electrophilic substitution reactions due to electron donation.

---

159. Which of the following compounds has the most signals in the noise-decoupled ^{13}C NMR spectrum?

(A) o-dibromobenzene

(B) m-dibromobenzene

(C) p-dibromobenzene

(D) 1,3,5-tribromobenzene

Correct Answer: (B) m-dibromobenzene

Solution: **Meta-dibromobenzene** has the highest number of **distinct carbon environments**, leading to **more signals** in ^{13}C NMR. The **ortho and para isomers**

display **fewer unique signals** due to **symmetry** reducing chemical inequivalence. NMR spectroscopy helps in **structural determination** of organic molecules.

Quick Tip

Higher molecular symmetry results in fewer distinct NMR signals due to equivalent carbon environments.

---

160. Antipsychotic drugs work by blocking post-synaptic dopamine __ receptors, particularly in the mesolimbic-mesocortical pathway.

(A) D4

(B) D5

(C) D2

(D) D1

Correct Answer: (C) D2

Solution: Most **antipsychotic drugs** function by **blocking dopamine D2 receptors**, reducing **dopaminergic hyperactivity**. This mechanism mitigates **positive symptoms of schizophrenia**, such as **hallucinations and delusions**. **Other dopamine receptor subtypes**, like **D1, D4, and D5**, play different roles in neurophysiology.

Quick Tip

D2 receptor antagonism is central to antipsychotic drug function, balancing dopamine levels in the brain.

---

161. Artificial moon is being developed by which country?

(A) USA

(B) Japan

(C) China

(D) KSA

Correct Answer: (C) China

Solution: **China** has initiated projects related to **artificial moons**, primarily for **urban illumination purposes**. This technology aims to supplement **night lighting** using **reflective satellites**, reducing **electricity dependency**. Other nations focus on **space-based solar power and artificial celestial bodies**.

Quick Tip

Artificial moons could revolutionize urban lighting and space research applications.

---

162. The reduced dose requirement of isoniazid is observed in patients who are:

(A) Fast acetylator
(B) Slow acetylator
(C) G6PD deficient
(D) CYP450 induced

Correct Answer: (B) Slow acetylator

Solution: **Isoniazid metabolism** is influenced by **N-acetyltransferase enzyme polymorphism**. Patients with **slow acetylation** exhibit **reduced drug clearance**, leading to **higher plasma concentrations** and **increased drug effects**. Fast acetylators metabolize **isoniazid rapidly**, requiring **higher doses** for therapeutic efficacy.

Quick Tip

Genetic variations in drug metabolism influence dosage requirements and therapeutic outcomes.

---

163. 3,5-Dinitrobenzoic acid will give how many peaks in ^1H NMR?

(A) 4

(B) 3

(C) 2

(D) 1

Correct Answer: (B) 3

Solution: **3,5-Dinitrobenzoic acid** exhibits **three distinct proton environments** due to **substituent symmetry**. The **nitro groups at positions 3 and 5** reduce chemical inequivalence, leading to **fewer signals** in **^1H NMR spectrum**. Aromatic protons appear as **deshielded signals** due to electron-withdrawing effects.

Quick Tip

Symmetry in molecular structure directly influences the number of distinct signals in NMR spectra.

---

164. Which of the following drugs works as a proteasome inhibitor?

(A) Nilotinib

(B) Infliximab

(C) Bortezomib

(D) Filgrastim

Correct Answer: (C) Bortezomib

Solution: **Bortezomib** is a **proteasome inhibitor** used in **multiple myeloma and mantle cell lymphoma** treatment. It disrupts **protein degradation pathways**, causing **apoptosis in cancer cells** by preventing the breakdown of **pro-apoptotic proteins**. Other drugs listed function via **alternative mechanisms**, not proteasome inhibition.

Quick Tip

Proteasome inhibitors selectively target cancer cell survival mechanisms, triggering cell death.

165. All of the following are typical cholinergic effects EXCEPT:

(A) A decrease in heart rate and contraction of bronchial muscle

(B) A decrease in conduction velocity through the AV node

(C) An increase in sweat secretion

(D) An increase in pupillary diameter

Correct Answer: (D) An increase in pupillary diameter

Solution: **Cholinergic effects** typically involve **parasympathetic activation**, leading to **bradycardia, bronchoconstriction, increased secretion, and pupil constriction (miosis)**. An **increase in pupillary diameter** (mydriasis) is an effect of **adrenergic stimulation**, not **cholinergic activity**.

Quick Tip

Cholinergic drugs mimic parasympathetic neurotransmission, influencing various physiological functions.

166. Agarose is a polysaccharide, composed of:

(A) D-galactose and agarobiose

(B) D-glucuronic acid and sulfated D-glucuronic acid

(C) D-glucuronic acid and glucosamine

(D) D-galactose and 3,6-anhydro-L-galactopyranose

Correct Answer: (D) D-galactose and 3,6-anhydro-L-galactopyranose

Solution: **Agarose**, widely used in **gel electrophoresis**, consists of **D-galactose and 3,6-anhydro-L-galactopyranose**. Its **gel-forming properties** enable separation of **biomolecules**, including **DNA, RNA, and proteins**. Other options describe different **polysaccharide compositions**, not specific to agarose.

Quick Tip

Agarose gels provide an efficient medium for molecular separation in analytical biochemistry.

---

167. Which of the following forces is dictated by entropic effects?

(A) Atom-atom repulsion based on the Pauli Exclusion principle

(B) Electrostatic interactions

(C) Hydrophobic interactions

(D) Charge-transfer interactions

Correct Answer: (C) Hydrophobic interactions

Solution: **Hydrophobic interactions** are largely governed by **entropy-driven effects**, occurring when **nonpolar molecules cluster** to minimize **water structuring** around them. This reduces the **overall entropy loss**, favoring **thermodynamic stability**. Other forces, such as **electrostatic or charge-transfer interactions**, are dictated by **electromagnetic effects**.

Quick Tip

Hydrophobic interactions stabilize protein folding and membrane formation by minimizing water structuring.

---

168. Which of the following functional groups is a classical isostere for -CH= ?

(A) $-CH_2$

(B) -NH-

(C) -N-

(D) COOH

Correct Answer: (C) -N-

Solution: **Classical isosteres** are functional groups that **mimic steric and electronic properties**. The **-N- group** serves as a **classical isostere for -CH=**, as **both contribute similar electronic effects** while modifying **biochemical interactions**. Other choices introduce **distinct electronic or steric differences**.

Quick Tip

Isosteric modifications in drug design help enhance biological activity while maintaining molecular function.

---

169. As much as 70 percent of all the APIs needed by India to manufacture drugs come from:

(A) China

(B) India

(C) Taiwan

(D) Belgium

Correct Answer: (A) China

Solution: A substantial portion of **Active Pharmaceutical Ingredients (APIs)** used in India's **drug production** originates from **China**. APIs are essential for **drug formulation**, and **global supply chains** influence manufacturing costs and availability. Efforts are ongoing to **boost domestic API production** to reduce dependence on imports.

Quick Tip

API production plays a critical role in pharmaceutical supply chains and global healthcare accessibility.

---

170. Alogliptin, saxagliptin, and vildagliptin share a structural feature responsible for reaction with DPP-4. What is that?

(A) Nitrilo group

(B) β-aminoacid group

(C) Adamantane ring

(D) Pyrrolidine

Correct Answer: (A) Nitrilo group

Solution: **DPP-4 inhibitors**, including **alogliptin, saxagliptin, and vildagliptin**, contain a **nitrilo (-CN) group**, crucial for **enzyme inhibition**. This structural motif enhances **DPP-4 binding affinity**, prolonging **GLP-1 activity** to **improve glycemic control in diabetes**. Other groups listed have **different pharmacological roles**.

Quick Tip

The nitrilo group enhances selectivity in DPP-4 inhibition, aiding in diabetes management.

---

171. The approximate δ value of methyl proton in ^1H NMR is:

(A) 1.3

(B) 1.5

(C) 0.9

(D) 2.5

Correct Answer: (C) 0.9

Solution: The **chemical shift (δ) of a methyl (-CH_3) proton** in **^1H NMR** typically falls around **0.9 ppm**, depending on **substituents and molecular environment**. Other values represent **different functional groups** or **electronic influences**.

Quick Tip

Chemical shift values in ^1H NMR help identify functional group environments in organic molecules.

172. 100 proof ethanol means it is:

(A) 100%

(B) 75%

(C) 60%

(D) 50%

Correct Answer: (D) 50%

Solution: Alcohol **proof** is measured as **twice the ethanol percentage** in solution. Thus, **100-proof ethanol** corresponds to **50The **proof system** originated for **alcohol purity assessment** in historical distillation.

Quick Tip

Alcohol proof is a legacy measurement system used to indicate ethanol concentration in beverages.

---

173. Select the drug indicated for extended drug resistance tuberculosis (XDR TB).

(A) Linezolid

(B) Moxifloxacin

(C) Tyrocidin

(D) Azithromycin

Correct Answer: (A) Linezolid

Solution: **Linezolid** is an **oxazolidinone antibiotic** recommended for **XDR-TB**, particularly for **cases resistant to multiple first-line drugs**. It inhibits **bacterial protein synthesis** by **binding to the 50S ribosomal subunit**, preventing infection spread. Other drugs listed have **different antibacterial spectrums**, with **limited efficacy against XDR-TB**.

Quick Tip

Effective treatment of XDR-TB involves a combination of antibiotics tailored to resistance patterns.

---

174. Which of the following quantities is not changed at different magnetic field strength?

(A) Chemical shift (in Hz)

(B) Nuclear spin population in an energy state

(C) J-coupling constant

(D)

Energy difference between two energy states of nuclei with nonzero spin quantum number

Correct Answer: (C) J-coupling constant

Solution: **J-coupling constants** remain **independent of magnetic field strength**, representing **intramolecular spin-spin interactions**. **Chemical shift (Hz), nuclear spin populations, and energy differences** are influenced by **magnetic field variations**, altering spectral properties. The **J-coupling constant** is determined by **bond connectivity and electronic environment**.

Quick Tip

J-coupling constants provide insight into molecular connectivity, regardless of magnetic field strength.

---

175. Choose the WRONG statement about mass spectrometry with ESI.

(A) It is very unlikely for adducts to occur during ESI.

(B) ESI can be used for thermally labile analytes.

(C) Adjusting the pH might enhance the generation of ions.

(D) It has easy compatibility with LC.

Correct Answer: (A) It is very unlikely for adducts to occur during ESI.

Solution: **Electrospray Ionization (ESI)** often forms **adducts**, such as **Na^+ or K^+**, influencing mass spectra interpretation. It is **suitable for thermally labile compounds**, enhances ion formation **via pH adjustment**, and integrates **efficiently with LC-MS workflows**. Thus, statement (A) is incorrect.

Quick Tip

ESI facilitates ionization of biomolecules while allowing soft ionization without fragmentation.

---

176. Which are the host cell membrane receptors that the outer coat protein gp-120 of HIV binds to?

(A) CD4 and CCR5

(B) Pepsin and adenylyl cyclase

(C) IP3 and cytochrome-c

(D) Bicoid and nanos

Correct Answer: (A) CD4 and CCR5

Solution: The **gp120 protein** of **HIV** binds to **CD4 receptors** on immune cells, facilitating **viral entry**. Co-receptors such as **CCR5 or CXCR4** further **mediate fusion**, allowing HIV to **infect T-cells**. Other options represent unrelated **enzymes or developmental regulators**.

Quick Tip

HIV targets immune cells by engaging CD4 and CCR5/CXCR4 co-receptors, leading to viral replication.

---

177. In LC-MS instrument, interface is applied between:

(A) LC column and mass separator

(B) Injection and ion source

(C) LC column and ion source

(D) LC column and detector

Correct Answer: (C) LC column and ion source

Solution: **LC-MS interfaces** bridge **liquid chromatography (LC) and mass spectrometry (MS)**, ensuring **efficient analyte transfer**. The **interface is placed between LC column and ion source**, converting **liquid-phase analytes into gas-phase ions**. This transition enables **mass spectrometric detection**.

Quick Tip

LC-MS coupling requires specialized interfaces to preserve sample integrity and ensure effective ionization.

---

178. Microwave spectroscopy is generally used to detect:

(A) Functional groups

(B) Double bonds

(C) Isotopes

(D) Unpaired electrons

Correct Answer: (C) Isotopes

Solution: **Microwave spectroscopy** detects **molecular rotational transitions**, making it useful for **isotope identification**. Since isotopes have **different atomic masses**, their **rotational spectra shift**, allowing precise differentiation. Other methods, such as **IR spectroscopy**, are more suited for **functional groups and double bonds**.

Quick Tip

Microwave spectroscopy provides insights into molecular rotational behavior and isotope differentiation.

179. Which of the following is NOT true?

(A) Magnets (200 MHz-900 MHz) are made of superconducting wires

(B) Room temperature shims are in a liquid nitrogen vessel

(C) Liquid helium and liquid nitrogen are needed to maintain the magnetic field

(D) The magnet solenoid is in a liquid helium vessel

Correct Answer: (B) Room temperature shims are in a liquid nitrogen vessel

Solution: Room temperature shims in an NMR system are **not placed in a liquid nitrogen vessel**, but rather **positioned externally** to adjust the **static magnetic field homogeneity**. Superconducting magnets require **cryogenic cooling with liquid helium and nitrogen** to maintain their functionality.

Quick Tip

Superconducting magnets require ultra-low temperatures for stable operation in NMR spectrometers.

---

180. The purpose of shimming is to:

(A) Stabilize the static magnetic field

(B) Obtain homogeneity of the static magnetic field

(C) Find the lock frequency

(D) Obtain homogeneity of the B_1 field

Correct Answer: (B) Obtain homogeneity of the static magnetic field

Solution: **Shimming** is performed to ensure **homogeneity** of the **static magnetic field (B_0)**, which is crucial for **high-resolution NMR spectroscopy**. Poor shimming results in **broadened spectral lines**, affecting **signal resolution**.

Quick Tip

Proper shimming enhances spectral resolution by optimizing magnetic field uniformity in NMR.

---

181. Tyndall effect is shown by:

(A) Particles in colloidal solution

(B) Particles in very fine suspension

(C) Aerosols

(D) All of the above

Correct Answer: (D) All of the above

Solution: **Tyndall effect** refers to the **scattering of light** by **small particles** suspended in a medium. It is observed in **colloidal solutions, fine suspensions, and aerosols**, where **light is dispersed due to particle interaction**. This phenomenon helps in **distinguishing true solutions from colloidal mixtures**.

Quick Tip

Tyndall effect is used in analytical chemistry to examine colloidal stability and composition.

---

182. Who is the founder of Lupin?

(A) Desh Bandhu Gupta

(B) Khwaja Abdul Hamied

(C) Dilip Shanghvi

(D) Habil Khorakiwala

Correct Answer: (A) Desh Bandhu Gupta

Solution: **Desh Bandhu Gupta** founded **Lupin**, one of India's leading **pharmaceutical companies**. Lupin specializes in **formulations, generics, and active

pharmaceutical ingredients (APIs)**. Other individuals listed are **prominent figures in the Indian pharmaceutical industry**, but did not establish Lupin.

Quick Tip

Lupin is a major pharmaceutical company, playing a key role in India's global drug market.

---

183. Neutropenia is an adverse effect of all of the following EXCEPT:

(A) Rituximab & Ganciclovir

(B) Phenytoin & Clarithromycin

(C) Propyl thiouracil & Carbamazepine

(D) Clozapine & Colchicine

Correct Answer: (B) Phenytoin & Clarithromycin

Solution: **Neutropenia**, a decrease in **neutrophil count**, is a **potential side effect** of drugs like **rituximab, ganciclovir, clozapine, and colchicine**. **Phenytoin and clarithromycin**, however, **do not typically induce neutropenia**, making (B) the correct answer.

Quick Tip

Certain drugs cause neutropenia, requiring regular monitoring to prevent severe immunosuppression.

---

184. The phenomenon of Fermi resonance is observed in:

(A) UV spectroscopy

(B) IR spectroscopy

(C) NMR spectroscopy

(D) ESR spectroscopy

Correct Answer: (B) IR spectroscopy

Solution: **Fermi resonance** occurs in **infrared (IR) spectroscopy** when two **closely spaced vibrational modes** interact, resulting in **enhanced intensity and frequency shifts**. This effect modifies **spectral interpretation**, influencing **band positions and molecular analysis**.

Quick Tip

Fermi resonance impacts IR spectral band shapes, requiring careful assignment in molecular characterization.

---

185. Hydroxychloroquine is:

(A) 4-Amino quinoline

(B) 8-Amino quinoline

(C) 9-Aminoacridine

(D) 8-Hydroxyquinoline

Correct Answer: (A) 4-Amino quinoline

Solution: **Hydroxychloroquine** belongs to the **4-aminoquinoline class**, used primarily for **malaria treatment and autoimmune diseases**. It functions by **modulating immune responses** and interfering with **parasite metabolism**. Other options represent distinct **quinoline derivatives** with **different pharmacological roles**.

Quick Tip

Hydroxychloroquine is widely used in **rheumatoid arthritis and lupus** for its immunomodulatory effects.

---

186. Gibbs free energy (F) is defined as:

(A) $F = E - Ts$

(B) $F = H - Ts$

(C) $F = H + TS$

(D) $F = E + TS$

Correct Answer: (B) $F = H - TS$

Solution: **Gibbs free energy (G)** is a thermodynamic function defined as:

$$G = H - TS$$

where **H** is enthalpy, **T** is temperature, and **S** is entropy. It determines **spontaneity of reactions**, with **negative ΔG** indicating a **spontaneous process**.

Quick Tip

Gibbs free energy is crucial in predicting chemical reaction spontaneity and equilibrium behavior.

---

187. Apart from TNF-alpha inhibitors, which IL-6 receptor antagonist has been found effective in treating arthritis?

(A) Anakinra
(B) Leflunomide
(C) Rituximab
(D) Tocilizumab

Correct Answer: (D) Tocilizumab

Solution: **Tocilizumab** is an **IL-6 receptor antagonist** used in **rheumatoid arthritis** treatment. It blocks **IL-6 signaling**, reducing **inflammation and autoimmune damage**. TNF-alpha inhibitors are common for **RA management**, but **IL-6 inhibition provides an alternative therapeutic pathway**.

Quick Tip

IL-6 inhibitors help manage inflammatory conditions resistant to TNF-alpha blockers.

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188. The time taken for 5% of a drug to decompose by first-order kinetics is:

(A) $0.022/k_1$

(B) $0.051/k_1$

(C) $0.105/k_1$

(D) $k_1/0.051$

Correct Answer: (B) $0.051/k_1$

Solution: First-order kinetics follows:

$$t = \frac{\ln(1/f)}{k}$$

For **5% decomposition**, $f = 0.95$, yielding:

$$t = \frac{\ln(1/0.95)}{k} = \frac{0.051}{k}$$

This equation governs **drug degradation and stability predictions**.

Quick Tip

First-order kinetics applies to most drug degradation processes, aiding shelf-life determinations.

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189. Based on their half-lives, which drug would you select for a sustained-release tablet?

(A) Metformin (6 hr)

(B) Heroin (2-6 mins)

(C) Cocaine (50 mins)

(D) Amlodipine (20 hrs)

Correct Answer: (A) Metformin (6 hr)

Solution: **Sustained-release tablets** are suitable for drugs with **moderate half-lives** (4-8 hours), ensuring **controlled drug release**. **Metformin (6 hr)** fits this profile,

allowing **prolonged therapeutic action** while **reducing dosing frequency**. Drugs with **very short or long half-lives** are **less suited for sustained-release formulations**.

Quick Tip

Sustained-release formulations help maintain steady drug levels, improving compliance and therapeutic efficacy.

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190. A partial theoretical support for the idea that more stable carbocations would be formed faster than less stable ones comes during regioselective addition of HCl to propene is provided by:

(A) The Hammond postulate
(B) Markovnikov's rule
(C) Saytzeff's rule
(D) The Diels-Alder rule

Correct Answer: (A) The Hammond postulate

Solution: **The Hammond postulate** suggests that **transition states resemble the species closest in energy**. For regioselective **HCl addition to propene**, the **more stable carbocation intermediate forms faster**, due to a **lower energy transition state**, supporting the **reaction mechanism**.

Quick Tip

The Hammond postulate explains why reactions favor the formation of more stable intermediates.

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191. Mode of action of nerve gas is:

(A) Blocking of acetylcholinesterase
(B) Blocking of serotonergic action
(C) Blocking of cholinergic action

(D) Blocking of noradrenergic action

Correct Answer: (A) Blocking of acetylcholinesterase

Solution: **Nerve gases** such as **sarin and VX** act by **irreversibly inhibiting acetylcholinesterase**, leading to **accumulation of acetylcholine** at **synapses**, resulting in **neuromuscular overstimulation**. This leads to **paralysis and respiratory failure**, requiring **rapid antidote administration**.

Quick Tip

Nerve agents disrupt neurotransmission by preventing acetylcholine breakdown.

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192. The heating effect is used in the measurement of the wavelength of:

(A) X-rays
(B) Infrared
(C) Ultraviolet rays
(D) Visible light

Correct Answer: (B) Infrared

Solution: **Infrared (IR) radiation** is absorbed by **molecular bonds**, causing **heat generation**, which is fundamental for **IR spectroscopy**. Other **radiations (UV, X-ray, visible)** primarily influence **electronic transitions** rather than heat effects.

Quick Tip

Infrared radiation increases molecular vibrational energy, making it useful for thermal measurements.

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193. Which form of electrochemical measurement does NOT involve electrolysis?

(A) Coulometry
(B) Voltammetry

(C) Amperometry

(D) Potentiometry

Correct Answer: (D) Potentiometry

Solution: **Potentiometry** measures **electrochemical potential differences** **without inducing electrolysis**, making it ideal for **pH measurement and ion-selective analysis**. Other techniques involve **electrolysis** to determine **chemical concentrations**.

Quick Tip

Potentiometric methods provide electrochemical insights without requiring applied current.

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194. Who is the founder and CEO of Netmeds Marketplace Limited?

(A) Pradeep Dadha

(B) Kalyan Krishnamurthy

(C) Byju Raveendran

(D) Ananth Narayanan

Correct Answer: (A) Pradeep Dadha

Solution: **Pradeep Dadha** is the **founder and CEO** of **Netmeds Marketplace Limited**, a **leading online pharmacy platform** in **India**, providing access to **prescription medicines**. Other individuals listed are **prominent business figures but are not associated with Netmeds**.

Quick Tip

Netmeds simplifies pharmaceutical access by offering doorstep medication delivery services.

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195. Which of the following are incorrectly paired?

(A) Gluconeogenesis: cortisol

(B) Hepatic glycogenesis: insulin

(C) Muscle glycogenolysis: epinephrine

(D) Kaliuresis: aldosterone

Correct Answer: (D) Kaliuresis: aldosterone

Solution: **Aldosterone promotes sodium retention and potassium excretion**, meaning it does not directly cause **kaliuresis (excess potassium loss in urine)**. Other pairings correctly correspond to **hormonal metabolic regulation**.

Quick Tip

Aldosterone regulates electrolyte balance by enhancing sodium retention and potassium excretion.

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196. Probability always lies between:

(A) 0 and infinite

(B) 0 and 1

(C) -infinite and + infinite

(D) 1 and infinite

Correct Answer: (B) 0 and 1

Solution: **Probability values** range from **0 (impossible event) to 1 (certain event)** and cannot exceed these limits. Values outside this range would be **mathematically invalid**.

Quick Tip

Probabilities are bounded by 0 and 1, representing certainty and impossibility.

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197. Friedel-Crafts reaction is observed in:

(A) Nitrobenzene

(B) Aniline

(C) Both A and B

(D) None of the above

Correct Answer: (D) None of the above

Solution: **Nitrobenzene and aniline deactivate benzene for Friedel-Crafts reactions**, since nitro and amino groups withdraw electron density or coordinate strongly with Lewis acids, preventing successful **alkylation/acylation**.

Quick Tip

Electron-withdrawing or coordinating groups hinder Friedel-Crafts reactions by disrupting electrophilic activation.

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198. Over-expression of __ in somatic cells leads to cell immortalization.

(A) p53

(B) Cadherin

(C) Telomerase

(D) DNA ligase

Correct Answer: (C) Telomerase

Solution: **Telomerase maintains telomere length**, preventing **cellular senescence** and enabling **uncontrolled division**, a key feature in **cancer cell immortalization**.

Quick Tip

Telomerase overexpression sustains indefinite cell division, a hallmark of cancer.

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199. Which of the following peptides is cyclic in nature?

(A) Glutathione

(B) Gramicidin

(C) Met-enkephalin

(D) Dynorphin

Correct Answer: (B) Gramicidin

Solution: **Gramicidin** is a **cyclic peptide**, forming **ion channels in bacterial membranes** to facilitate antibiotic function. Other peptides have **linear structures**.

Quick Tip

Cyclic peptides often exhibit enhanced stability and bioactivity compared to linear counterparts.

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200. The term WIPO stands for:

(A) World Internet Policy Organization

(B) Wildlife Investigation and Policing Organization

(C) World Institute for Prevention of Organized Crime

(D) World Intellectual Property Organization

Correct Answer: (D) World Intellectual Property Organization

Solution: **WIPO** is a **global organization** responsible for **intellectual property (IP) protection**, including **patents, copyrights, and trademarks** across member nations.

Quick Tip

WIPO facilitates international cooperation in innovation, trademark, and copyright protection.
