# ANSWER KEY

## SECTION-A PHYSICS

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 4 | 1 |
| **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** |
| 2 | 2 | 2 | 1 | 1 | 3 | 4 | 1 | 3 | 3 |
| **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** |
| 1 | 1 | 2 | 4 | 2 | 1 | 1 | 4 | 4 | 1 |
| **31** | **32** | **33** | **34** | **35** | | | | | |
| 4 | 4 | 2 | 1 | 2 | | | | | |

## SECTION-B PHYSICS

| | | | | | **36** | **37** | **38** | **39** | **40** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 1 | 3 | 2 | 2 |
| **41** | **42** | **43** | **44** | **45** | 46 | 47 | 48 | 49 | 50 |
| 4 | 3 | 4 | 4 | 3 | **2** | **2** | **2** | **1** | **3** |

## SECTION-A CHEMISTRY

| **51** | **52** | **53** | **54** | **55** | **56** | **57** | **58** | **59** | **60** |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 1 | 4 | 3 | 1 | 3 | 3 | 3 | 2 | 3 |
| **61** | **62** | **63** | **64** | **65** | **66** | **67** | **68** | **69** | **70** |
| 3 | 4 | 2 | 1 | 2 | 3 | 2 | 3 | 4 | 2 |
| **71** | **72** | **73** | **74** | **75** | **76** | **77** | **78** | **79** | **80** |
| 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 4 | 2 |
| **81** | **82** | **83** | **84** | **85** | | | | | |
| 3 | 2 | 1 | 4 | 3 | | | | | |

## SECTION-B CHEMISTRY

| | | | | | **86** | **87** | **88** | **89** | **90** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 3 | 4 | 2 | 1 |
| **91** | **92** | **93** | **94** | **95** | **96** | **97** | **98** | **99** | **100** |
| 3 | 2 | 2 | 3 | 3 | **1** | **2** | **3** | **2** | **4** |

**SECTION-A BOTANY**

| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 4 | 3 | 3 | 1 | 3 | 1 | 3 | 1 | 2 |
| **111** | **112** | **113** | **114** | **115** | **116** | **117** | **118** | **119** | **120** |
| 2 | 3 | 4 | 3 | 2 | 1 | 2 | 2 | 1 | 4 |
| **121** | **122** | **123** | **124** | **125** | **126** | **127** | **128** | **129** | **130** |
| 4 | 4 | 2 | 2 | 1 | 3 | 1 | 1 | 3 | 1 |
| **131** | **132** | **133** | **134** | **135** | | | | | |
| 3 | 1 | 1 | 2 | 4 | | | | | |

**SECTION-B BOTANY**

| | | | | | 136 | 137 | 138 | 139 | 140 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 1 | 4 | 3 | 4 |
| **141** | **142** | **143** | **144** | **145** | **146** | **147** | **148** | **149** | **150** |
| 4 | 2 | 4 | 3 | 3 | **3** | **2** | **2** | **2** | **2** |

**SECTION-A ZOOLOGY**

| 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 4 | 3 | 4 | 4 | 2 | 3 | 1 | 2 | 2 |
| **161** | **162** | **163** | **164** | **165** | **166** | **167** | **168** | **169** | **170** |
| 4 | 3 | 4 | 3 | 1 | 1 | 2 | 4 | 2 | 2 |
| **171** | **172** | **173** | **174** | **175** | **176** | **177** | **178** | **179** | **180** |
| 2 | 1 | 1 | 3 | 4 | 3 | 3 | 1 | 3 | 3 |
| **181** | **182** | **183** | **184** | **185** | | | | | |
| 3 | 1 | 4 | 3 | 3 | | | | | |

**SECTION-B ZOOLOGY**

| | | | | | 186 | 187 | 188 | 189 | 190 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2 | 2 | 4 | 3 | 2 |
| **191** | **192** | **193** | **194** | **195** | **196** | **197** | **198** | **199** | **200** |
| 2 | 3 | 1 | 4 | 2 | 2 | 3 | 2 | 3 | 3 |

## HINTS AND SOLUTIONS

### SECTION-I [PHYSICS]

**1.** **(1)**

$$x = \left(\frac{10\text{ kg}}{1\text{ kg}}\right)^1 \left(\frac{60\text{ m}}{1\text{ m}}\right)^2 \left(\frac{60\text{ s}}{1\text{ s}}\right)^{-2}$$

$= 10$

**2.** **(2)**

Fact based

**3.** **(1)**

$$t = \sqrt{t_1^2 + t_2^2} = \sqrt{3^2 + 4^2} = 5\text{ s}$$

**4.** **(2)**

$$v = \frac{dx}{dt} = 0 \Rightarrow 2t - 4 = 0$$

$\Rightarrow t = 2\text{ s}$

**5.** **(1)**

**6.** **(1)**

**7.** **(1)**

$$f = mg\sin\theta$$

$$= 10 \times 10 \times \frac{3}{5} = 60\text{ N}$$

**8.** **(1)**

$$\frac{h'}{h} = \frac{(100 - 36)}{100}$$

$\Rightarrow h' = 0.64\text{ H}$

**9.** **(4)**

$F_{ex} = 0 \Rightarrow V_{cm} = U_{cm} = 0$

**10.** **(1)**

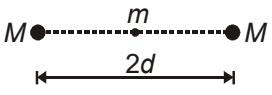
$$\omega_0 = \left(\frac{1200}{60}\right) = 20\text{ rps}$$

$$\therefore\ \omega_{av} = \left(\frac{0 + 20}{2}\right) = 10$$

$\therefore N = 10 \times 10 = 100$

**11.** **(2)**

**12.** **(2)**




$$U = -2\frac{GMm}{d}$$

$$\Rightarrow \frac{1}{2}mv^2 = \frac{2GMm}{d}$$

$$\Rightarrow v_e = 2\sqrt{\frac{GM}{d}}$$

**13.** **(2)**

**14.** **(1)**

$$\theta_f = \frac{40\times 60 - 80\times 30}{40+30}$$

$$= \frac{2400-2400}{70}$$

$$= 0^\circ C$$

**15.** **(1)**

$$\frac{T_1}{T_2} = \frac{\lambda_2}{\lambda_1} = \frac{1.5\,\lambda_0}{\lambda_0} = \frac{3}{2}$$

**16.** **(3)**

**17.** **(4)**

$$\eta_{max} = 1 - \frac{300}{900} = 1 - \frac{1}{3} = \frac{2}{3}$$

$$\Rightarrow 66.7\%$$

$\therefore$ For a practical engine < 66.7%.

**18.** **(1)**

$$\lambda \propto \frac{V}{N}$$

$\Rightarrow N$ decreases as gas escapes.

**19.** **(3)**

$$\frac{T_1}{T_2} = \frac{p_0 \times 4V_0}{p_0 \times V_0} = \frac{4}{1},\ v_{mean} \propto \sqrt{T}$$

**20.** **(3)**

**21.** **(1)**

$$\text{Effective force constant} = \frac{2k\times 2k}{2k+2k} = k$$

$$\therefore T = 2\pi\sqrt{\frac{M}{k}}$$

**22.** **(1)**

$$T \propto \frac{l}{\sqrt{g}}$$

**23.** **(2)**

$$v = \frac{\omega}{k} = \frac{2}{0.5} = 4 \text{ m/s}$$

**24.** **(4)**

**25.** **(2)**

**26.** **(1)**

$$\frac{F'}{F} = \frac{2q\cdot 2q}{q\cdot 3q} = \frac{4}{3}$$

$$\Rightarrow F' = \frac{4}{3}F$$

**27.** **(1)**

$\phi \propto q_{enclosed}$

**28.** **(4)**

**29.** **(4)**

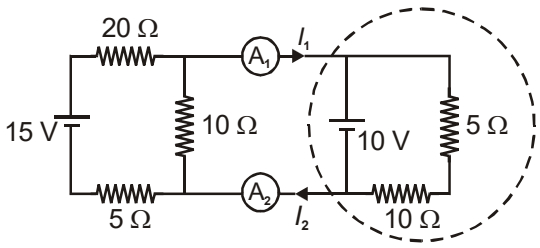
All capacitors are in parallel.

**30.** **(1)**

$\sqrt{R \times 8} = 4$

$\Rightarrow R = 2\Omega$

**31.** **(4)**




From Kirchhoff's junction law $I_1 = I_2$

**32.** **(4)**

**33.** **(2)**

$$T = \frac{2\pi m}{qB}$$

$$\therefore \frac{T_p}{T_\alpha} = \frac{m}{4m} \times \frac{2e}{e} = \frac{1}{2}$$

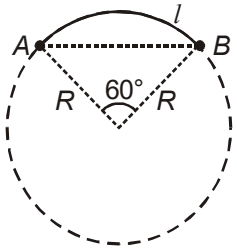
**34.** **(1)**

**35.** **(2)**

$$B = \sqrt{\left(\frac{\mu_0 i}{2\pi d}\right)^2 + \left(\frac{\mu_0 i}{2\pi d}\right)^2}$$

$$= \frac{\mu_0 i}{\sqrt{2}\,\pi d}$$

**36.** **(1)**




$l' = AB = R$

$$l = \left(\frac{2\pi R}{6}\right) \Rightarrow R = \frac{6l}{2\pi} = \frac{3l}{\pi}$$

$$\therefore \frac{M'}{M} = \frac{l'}{l} = \frac{R}{l} = \frac{3l}{\pi l} = \frac{3}{\pi}$$

$\therefore\ M' = \dfrac{3M}{\pi}$

**37.** **(1)**

$V_a - V_b = 5 \times 2 + 10 + 2 \times 3 = 26$ V

**38.** **(3)**

**39.** **(2)**

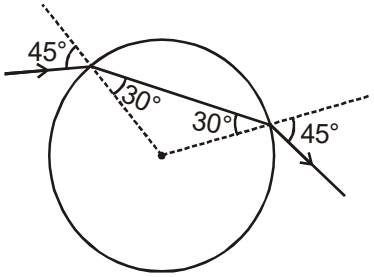
$\omega^2 = \dfrac{1}{LC} \Rightarrow LC = \dfrac{1}{\omega^2} = \dfrac{1}{\omega_1\omega_2}$

$\Rightarrow LC = \dfrac{1}{200 \times 800}$

$= \dfrac{1}{16} \times 10^{-4}$

$= 6.25 \times 10^{-6}$

**40.** **(2)**




$\therefore \delta = 2(45 - 30) = 2 \times 15 = 30°$

**41.** **(4)**

$d \geq 4f$

$\therefore\ d = 50$ cm

**42.** **(3)**

**43.** **(4)**

$i_n \propto$ intensity

**44.** **(4)**

**45.** **(3)**

$N = \dfrac{(7-3)(7-3+1)}{2}$

$= \dfrac{4 \times 5}{2}$

$= 10$

**46.** **(2)**

As displacement (in uniformly accelerated motion) = average velocity × time

The average velocity is the same, when overtaking takes place.

$15 + 30 = 20 + v$

or, $v = 25$ m/s

**47.** **(2)**

The range $R = \dfrac{2u^2 \sin\alpha\cos\alpha}{g}$

$\sin 2\alpha = \frac{Rg}{u^2} \Rightarrow Rg = u^2$, then $\sin 2\alpha = 1,$, so $\alpha = 45^o$.

$\sin 2\alpha_1 = \sin 2\alpha_2 \Rightarrow \frac{Rg}{u^2}\sin 2\alpha_1 - \sin 2\alpha_2 = 0$

or, $2\cos(\alpha_1 + \alpha_2)\sin(\alpha_1 - \alpha_2) = 0$

If $Rg < u^2, \alpha_1 + \alpha_2 = \pi/2$; if $Rg = u^2, \alpha_1 = \alpha_2 = \pi/2$

$t_1 t_2 = \frac{2u\sin\alpha_1}{g} \times \frac{2u\sin\alpha_2}{g} = \frac{4u^2\sin\alpha_1\cos\alpha_1}{g^2} = \frac{2R}{g}$

since $\alpha_1 + \alpha_2 = \pi/2$

**48. (2)**

Orbital velocity $= \sqrt{\frac{g_0 R^2}{R+h}}$ where *R* is radius of earth.

If $h = 0$, $v_0 = \sqrt{\frac{g_0 R^2}{R}} = \sqrt{g_0 R}$ If $h = \frac{R}{2}$, $v = \sqrt{\frac{g_0 R^2}{R + \frac{R}{2}}} = \sqrt{\frac{2g_0 R}{3}} = \sqrt{\frac{2}{3}}v_0$.

**49. (1)**

The potential difference depends only on the charge on the inner sphere.

**50. (3)**

$i_1 = \frac{E}{R_1 + r}; i_2 = \frac{E}{R_2 + r}$

$H = i_1^2 R_1 t = i_2^2 R_2 t$

$\left(\frac{E}{R_1 + r}\right)^2 R_1 t = \left(\frac{E}{R_2 + r}\right)^2 R_2 t, \frac{R_2 + r}{R_1 + r} = \sqrt{\frac{R_2}{R_1}}$

$\frac{R_2 - R_1}{R_1 + r} = \frac{\sqrt{R_2} - \sqrt{R_1}}{\sqrt{R_1}}$

$R_1 + r = R_1\frac{(R_2 - R_1)}{\sqrt{R_2} - \sqrt{R_1}} = \sqrt{R_1}(\sqrt{R_2} + \sqrt{R_1})$

$R_1 + r = \sqrt{R_1 R_2} + R_1$

$r = \sqrt{R_1 R_2}$

## SECTION-[CHEMISTRY]

**51.** **(4)**

**52.** **(1)**

$O_2$ molecule as per the molecular orbital configuration has two unpaired electrons where as $O_2^+$ has one, $O_2^-$ also has one and $O_2^{2-}$ does not have any unpaired electron.

**53.** **(4)**

If we begin with 2 mole reactants then in 10 minutes only 1 mole substance will be left and then so on, as shown below:

$$2\text{moles} \xrightarrow{10\,mins} 1\text{mole} \xrightarrow{10\,mins} 0.5\text{moles} \xrightarrow{10\,mins} 0.25\text{moles} \xrightarrow{10\,mins} 0.125\text{moles}$$

**54.** **(3)**

$2H^+ + 2e^- \rightarrow H_2$ . So, $E_{cell} = 0.00 - \frac{0.0591}{2}\log\frac{1}{[H^+]^2}$ or $E_{cell} = -0.0591\log[10^4] = -0.236V$

**55.** **(1)**

All isocyanides on complete hydrolysis yield primary amines and formic acid. In the same way, methyl isocyanide on complete hydrolysis will yield methylamine and HCOOH.

**56.** **(3)**

Schotten–Baumann Reaction is benzoylation reaction of both aniline and phenol. In the case of aniline, the product obtained by a reaction with benzoyl chloride is N-phenyl benzamide or benzanilide.

**57.** **(3)**

Trimethylamine is a weaker base as compared to dimethylamine due to crowding of the three methyl groups. For methyl-amines, the order of base strength will be $2^o - 1^o - 3^o$.

**58.** **(1)**

**59.** **(2)**

Out of all halo-acids, HF shows hydrogen bonding and hence has a boiling point of 19.5°C whereas HBr and HI have a value of –66°C and –35.35°C respectively due to their larger mass and hence larger Van-der Waal's forces. HCl does not show any hydrogen bonding and has moderate mass, so its boiling point is the least with a value of -85.05°C.

**60.** **(3)**

In the complex $[Co(en)_2ClNO_2]^+$, the coordination number of Cobalt is 6 as ethylene diamine is a bidentate ligand where as Cl and $NO_2$ are monodentate ligands.

**61.** **(3)**

**62.** **(3)**

**63.** **(2)**

The $-OCH_3$ group is an activating (+R) group and hence will decrease the acidic strength of the phenolic group. On the contrary, $-NO_2$ is a deactivating (-R) group and will cause the acidic strength to increase. The order of acidic strength therefore becomes p-nitrophenol ($pK_a$=7.1)> phenol ($pK_a$~9.9)> p-methoxy phenol ($pK_a$= 10.21)

**64.** **(2)**

**65.** **(2)**

Phenetole is ethoxybenzene. When treated with HI, it yields Ethyl Iodide and Phenol

**66.** **(2)**

In choice (2) acetaldehyde is undergoing self aldol condensation in Aq. $K_2CO_3$ solution to form 3-hydroxybutanal.

**67. (1)**

**68. (3)**

$p^o_{cyclohexane} = 100 mmHg$ and $p^o_{cyclopentane} = 180 mmHg$.

$p^o_{cyclohexane} \times \chi_{cyclohexane} = p_{total} \times \gamma_{cyclohexane}$ and $p^o_{cyclopentane} \times \chi_{cyclopentane} = p_{total} \times (1 - \gamma_{cyclohexane})$.

Now, dividing these equations we get,

$$\frac{100}{180} \times \frac{\chi_{cyclohexane}}{1 - \chi_{cyclohexane}} = \frac{\gamma_{cyclohexane}}{1 - \gamma_{cyclohexane}} = \frac{0.25}{0.75} = \frac{1}{3} \text{ or } \chi_{cyclohexane} = 0.375$$

$$P_{total} = (100 \times 0.375) + (180 \times 0.625) = 150 mmHg$$

**69. (4)**

For the solution, two equations can be established :

$$300 = p^o_A \times \frac{1}{3} + p^o_B \times \frac{2}{3} \quad \ldots\ldots\ldots (1)$$

$$350 = p^o_A \times \frac{1}{2} + p^o_B \times \frac{1}{2} \quad \ldots\ldots\ldots (2)$$

Solving for $p^o_A$ and $p^o_B$ we get $p^o_A$ =500 mmHg and $p^o_B$ =200 mmHg

**70. (2)**

Freezing point depression: $\Delta T_f = (\text{F.Pt of Solvent} - \text{F.Pt of solution}) = 1.7$

$$1.7 = k_f \times \frac{w_{solute}}{M.Mass_{solute}} \times \frac{1000}{w_{solvent}(g)} = \frac{5.1 \times 2 \times 1000}{M.Mass_{solute} \times 25}$$

$$M.Mass_{solute} = 240 g / mole$$

**71. (3)**

**72. (1)**

**73. (1)**

Specific conductance $(\kappa)$ of an electrolyte is defined for its unit volume. As the electrolyte is diluted with pure water, the total number of ions present in a unit volume decrease and so does specific conductance.

**74. (1)**

**75. (3)**

Learn that $\Delta H_r = (E_a)_f - (E_a)_b$ or 5 = 15 – $(E_a)_f$. This means $(E_a)_f$ = 10 kcal/mole

**76. (3)**

$k = \frac{2.303}{8hr} log \frac{a_o}{a} = \frac{2.303}{8} log \frac{1}{0.25} = 0.172 hr^{-1}$ which is the expression for flask-I

Now, for flask-II if we notice then the concentration is reducing to exactly half of its original value, that is we need the half life time for decay of A. $t_{1/2} = \frac{0.693}{0.172} = 4hrs$

**77. (3)**

$\Delta H = \Delta E + \Delta(PV)$ or $\Delta H = \Delta E + P\Delta V + V\Delta P$ but if the process is isochoric then $\Delta V = 0$. So, $\Delta H - \Delta E = V\Delta P$

**78. (3)**

If $H_2O(l)$ $H_2O(g)$ at 100°C then $\Delta n_g = 1$ and work done is $\Delta n_g RT = 1 \times 8.314 \times 373 = 3101J$ . As the work is expansive so it should be stated as –3101J

**79.** **(1)**

**80.** **(2)**

Any species can behave as a ligand if it has at least one lone pair of electrons available with it for donation.

**81.** **(3)**

AgCl is a white ppt insoluble in water but it is readily soluble in ammoniacal solution to give the soluble diamminesilver(I)chloride complex.

**82.** **(2)**

All the complexes except for $[Cr(en)_3]^{3+}$ have a plane of symmetry in them.

**83.** **(1)**

The overall reaction is the reduction of the nitrate ion by iron (II) which is oxidised to iron (III) and formation of a nitrosonium complex where nitric oxide is reduced to NO.

$2HNO_3 + 3H_2SO_4 + 6FeSO_4 \longrightarrow 3Fe_2(SO_4)_3 + 2NO + 4H_2O$

$[Fe(H_2O)_6]SO_4 + NO \longrightarrow [Fe(H_2O)_5(NO)]SO_4$ (Brown ring) $+ H_2O$

**84.** **(4)**

Facial –Meridional isomerism is the geometrical isomerism that is associated with complexes of the type $[Ma_3b_3]$

**85.** **(3)**

This is a hydrolysis reaction of ethyl chloride and yields ethanol as shown:

$CH_3CH_2Cl \xrightarrow{\text{Moist } Ag_2O} CH_3CH_2OH$

**86.** **(1)**

More the s-character in a hybridization, more its electronegativity. So, among different hybrid schemes the order of electronegativity is $sp > sp^2 > sp^3$. In $CH \equiv C - COOH$ the acidic strength will be maximum due to the highest (-I) effect of an sp carbon. The order of acidic strength therefore becomes $CH \equiv C - COOH > CH_2 = CH - COOH > CH_3 - CH_2 - COOH$

**87.** **(3)**

N-bromosuccinimde is used for free radical bromination on allylic or benzylic carbons as both allylic and benzylic free radicals are resonance stabilised. The product of bromination on toluene will be benzyl bromide

**88.** **(4)**

The halogen in chlorobenzene is resonance stabilised with the ring and has partial double bond character. As double bonds have high bond dissociation energy so the halogen cannot be substituted directly from over the ring by using a nucleophile.

**89.** **(2)**

Perkin's reaction also called Perkin's condensation is used to make α, β -unstaurated carboxylic acids.

**90.** **(1)**

In p-nitro toluene, the bromine atom on electrophilic substitution occupies the ortho location next to the methyl group. Learn that the methyl group is activating whereas the nitro group is deactivating.

**91.** **(2)**

**92. (2)**

The Duff reaction or hexamine aromatic formylation is a formylation reaction used in organic chemistry for the synthesis of benzaldehydes with hexamine as the formyl carbon source. The electrophilic species in this electrophilic aromatic substitution reaction is the iminium ion $CH_2^+NR_2$. The initial reaction product is an iminium which is hydrolyzed to the aldehyde.

**93. (2)**

In non-polar solvents like $CS_2$ or $CCl_4$, the dominant product mixture contains mono-brominated products.

**94. (3)**

Cannizarro Reaction between formaldehyde and benzaldehyde using NaOH will cause the hydride transfer from formaldehyde to benzaldehyde and hence form sodium methanoate and benzyl alcohol.

**95. (3)**

**96. (1)**

**97. (2)**

**98. (4)**

**99. (2)**

**100. (4)**

## BOTANY

**101. (2)**

Present in the axils (angle between the upper surface of a leaf stalk and stem that bears it).

**102. (4)**

Increase in girth is due to secondary meristem.

Apical and Intercalary meristem Both are primary meristem and are responsible for increase in length

**103. (3)**

Insects are the most numerous, i.e., 7, out of 10 animals on earth are insects

**104. (3)**

Conventional taxonomic methods are not suitable for identifying the microbial species, because many of them cannot be cultured.

**105. (1)**

Bacteria Kingdom

Blue-green algae – Prokaryotes

Nitrogen-fixing bacteria – Prokaryotes

Methanogenic bacteria – Prokaryotes

**106. (3)**

Cholera, Typhoid, Tetanus – Bacterial diseases

Dinoflagellates, Euglenoids & Slimemoulds – Protista

Diatoms are the chief producers in the ocean.

**107. (1)**

Heterocysts present in Anabaena is specialised for nitrogen fixation

**108. (3)**

**Quiescent stage :** In this phase cell remains metabolically active but do not proliferate unless they are called on to do so.

**Generation time:** Time between two consecutive cell cycles i.e., Time taken by the number of cells to be doubled.

**Kinetochore :** Trilamellar proteinaceous structure present at centromere.It is attachment site for spindle fibers.

**109. (1)**

While $G_1$ phase – Organelles duplicate in this phase

$G_2$ phase – Tubulin protein synthesis

M phase – Mitotic phase

**110. (2)**

Interphase stage of cell cycle involves growth of cell and does not involves division of cell.

**111. (2)**

Humification results in formation of acidic, dark coloured substance known as humus.

**112. (3)**

Major conduit of energy in land and aquatic ecosystem is transferred through detritus food chain and grazing food chain respectively.

**113. (4)**

All aspects are related with microbial colonies.

**114. (3)**

LAB checks disease causing microbes in our stomach.

**115. (2)**

Criteria of essentiality say that element must not be replacable by any another element and it must be indespensable and should have a demonstratable function.

**116. (1)**

Carbon and nitrogen are essential macronutrients, they are present in concentration, more than 10 m mole/ kg of dry matter, i.e., why macronutrients.

**117. (2)**

C – N – C

**118. (2)**

DNA pol III: Read DNA segment and add nucleotide of DNA

**119. (1)**

Grel electrophoresis will separate the DNA segment.

**120. (4)**

Photosynthesis is not the main function of the root system.

**121. (4)**

Phylloclade is stem modification in *Euphorbia.*

**122. (4)**

All statements/features are related with predators.

**123. (2)**

A J-shaped growth curve depicts exponential growth, when conditions are unlimited.

**124. (2)**

Hill used chlorella for proving that photosynthesis completed in two phase i.e., light and dark phase.

**125. (1)**

When a photon of light strikes the reaction centre of PS II, it emites an electron. Two $H_2O$ molecules bind to an enzyme at reaction centre and enzyme splits the water and $H^+$ are released in the lumen and also $O_2$ is produced.

**126. (3)**
In Bundle sheath cells agranal chloroplast present

**127. (1)**
Increase in protoplasm content is difficult to measure, while surface area, volume and dry weight measurement are easy.

**128. (1)**
IAA and IBA used in parthenocarpy.
Parthenocarpic i.e., seedless fruits are produced by using diluted form of IAA and IBA e.g., tomato.

**129. (3)**
During flowering stimulus recevied by leaves.

**130. (1)**
Laminarin is the stored food in brown algae e.g., *Dictyota.*
*Volvox* and *Chlamydomonas* are green algae *Polysiphonia* is a red alga

**131. (3)**
In mosses the sex organs are present in the leafy gametophytic stage.

**132. (1)**
Sea kelps are sources of $I_2$ & $Br_2$ which are useful for curing goiter.

**133. (1)**
Trisomy of 21 chromosome

**134. (1)**

**135. (4)**
Bacteria are called nearly immortal because the cell does not die but undergoes binary fission

**136. (1)**
Maize $\rightarrow$ 2n $\rightarrow$ 20
Rice $\rightarrow$ 2n $\rightarrow$ 24
Onion $\rightarrow$ 2n $\rightarrow$ 32
Apple $\rightarrow$ 2n $\rightarrow$ 34

**137. (1)**
i.e., Glycolysis, after that fate of pyruvic acid is decided.

**138. (4)**
1 NADPH $\rightarrow$ 3 ATP
3 NADPH $\rightarrow$ 9 ATP

**139. (3)**
Sporopollenin $\rightarrow$ Caratenoid derivative

**140. (4)**
Mucilage covering in pollen grain is found in aquatic plants.

**141. (1)**

**142. (1)**

**143. (4)**
Metabolism is a defining feature.

**144. (3)**
In binomial nomenclature, Ist name is genus, 2nd is species epithet and 3rd is author's name (optional).

**145. (1)**

**146. (3)**

Gill fungi – Trama (central part)

Cup fungi – Apothecium (Peziza & Ascobolus)

Black mould – Zygophore Blue/Green mould – Penicillin

**147. (2)**

Characters belong to brown algae are – Alginic acid – Trumpet hyphae – Haplodiplontic life cycle – Fucoxanthin

**148. (2)**

Fabaceae – Diadelphous stamen – Marginal placentation – Large posterior petal

**149. (2)**

Pollens are spherical and average size is 25-50 μm. Sporopollenin do not get destroyed by any known chemical.

**150. (2)**

Mitochondrial inheritance is cytoplasmic inheritance and male gamete carry only nucleus.

## ZOOLOGY

**151. (2)**

*Vipera* (viper snake) belongs to sub-order Ophidia of class Reptilia and possess three chambered heart.

*Testudo* (Tortoise), belongs to order Chelonia of class Reptilia, possess three chambered heart.

*Hemidactylus* (House lizard) belongs to sub-order Lacertilia of class-Reptilia, possess three chambered heart.

*Crocodilus* (crocodile) possesses four chambered heart.

**152. (4)**

Skin in Aves is dry and without glands, except oil gland and spleen gland at base of tail for lubrication of feathers. Air sacs in Aves help in respiration and excretory function in Aves is mediated by kidneys. Heart is completely four chambered in birds.

**153. (3)**

Features of *Petromyzon* (Lamprey) are:

*Petromyzon* are marine fishes but they migrate to fresh water (rivers) for spawning. Such migration anadromous migration.

*Petromyzon* has ammocoete larva, which migrate from fresh water (river) to ocean.

*Petromyzon* belong to class cyclostomata which are ectoparasite on some fishes.

*Petromyzon* bear circular and suctorial mouth with sanguivorous feeding habit.

**154. (4)**

Option **(4)** is incorrectly matched as correct match will be

| | | | |
|---|---|---|---|
| (1) | Millipede | Terrestrial organism with two pairs of appendages attached to each of its many body segments and respire through trachea | Class Diplopoda<br>Phylum Arthropoda |
| (2) | *Nereis* | Numerous setae on lateral appendages called parapodia | Class Polychaeta<br>Phylum Annelida |
| (3) | *Taenia solium* | Body is covered with cuticle alimentary canal is absent | Class Cestoda<br>Phylum Platyhelminthes |
| (4) | Ctenophores | Radially symmetric animals, devoid | Phylum Ctenophora |

| | | | |
|---|---|---|---|
| | | of cnidoblast, no polyp like stage is present in their life cycle | |

**155. (4)**

Inner lining of cheeks is stratified keratinised squamous epithelium. This epithelium is compound epithelium in which cells of superficial layer are squamous, i.e. polygonal and flattened in outline.

**156. (2)**

Each leg in cockroach has five segments in the following order

Broad short proximal coxa

Triangular short and rod like trochanter

Long, strong and spiny femur

Spiny and longest segment called tibia

Long tarsus

**157. (3)**

The blood from heart is pumped into sinuses anteriorly by contraction and relaxation of paired muscles called Alary muscles. Contraction of alary muscles cause floating of dorsal diaphragm and pericardial sinus increase in volume.

**158. (1)**

Because, hydrolases are the enzyme which catalyse the breakdown of larger molecules into smaller molecules with the addition of water.

**Isomerases :** They are the enzymes which catalyse the rearrangement of molecular structure to form isomers.

**Ligases:** They help in joining C-O, C-S, C-N etc. bonds by using energy of ATP.

**159. (2)**

Option **(1)** is wrong, because alanine contains an amino group and an acidic group at ct-carbon in the molecule.

Option **(3)** is wrong, because palmitic acid is a saturated fatty acid with 16C atoms.

Option **(4)** is wrong, because adenylic acid is form by adding phosphate group to adenosine.

**160. (2)**

**161. (4)**

**162. (3)**

**163. (4)**

**164. (3)**

**165. (1)**

Minute volume = TV × Breathing rate

500 ml × 12 – 16 /min $\Rightarrow$ 6000 – 8000 ml/ min

Minute volume is also known as pulmonary ventilation.

**166. (1)**

Pneuomotaxic centre is present in the pons region of hind brain.

It is also known as "switch off point of inspiration" i.e. it reduces the duration of inspiration and alter the respiratory rate and depth of breathing.

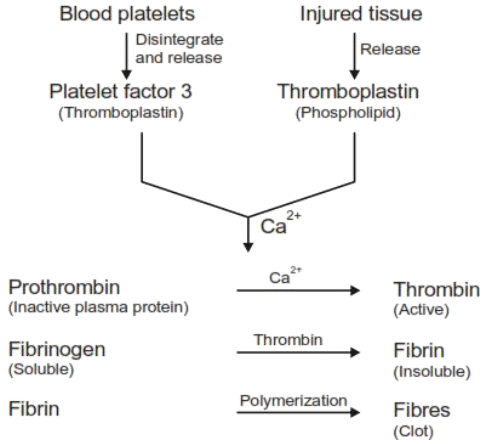
**167. (2)**

During a cardiac cycle, each ventricle pumps out approximately 70 mL of blood, (stroke volume)

Cardiac output = Stroke volume × Number of beats per minute

= 70 mL × 72 beats/min = 5040 mL/min ≅ 5 L/min

**168. (4)**




**169. (2)**

Time interval between the closure of semilunar valve and closure of AV valve is the ventricular diastole time, which is equal to 0.5 seconds.

**170. (2)**

**171. (2)**

Kidneys are located between 12th thoracic and 3rd lumbar vertebra and is covered by peritoneum only on the front i.e. fused with the body wall. This arrangement is known as retroperitoneal arrangement.

**172. (1)**

In diabetes, the excretion of glucose is due to imbalance in glucose metabolism due to absence or deficiency of insulin.

Due to deficiency of glucose inside the cells, cells hydrolyse fats and proteins, leading to formation of ketone bodies.

**173. (1)**

**174. (3)**

**Pivot joint:** One bone rotates around another. e.g., radius over ulna

**Gliding joint:** Two bones can glide over each other, surfaces are flat or curved. e.g., wrist / tarsal bone.

**Saddle joint:** The convex end of one bone fixes into the saddle like depression of the other bone. e.g., human thumb and carpals.

**Angular joint :** Allows movement is two planes. e.g., between meta carpals and phalanges.

**175 (4)**

**Myasthenia gravis:** auto immune disorder which leads to destruction of Ach receptors of the myocytes and thus there is no nerve transmission. Patients becomes weak and paralysis occurs.

**Gout:** accumulation of uric acid leads to pain and inflammation of joint.

**Muscular dystrophy:** absence of "dystrophin" protein thus the conduction of nerve impulse from T-tubules to SR is inhibited.

**176. (3)**

On application of a stimulus on the axonal membrane, there is rapid influx of $Na^+$ ions from outside due to opening of $Na^+$ voltage gated channels.

**177. (3)**

Limbic system is responsible for the regulation of sexual behaviour. Association areas regulate intersensory association, communication and memory

**178. (1)**

**179. (3)**

The hormones that are released from part nervosa are - Oxytocin and ADH. The hormones are secreted by the neurosecretory nuclei that are present is the hypothalamus. The axons extend upto the pars nervosa where the hormones are secreted.

**180. (3)**

Surgical removal of pituitary gland results in non-release of ACTH which stimulates adrenal cortex of the adrenal gland to release corticoids. Absence of the ACTH results in atrophy of adrenal cortex.

**181. (3)**

Thymus gland is the site of maturation of lymphocytes which play major role in the immunological reactions.

It is called 'Training School of T-lymphocytes' or 'Throne of immunity'.

**182. (1)**

**183. (4)**

**184. (3)**

There is unequal division of cytoplasm. Secondary oocyte is arrested at metaphase-ll and II meiotic division is completed only after the entry of sperm.

**185. (3)**

After implantation, chorionic villi and uterine tissue become interdigitated with each other and jointly form placenta.

Blastocyst gets implanted in the uterus about 7 days after fertilization.

Inner cell mass gets differentiated into embryo.

**186. (2)**

GnRH (= Gonadotropin releasing hormone) is a hypothalamic hormone, which acts on anterior pituitary to secrete gonodotropins (FSH & LH). LH acts at Leyding cells and stimulates synthesis and secretion of androgens. FSH acts on Sertoli cells and stimulates some factors which help in the process of spermiogenesis.

**187. (2)**

Before the sperm can fertilize the ovum, it has to undergo capacitation and acrosomal reaction. Capacitation is a period of conditioning which occur in sperms starting from vagina. In this the cholesterol vesicles adhering the membrane surrounding the acrosome are removed.

**188. (4)**

Amniocentesis is legal only for detection of any genetic disorder based on chromosomal pattern of foetus.

**189. (3)**

GIFT→ Garnet Intra Fallopian Transfer.

ZIFT → Zygote Intra Fallopian Transfer.

AI → Artificial Insemination.

ICSI → Intra Cytoplasmic Sperm Injection.

(One sperm is placed inside the egg by a microscopic needle)

**190. (2)**

Hugo de Vries gave mutation theory. Evening primrose = *Oenothera lamarckiana*.

**191. (2)**

Genetic drift causes the change in gene frequency by chance in a small population.

**192. (3)**

Darwinian variations are small and directional.

According to Hugo de Vries, mutations are large and can occur in any direction

**193. (1)**

Because in this preformed antibodies against snake venom are directly injected into the human body.

Artificially acquired active immunity- Includes resistance induced by vaccines.

Naturally acquired passive immunity- IgA and IgG antibodies from mother to baby and foetus respectively.

Naturally acquired active immunity- Acquired when antigens gain access into the body during natural infection.

**194. (4)**

**Cocaine:** obtained from *Erythroxylum* coca, generally snorted. Causes hallucinations, and has a potent effect on central nervous system, producing a sense of euphoria and increased energy.

**Hashish:** Obtained from Cannabis plant, taken by inhalation and oral ingestion. Effects on cardiovascular system.

**Barbiturates:** It is a sedative. Used as a medicine to help patients cope with mental illness like depression, insomnia etc. Reduces excitement by depressing the CNS activity and lowers physiological activity leading to drowsiness or sleep.

**195. (2)**

**196. (2)**

Neural signals from pneumotaxic center can reduce duration of inspiration, by overriding the stimulatory effect of apneustic center on Inspiratory center.

**197. (3)**

The appearance of albumin in the urine is most likely due to damage to the Malpighian corpuscles, where ultrafiltration occurs. Albumin is not a normal constituent of urine.

**198. (2)**

A person who has recovered from an attack of chicken pox or mumps develops Naturally acquired active immunity, as antibodies are synthesised in the individuals' body.

**199. (3)**

In human beings, after first month of pregnancy, the embryo's heart is formed and starts beating. The first sign of growing foetus may be noticed by listening to the heart sound carefully through the stethoscope. The first movement of the foetus and appearance of hair on head are usually observed during fifth month. By the end of 24-weeks, the body is covered by fine hair, eyelids separate and eyelashes are formed.

**200. (3)**

Human ancestor with cranial capacity of about 900 cc whose fossils suggest use of fire was *Homo erectus*. Cranial capacities of other fossils mentioned in options are as follows:

Cro-Magnon man – 1600 cc

Neanderthal man – 1400 cc

*Homo habilis* – 650 – 800 cc