

PGIMER B.SC PARAMEDICAL SAMPLE PAPER 02

A) Time Allowed: 1 Hour 30 Minutes.

B) Maximum Marks: 100

C) Total Questions: 100

General Instructions:

- This paper consists of five sections: Biology (25), Chemistry (25), Physics (25), English (10), and General Knowledge (15).
- Each question has four options (A, B, C, D), with only one correct answer.
- +1 mark is awarded for each correct answer and 0.25 marks are deducted for each incorrect answer.
- The question paper is available in English language only.

SECTION 1 : PHYSICS

- Q1. A satellite is orbiting the Earth in a circular orbit of radius r . If the orbital radius is increased to $4r$, the period of revolution will increase by a factor of:
- A) 2
 - B) 4
 - C) 8
 - D) 16
- Q2. A block of mass m slides down a frictionless incline of angle θ . The acceleration of the block is:
- A) g
 - B) $g \sin \theta$
 - C) $g \cos \theta$
 - D) $g \tan \theta$
- Q3. The Work-Energy Theorem states that the net work done on an object is equal to:
- A) Change in potential energy
 - B) Change in kinetic energy
 - C) Total mechanical energy
 - D) Change in power
- Q4. In a perfectly elastic collision between two bodies of equal mass where one is initially at rest, the striking body:
- A) Comes to rest
 - B) Continues with the same velocity
 - C) Rebounds with double velocity
 - D) Moves with half the initial velocity
- Q5. The temperature of a gas is doubled and its volume is halved. The new pressure P' in terms of initial pressure P is:
- A) P
 - B) $2P$
 - C) $4P$
 - D) $8P$
- Q6. The Root Mean Square (RMS) velocity of gas molecules is:
- A) $\sqrt{3RT/M}$
 - B) $\sqrt{2RT/M}$
 - C) $\sqrt{8RT/\pi M}$
 - D) RT/M
- Q7. If the current in a solenoid is doubled and the number of turns per unit length is halved, the magnetic field inside the solenoid:
- A) Remains the same
 - B) Becomes double
 - C) Becomes half
 - D) Becomes four times

- Q8. A thin lens of refractive index 1.5 has a focal length of 20 cm in air. Its focal length when immersed in a liquid of refractive index 1.5 is:
- A) 20 cm
 - B) 40 cm
 - C) Infinite
 - D) Zero
- Q9. Two coherent sources of intensity I and $4I$ produce interference. The ratio of maximum to minimum intensity is:
- A) 3:1
 - B) 9:1
 - C) 5:1
 - D) 4:1
- Q10. The threshold frequency for a metal surface is f_0 . If light of frequency $2f_0$ is incident on it, the maximum kinetic energy of emitted photoelectrons is:
- A) hf_0
 - B) $2hf_0$
 - C) $hf_0/2$
 - D) Zero
- Q11. In a transistor, the base is made very thin and lightly doped to:
- A) Increase base current
 - B) Increase collector current
 - C) Reduce recombination of carriers
 - D) Prevent overheating
- Q12. The ripple factor in a half-wave rectifier is:
- A) 1.21
 - B) 0.48
 - C) 0.81
 - D) 0.69
- Q13. A radioactive substance has a decay constant λ . The mean life is:
- A) λ
 - B) $1/\lambda$
 - C) $\lambda \ln 2$
 - D) 0.693λ
- Q14. The internal resistance of a cell with EMF E and terminal voltage V when connected to an external resistance R is:
- A) $r = R(E - V)V$
 - B) $r = R(V - E)V$
 - C) $r = R(E - V)E$
 - D) $r = E - VR$
- Q15. A charge q is placed at the center of a cube. The total electric flux through all faces of the cube is:
- A) q/ϵ_0
 - B) $q/6\epsilon_0$

- C) $q/2\epsilon_0$
D) Zero
- Q16. The resonance frequency of an LCR circuit is:
A) $\sqrt{LC}$
B) $1/\sqrt{LC}$
C) $2\pi\sqrt{LC}$
D) $1/(2\pi\sqrt{LC})$
- Q17. Which electromagnetic wave has the highest penetrating power?
A) Infrared
B) Ultraviolet
C) X-rays
D) Gamma rays
- Q18. A string of length L is fixed at both ends. The frequency of the fundamental mode is proportional to:
A) L
B) $1/L$
C) L^2
D) $1/L^2$
- Q19. If the mass of the Earth were doubled and its radius halved, the acceleration due to gravity g would:
A) Remain the same
B) Double
C) Become 4 times
D) Become 8 times
- Q20. Viscous force on a spherical body of radius r moving with velocity v in a fluid of viscosity η is (Stokes' Law):
A) $6\pi\eta rv$
B) $4\pi\eta rv$
C) $\pi\eta rv$
D) $6\pi\eta r^2v$
- Q21. In a Wheatstone bridge, the condition for a balanced bridge is:
A) $P + Q = R + S$
B) $P/Q = R/S$
C) $P/R = Q/S$
D) Both B and C
- Q22. The entropy of the universe in any irreversible process:
A) Increases
B) Decreases
C) Remains constant
D) Becomes zero
- Q23. A laser beam is highly monochromatic and coherent because it involves:
A) Spontaneous emission
B) Stimulated emission

- C) Absorption
- D) Scattering

Q24. The magnetic moment of a current loop is:

- A) I/A
- B) IA
- C) I^2A
- D) I/A^2

Q25. The de-Broglie wavelength associated with a particle of momentum p is:

- A) hp
- B) h/p
- C) p/h
- D) h^2p



SECTION 2 : CHEMISTRY

- Q26. In the substitution reaction of an alkyl halide with OH^- , which solvent would favor the S_N2 mechanism?
- A) Water
 - B) Methanol
 - C) Acetone (Polar Aprotic)
 - D) Formic acid
- Q27. The correct order of stability for the following carbocations is:
- A) Methyl > Ethyl > Isopropyl > Tert-butyl
 - B) Tert-butyl > Isopropyl > Ethyl > Methyl
 - C) Ethyl > Methyl > Tert-butyl > Isopropyl
 - D) Isopropyl > Tert-butyl > Methyl > Ethyl
- Q28. Which of the following complexes exhibits linkage isomerism?
- A) $[Co(NH_3)_5Cl]Cl_2$
 - B) $[Co(NH_3)_5(NO_2)]Cl_2$
 - C) $[Co(NH_3)_6][Cr(CN)_6]$
 - D) $[Co(en)_2Cl_2]Cl$
- Q29. In the Arrhenius equation $k = Ae^{-E_a/RT}$, the factor $e^{-E_a/RT}$ represents:
- A) Total number of collisions
 - B) Fraction of molecules with energy $\geq E_a$
 - C) Frequency factor
 - D) Rate of reaction
- Q30. The primary product formed when Phenol reacts with Br_2 in CS_2 at low temperature is:
- A) 2,4,6-Tribromophenol
 - B) o-Bromophenol
 - C) p-Bromophenol
 - D) Both B and C
- Q31. Which of the following isotopes is used to determine the age of archaeological artifacts?
- A) ^{14}C
 - B) ^{12}C
 - C) ^{235}U
 - D) ^{60}Co
- Q32. The geometry of $[Cu(NH_3)_4]^{2+}$ ion is:
- A) Tetrahedral
 - B) Square planar
 - C) Octahedral
 - D) Trigonal bipyramidal
- Q33. Which of the following is NOT an electrophile?
- A) BF_3
 - B) $AlCl_3$
 - C) NH_3
 - D) NO_2^+

- Q34. The osmotic pressure of a solution can be increased by:
- A) Increasing the volume
 - B) Increasing the number of solute particles
 - C) Lowering the temperature
 - D) Adding more solvent
- Q35. The basic strength order of methyl-substituted amines in aqueous solution is influenced by:
- A) Inductive effect only
 - B) Solvation effect only
 - C) Steric hindrance only
 - D) Combination of Inductive, Solvation, and Steric effects
- Q36. Which compound undergoes a self-oxidation-reduction (disproportionation) reaction in the presence of concentrated alkali?
- A) Acetone
 - B) Benzaldehyde
 - C) Acetaldehyde
 - D) Formaldehyde
- Q37. The Gold Number is a measure of:
- A) Purity of gold
 - B) Protective power of a lyophilic colloid
 - C) Concentration of gold sol
 - D) Efficiency of gold extraction
- Q38. In the extraction of Aluminum, the role of Cryolite (Na_3AlF_6) is to:
- A) Lower the melting point of alumina
 - B) Act as a reducing agent
 - C) Purify the ore
 - D) Prevent oxidation
- Q39. Which hybridization corresponds to a trigonal bipyramidal geometry?
- A) sp^3
 - B) sp^3d
 - C) sp^3d^2
 - D) dsp^2
- Q40. The Freundlich Adsorption Isotherm equation is:
- A) $x/m = kP^{1/n}$
 - B) $x/m = kP^n$
 - C) $x/m = kP$
 - D) $P = k(x/m)$
- Q41. Which of the following is a non-reducing sugar?
- A) Glucose
 - B) Fructose
 - C) Sucrose
 - D) Maltose

- Q42. What is the product of the reaction between CH_3MgBr and CO_2 followed by acid hydrolysis?
- A) Ethanol
 - B) Acetic acid
 - C) Methanol
 - D) Propan-2-ol
- Q43. The coordination number of Cl^- ions in a $CsCl$ crystal lattice is:
- A) 6
 - B) 8
 - C) 4
 - D) 12
- Q44. Which transition series element has the highest melting point?
- A) W (Tungsten)
 - B) Fe
 - C) Cu
 - D) Zn
- Q45. The Riemer-Tiemann reaction introduces which group into the phenol ring?
- A) $-COOH$
 - B) $-CHO$
 - C) $-CH_3$
 - D) $-OH$
- Q46. In the electrochemical series, the standard electrode potential (E^0) of a metal is a measure of its:
- A) Reactivity as a reducing agent
 - B) Reactivity as an oxidizing agent
 - C) Density
 - D) Conductivity
- Q47. Which of the following molecules has the highest bond angle?
- A) CH_4
 - B) NH_3
 - C) H_2O
 - D) $BeCl_2$
- Q48. The Hinsberg reagent used to distinguish between primary, secondary, and tertiary amines is:
- A) Benzene sulfonyl chloride
 - B) Acetyl chloride
 - C) Nitrous acid
 - D) Phosphorus pentachloride
- Q49. Which is the correct IUPAC name for $CH_3 - CH(OH) - CH_2 - CHO$?
- A) 3-hydroxybutanal
 - B) 1-hydroxybutan-3-one
 - C) 4-hydroxybutan-2-one
 - D) 3-oxobutan-1-ol

Q50. The lattice energy of an ionic compound depends on:

- A) Charge of ions and inter-ionic distance
- B) Only the mass of the ions
- C) Temperature only
- D) Solvent type

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SECTION 3 : BIOLOGY

- Q51. Which component of the respiratory membrane is the primary determinant of the rate of gas diffusion according to Fick's Law?
- A) Surfactant layer
 - B) Alveolar epithelium
 - C) Interstitial space
 - D) Capillary endothelium
- Q52. During DNA replication in eukaryotes, which enzyme is responsible for removing RNA primers and replacing them with DNA?
- A) DNA Polymerase α
 - B) DNA Polymerase δ
 - C) DNA Polymerase ϵ
 - D) FEN1
- Q53. In the context of the lac operon, what is the role of allolactose?
- A) It acts as a repressor
 - B) It binds to the operator
 - C) It acts as an inducer by binding to the repressor
 - D) It stimulates RNA polymerase
- Q54. Which stage of meiosis involves the completion of the synaptonemal complex?
- A) Leptotene
 - B) Zygotene
 - C) Pachytene
 - D) Diplotene
- Q55. The Cori Cycle is an energy-conserving pathway that specifically prevents:
- A) Ketoacidosis
 - B) Lactic acidosis
 - C) Hyperglycemia
 - D) Protein catabolism
- Q56. In a nephron, which part is responsible for the counter-current multiplication mechanism?
- A) Proximal Convoluted Tubule
 - B) Loop of Henle
 - C) Distal Convoluted Tubule
 - D) Collecting Duct
- Q57. The Golgi apparatus is involved in the post-translational modification of proteins. Which specific modification typically occurs here?
- A) Proteolysis
 - B) Glycosylation
 - C) Phosphorylation
 - D) Ubiquitination
- Q58. Myasthenia Gravis is an autoimmune disorder that affects communication at the neuro-muscular junction by:
- A) Blocking release of Acetylcholine

- B) Destroying Nicotinic Acetylcholine receptors
 - C) Inhibiting Acetylcholinesterase
 - D) Damaging motor neurons
- Q59. Which of these cells in the Islets of Langerhans is responsible for secreting Somatostatin?
- A) α -cells
 - B) β -cells
 - C) δ -cells
 - D) F-cells
- Q60. The T-tubules in muscle fibers are continuous with which structure?
- A) Sarcoplasmic reticulum
 - B) Sarcolemma
 - C) Myofibrils
 - D) Z-discs
- Q61. Which hormone directly stimulates the conversion of Angiotensinogen to Angiotensin I?
- A) ACE
 - B) Aldosterone
 - C) Renin
 - D) ADH
- Q62. What is the primary physiological effect of Atrial Natriuretic Peptide (ANP)?
- A) Vasoconstriction
 - B) Sodium retention
 - C) Sodium excretion and vasodilation
 - D) Increased ADH release
- Q63. In the electron transport chain, Complex IV (Cytochrome c oxidase) catalyzes the reduction of:
- A) NAD^+ to NADH
 - B) O_2 to H_2O
 - C) FAD to $FADH_2$
 - D) Ubiquinone to Ubiquinol
- Q64. Which of the following is an example of an imprinted gene?
- A) IGF2
 - B) BRCA1
 - C) CFTR
 - D) Hemoglobin
- Q65. The Hering-Breuer reflex is activated specifically when the lung volume exceeds:
- A) Tidal volume
 - B) Expiratory reserve volume
 - C) Inspiratory capacity
 - D) Vital capacity
- Q66. Which amino acid is considered conditionally essential in humans?
- A) Arginine
 - B) Leucine

- C) Lysine
D) Tryptophan
- Q67. What is the outcome of nondisjunction during Meiosis II?
A) $n + 1$, $n - 1$, n , n gametes
B) $n + 1$, $n + 1$, $n - 1$, $n - 1$ gametes
C) $n + 1$, $n - 1$ gametes
D) All abnormal gametes
- Q68. Which of the following is the final electron acceptor in the process of cyclic photophosphorylation?
A) $NADP^+$
B) O_2
C) $P700$
D) Ferredoxin
- Q69. The Signal Peptide of a protein destined for secretion is typically located at the:
A) C-terminus
B) N-terminus
C) Middle of the sequence
D) Intron region
- Q70. Which immunoglobulin is associated with the mucosal immune system and prevents pathogen attachment?
A) IgG
B) IgA
C) IgM
D) IgD
- Q71. The Sarcomere shortens during muscle contraction because:
A) Actin filaments shorten
B) Myosin filaments shorten
C) Filaments slide past each other
D) The Z-discs degrade
- Q72. What enzyme is deficient in Phenylketonuria?
A) Phenylalanine hydroxylase
B) Tyrosinase
C) Homogentisate oxidase
D) Glucose-6-phosphatase
- Q73. Which hormone is released by the hypothalamus to stimulate the release of ACTH?
A) CRH
B) GHRH
C) TRH
D) GnRH
- Q74. In DNA, Guanine always pairs with Cytosine via:
A) One hydrogen bond
B) Two hydrogen bonds

- C) Three hydrogen bonds
- D) Four hydrogen bonds

Q75. The Fluid Mosaic Model highlights the lateral movement of which components?

- A) Integral proteins and lipids
- B) Peripheral proteins only
- C) Nucleotides
- D) Cytoskeleton



SECTION 4 : ENGLISH

- Q76. Which word best replaces “Ineffable” in a sentence?
A) Clearly spoken
B) Indescribable
C) Commonplace
D) Temporary
- Q77. Select the sentence with the correct usage of the subjunctive mood:
A) I wish I was there.
B) I wish I were there.
C) I wish I am there.
D) I wish I be there.
- Q78. Identify the meaning of the idiom “To pull someone’s leg”:
A) To physically restrain someone
B) To deceive someone seriously
C) To tease someone playfully
D) To ask someone for a favor
- Q79. “The architect’s design was _____; it lacked any distinctive features or creativity.”
A) Opulent
B) Pedestrian
C) Avant-garde
D) Resplendent
- Q80. Choose the grammatically correct sentence:
A) Between you and I, this plan is flawed.
B) Between you and me, this plan is flawed.
C) Between I and you, this plan is flawed.
D) Between me and you, this plan is flawed.
- Q81. Which word is the antonym of “Ebullient”?
A) Vivacious
B) Depressed
C) Effervescent
D) Enthusiastic
- Q82. Select the correctly spelled word:
A) Occurrence
B) Ocurence
C) Occurence
D) Ocurrence
- Q83. “Despite his _____ background, he managed to rise to the position of CEO through sheer grit.”
A) Illustrious
B) Plebeian
C) Regal
D) Aristocratic

- Q84. Which sentence uses “whom” correctly?
- A) Whom did you call?
 - B) Whom did he say was coming?
 - C) Whom shall I say is calling?
 - D) To whom should I give the report?
- Q85. The word “Esoteric” implies knowledge that is:
- A) Widely understood
 - B) Intended for a specialized few
 - C) Based on ancient history
 - D) Highly scientific
- Q86. Identify the error in the following sentence: “Neither the captain nor the crew were able to escape the sinking ship.”
- A) “Neither” is wrong.
 - B) “nor” is wrong.
 - C) “were” should be “was”.
 - D) The sentence is correct.
- Q87. Which word is a synonym for “Capricious”?
- A) Steadfast
 - B) Whimsical
 - C) Consistent
 - D) Methodical
- Q88. “The politician’s _____ speech swayed the undecided voters.”
- A) Tedious
 - B) Verbose
 - C) Eloquent
 - D) Incoherent
- Q89. Which is the correct plural form of “Criterion”?
- A) Criteria
 - B) Criteria
 - C) Criterias
 - D) Criterion
- Q90. Choose the sentence that correctly uses a participle phrase:
- A) Walking down the street, the trees looked beautiful.
 - B) Walking down the street, I saw beautiful trees.
 - C) Having walked down the street, the trees were seen.
 - D) Walking down the street, it was seen that trees were beautiful.

SECTION 5 : GENERAL KNOWLEDGE

- Q91. The Mohorovičić discontinuity (Moho) marks the boundary between which two layers of the Earth?
- A) Inner core and outer core
 - B) Crust and mantle
 - C) Mantle and outer core
 - D) Lithosphere and asthenosphere
- Q92. Which international treaty, signed in 1987, was designed to protect the ozone layer by phasing out the production of CFCs?
- A) Kyoto Protocol
 - B) Montreal Protocol
 - C) Paris Agreement
 - D) Basel Convention
- Q93. In 1921, Albert Einstein received the Nobel Prize in Physics for his work on:
- A) General Relativity
 - B) The Photoelectric Effect
 - C) Brownian Motion
 - D) Special Relativity
- Q94. The Doldrums, a region of calm and light winds, are located near:
- A) The Arctic Circle
 - B) The Tropic of Cancer
 - C) The Equator
 - D) The Subtropics
- Q95. Which of these is the only internal organ of the human body capable of regenerating lost tissue?
- A) Heart
 - B) Liver
 - C) Kidneys
 - D) Pancreas
- Q96. The Bessemer process was a significant historical innovation for the mass production of:
- A) Glass
 - B) Steel
 - C) Synthetic rubber
 - D) Paper
- Q97. Which element is the most abundant metal in the Earth's crust?
- A) Iron
 - B) Aluminum
 - C) Calcium
 - D) Sodium
- Q98. The Gini Coefficient is a statistical measure primarily used to evaluate:
- A) Industrial output
 - B) Income inequality

- C) Life expectancy
 - D) Environmental pollution
- Q99. Who was the first woman to win a Nobel Prize, and the only person to win in two different scientific fields (Physics and Chemistry)?
- A) Rosalind Franklin
 - B) Barbara McClintock
 - C) Marie Curie
 - D) Dorothy Hodgkin
- Q100. The Great Schism of 1054 led to the split between the Roman Catholic Church and which other body?
- A) The Eastern Orthodox Church
 - B) The Protestant Church
 - C) The Anglican Church
 - D) The Coptic Church

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SOLUTIONS

Q1. Answer: C

Using Kepler's Third Law, $T^2 \propto r^3$. Therefore,

$$\frac{T'}{T} = \left(\frac{4r}{r}\right)^{3/2} = 4^{3/2} = 8$$

Hence, the period increases by a factor of 8.

Q2. Answer: B

The component of gravitational acceleration along the incline is:

$$a = g \sin \theta$$

Q3. Answer: B

The Work-Energy Theorem states:

$$W_{net} = \Delta K$$

where ΔK is the change in kinetic energy.

Q4. Answer: A

In a perfectly elastic collision between equal masses, the moving body transfers all its velocity to the stationary body and comes to rest.

Q5. Answer: C

Using the ideal gas equation:

$$PV = nRT$$

If temperature doubles and volume becomes half,

$$P' = \frac{nR(2T)}{V/2} = 4P$$

Q6. Answer: A

The RMS speed of gas molecules is:

$$v_{rms} = \sqrt{\frac{3RT}{M}}$$

Q7. Answer: A

Magnetic field inside a solenoid:

$$B = \mu_0 nI$$

If I doubles and n halves, the product nI remains unchanged.

Q8. Answer: C

When the refractive index of the lens and surrounding medium become equal, refraction ceases and:

$$f = \infty$$

Q9. Answer: B

$$I_{\max} = (\sqrt{I} + \sqrt{4I})^2 = (3\sqrt{I})^2 = 9I$$

$$I_{\min} = (\sqrt{I} - \sqrt{4I})^2 = (\sqrt{I})^2 = I$$

Therefore,

$$I_{\max} : I_{\min} = 9 : 1$$

Q10. Answer: A

Using Einstein's photoelectric equation:

$$K_{\max} = h\nu - h\nu_0$$

For $\nu = 2\nu_0$,

$$K_{\max} = 2h\nu_0 - h\nu_0 = h\nu_0$$

Q11. Answer: C

A thin and lightly doped base minimizes recombination so that most charge carriers reach the collector.

Q12. Answer: A

The ripple factor of a half-wave rectifier is:

$$r = 1.21$$

Q13. Answer: B

Mean life is related to decay constant by:

$$\tau = \frac{1}{\lambda}$$

Q14. Answer: A

Since

$$E = V + Ir$$

and

$$I = \frac{V}{R}$$

therefore,

$$r = \frac{R(E - V)}{V}$$

Q15. Answer: A

According to Gauss's law:

$$\Phi = \frac{q}{\epsilon_0}$$

Q16. Answer: D

Resonant frequency:

$$f = \frac{1}{2\pi\sqrt{LC}}$$

Q17. **Answer: D**

Gamma rays possess the highest frequency and energy, hence the greatest penetrating power.

Q18. **Answer: B**

For a stretched string:

$$f = \frac{1}{2L} \sqrt{\frac{T}{\mu}}$$

Thus, frequency is inversely proportional to length.

Q19. **Answer: D**

$$g = \frac{GM}{R^2}$$

If mass doubles and radius becomes half:

$$g' = \frac{G(2M)}{(R/2)^2} = \frac{2GM}{R^2/4} = 8g$$

Q20. **Answer: A**

According to Stokes' law:

$$F = 6\pi\eta r v$$

Q21. **Answer: D**

For a balanced Wheatstone bridge:

$$\frac{P}{Q} = \frac{R}{S}$$

which is equivalent to

$$\frac{P}{R} = \frac{Q}{S}$$

Q22. **Answer: A**

According to the second law of thermodynamics, entropy of the universe increases in an irreversible process.

Q23. **Answer: B**

Laser action is based on stimulated emission, producing coherent and monochromatic light.

Q24. **Answer: B**

Magnetic moment of a current loop:

$$\mu = IA$$

Q25. **Answer: B**

De-Broglie wavelength:

$$\lambda = \frac{h}{p}$$

Q26. **Answer: C**

Polar aprotic solvents enhance the nucleophilicity of OH^- by not strongly solvating it. Therefore, acetone favors the S_N2 mechanism.

Q27. Answer: B

Carbocation stability increases with increasing alkyl substitution due to hyperconjugation and inductive effects:

**Q28. Answer: B**

The nitrite ion (NO_2^-) is an ambidentate ligand and can coordinate through nitrogen or oxygen, resulting in linkage isomerism.

Q29. Answer: B

In the Arrhenius equation,

$$k = Ae^{-E_a/RT}$$

the term $e^{-E_a/RT}$ represents the fraction of molecules possessing energy equal to or greater than the activation energy.

Q30. Answer: D

Phenol reacts with bromine in a non-polar solvent such as CS_2 to give a mixture of ortho- and para-bromophenol.

Q31. Answer: A

Radiocarbon dating uses the radioactive isotope:



to estimate the age of archaeological samples.

Q32. Answer: B

The complex $[\text{Cu}(\text{NH}_3)_4]^{2+}$ commonly exhibits square planar geometry due to Jahn-Teller distortion.

Q33. Answer: C

NH_3 possesses a lone pair and acts as a nucleophile (Lewis base), not as an electrophile.

Q34. Answer: B

Osmotic pressure is given by:

$$\pi = iCRT$$

Hence increasing the number of solute particles increases osmotic pressure.

Q35. Answer: D

The basic strength of amines in aqueous solution depends on inductive effect, solvation of the conjugate acid, and steric hindrance.

Q36. Answer: D

Formaldehyde undergoes the Cannizzaro reaction in concentrated alkali because it lacks an α -hydrogen atom.

Q37. Answer: B

Gold number measures the protective power of a lyophilic colloid in preventing coagulation of a gold sol.

Q38. Answer: A

Cryolite lowers the melting point of alumina and increases the electrical conductivity of the electrolyte.

Q39. Answer: B

Trigonal bipyramidal geometry corresponds to:



hybridization.

Q40. Answer: A

Freundlich adsorption isotherm is:

$$\frac{x}{m} = kP^{1/n}$$

Q41. Answer: C

Sucrose is a non-reducing sugar because both anomeric carbons participate in glycosidic bond formation.

Q42. Answer: B

Grignard reagent reacts with carbon dioxide followed by hydrolysis to form a carboxylic acid with one extra carbon atom:



Q43. Answer: B

In the CsCl crystal structure, each Cl^- ion is surrounded by 8 Cs^+ ions. Therefore, its coordination number is 8.

Q44. Answer: A

Tungsten (W) possesses the highest melting point among the listed transition metals because of very strong metallic bonding.

Q45. Answer: B

The Reimer-Tiemann reaction introduces a formyl group:



into the ortho position of phenol.

Q46. Answer: A

A more negative standard electrode potential indicates a stronger tendency to lose electrons and act as a reducing agent.

Q47. Answer: D

$BeCl_2$ is linear with a bond angle of:

$$180^\circ$$

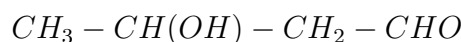
which is greater than the bond angles in the other molecules.

Q48. Answer: A

Hinsberg reagent is benzene sulfonyl chloride, used for distinguishing primary, secondary, and tertiary amines.

Q49. Answer: A

The aldehyde carbon has highest priority and is numbered as carbon-1:



Hence the IUPAC name is 3-hydroxybutanal.

Q50. Answer: A

According to the Born-Landé concept, lattice energy depends primarily on ionic charges and the distance between the ions.

Q51. Answer: B

According to Fick's Law, the rate of diffusion is inversely proportional to the thickness of the respiratory membrane. The alveolar epithelium forms a major component of this diffusion barrier.

Q52. Answer: D

In eukaryotic DNA replication, the RNA primer is removed by FEN1 (Flap Endonuclease 1), and the gap is subsequently filled with DNA.

Q53. Answer: C

Allolactose acts as an inducer by binding to the lac repressor, causing it to detach from the operator and allowing transcription.

Q54. Answer: C

During the pachytene stage of Prophase I, synapsis is complete and the synaptonemal complex is fully formed.

Q55. Answer: B

The Cori cycle transports lactate from muscles to the liver, where it is converted back to glucose, thereby preventing lactic acidosis.

Q56. Answer: B

The Loop of Henle establishes the osmotic gradient in the medulla through the counter-current multiplication mechanism.

Q57. Answer: B

Protein glycosylation is one of the major post-translational modifications carried out in the Golgi apparatus.

Q58. Answer: B

Myasthenia Gravis results from autoantibodies directed against nicotinic acetylcholine receptors at the neuromuscular junction.

Q59. Answer: C

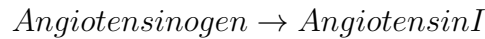
δ -cells of the Islets of Langerhans secrete somatostatin, which inhibits the release of several hormones.

Q60. Answer: B

T-tubules are invaginations of the sarcolemma and are continuous with the muscle cell membrane.

Q61. Answer: C

Renin catalyzes the conversion:

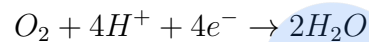


Q62. Answer: C

ANP promotes sodium excretion (natriuresis) and vasodilation, thereby reducing blood volume and blood pressure.

Q63. Answer: B

Complex IV transfers electrons to oxygen and catalyzes:



Q64. Answer: A

IGF2 (Insulin-like Growth Factor 2) is a classic example of a genomically imprinted gene.

Q65. Answer: C

The Hering-Breuer inflation reflex becomes significant when lung expansion approaches inspiratory capacity, preventing overinflation.

Q66. Answer: A

Arginine is considered conditionally essential because the body may not synthesize sufficient amounts during growth or physiological stress.

Q67. Answer: A

Nondisjunction during Meiosis II produces:

$$n + 1, n - 1, n, n$$

gametes.

Q68. Answer: C

In cyclic photophosphorylation, electrons return to the reaction center chlorophyll:



which acts as the final electron acceptor.

Q69. Answer: B

Signal peptides directing proteins for secretion are generally located at the N-terminus of the polypeptide chain.

Q70. Answer: B

IgA is the principal immunoglobulin in mucosal secretions and prevents pathogen attachment to epithelial surfaces.

Q71. Answer: C

According to the sliding filament theory, muscle contraction occurs because actin and myosin filaments slide past each other without shortening.

Q72. Answer: A

Phenylketonuria (PKU) is caused by deficiency of:

PhenylalanineHydroxylase

Q73. Answer: A

Corticotropin-Releasing Hormone (CRH) from the hypothalamus stimulates the anterior pituitary to release ACTH.

Q74. Answer: C

Guanine pairs with Cytosine through three hydrogen bonds, providing additional stability to the DNA double helix.

Q75. Answer: A

The Fluid Mosaic Model describes the lateral movement of membrane lipids and many integral membrane proteins within the phospholipid bilayer.

Q76. Answer: B

The word “Ineffable” means something too great or extreme to be expressed in words. Therefore, “Indescribable” is the closest synonym.

Q77. Answer: B

The subjunctive mood is used to express wishes or hypothetical situations. The correct form is:

IwishIwerethere.

Q78. Answer: C

The idiom “to pull someone’s leg” means to tease or joke with someone in a playful manner.

Q79. Answer: B

“Pedestrian” means ordinary, dull, or lacking imagination, which best fits the context.

Q80. Answer: B

After a preposition such as “between,” objective pronouns are required. Hence:

Betweenyouandme, thisplanisflawed.

Q81. Answer: B

“Ebullient” means cheerful, energetic, and enthusiastic. Its antonym is “depressed.”

Q82. Answer: A

The correct spelling is:

Occurrence

Q83. Answer: B

“Plebeian” refers to an ordinary or common background, making it the most appropriate choice.

Q84. Answer: D

“Whom” is correctly used as the object of the preposition “to”:

To whom should I give the report?

Q85. Answer: B

“Esoteric” refers to knowledge intended for or understood by a small, specialized group of people.

Q86. Answer: D

The sentence is grammatically correct. In constructions using “neither...nor,” the verb agrees with the noun closest to it. Since “crew” is plural in this context, “were” is acceptable.

Q87. Answer: B

“Capricious” means unpredictable or subject to sudden changes in mood or behavior. “Whimsical” is its closest synonym.

Q88. Answer: C

An “eloquent” speech is persuasive, fluent, and effective in influencing listeners.

Q89. Answer: B

The plural form of “criterion” is:

Criteria

Q90. Answer: B

The participle phrase “Walking down the street” correctly modifies the subject “I”:

Walking down the street, I saw beautiful trees.