All India Aakash Test Series for NEET - 2027

TEST - 6 (Code-C)

Click here for Code-D Sol.

Test Date : 08/03/2026

ANSWERS

1. (1)	37. (1)	73. (3)	109. (2)	145. (1)
2. (3)	38. (4)	74. (1)	110. (4)	146. (2)
3. (3)	39. (1)	75. (1)	111. (3)	147. (4)
4. (4)	40. (1)	76. (4)	112. (2)	148. (2)
5. (2)	41. (1)	77. (2)	113. (3)	149. (1)
6. (1)	42. (1)	78. (3)	114. (4)	150. (4)
7. (3)	43. (4)	79. (4)	115. (2)	151. (4)
8. (1)	44. (4)	80. (3)	116. (2)	152. (3)
9. (1)	45. (1)	81. (2)	117. (3)	153. (4)
10. (4)	46. (4)	82. (1)	118. (3)	154. (1)
11. (3)	47. (1)	83. (2)	119. (3)	155. (2)
12. (2)	48. (4)	84. (3)	120. (1)	156. (2)
13. (3)	49. (2)	85. (2)	121. (2)	157. (1)
14. (1)	50. (3)	86. (3)	122. (3)	158. (1)
15. (4)	51. (4)	87. (1)	123. (3)	159. (4)
16. (2)	52. (4)	88. (1)	124. (2)	160. (3)
17. (1)	53. (1)	89. (4)	125. (2)	161. (2)
18. (4)	54. (3)	90. (1)	126. (1)	162. (2)
19. (2)	55. (3)	91. (3)	127. (3)	163. (4)
20. (1)	56. (4)	92. (1)	128. (2)	164. (2)
21. (3)	57. (1)	93. (4)	129. (3)	165. (3)
22. (2)	58. (1)	94. (3)	130. (1)	166. (3)
23. (3)	59. (2)	95. (3)	131. (4)	167. (3)
24. (2)	60. (1)	96. (2)	132. (1)	168. (2)
25. (3)	61. (3)	97. (3)	133. (4)	169. (1)
26. (1)	62. (4)	98. (1)	134. (4)	170. (3)
27. (4)	63. (1)	99. (4)	135. (4)	171. (3)
28. (3)	64. (2)	100. (4)	136. (3)	172. (4)
29. (4)	65. (4)	101. (2)	137. (2)	173. (2)
30. (3)	66. (2)	102. (3)	138. (2)	174. (1)
31. (1)	67. (3)	103. (2)	139. (1)	175. (4)
32. (2)	68. (3)	104. (2)	140. (2)	176. (4)
33. (3)	69. (3)	105. (4)	141. (3)	177. (1)
34. (3)	70. (4)	106. (2)	142. (2)	178. (3)
35. (2)	71. (1)	107. (3)	143. (3)	179. (3)
36. (3)	72. (3)	108. (3)	144. (3)	180. (2)

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (1)

Hint: Area under ($P - V$) curve is work done by gas

Sol.: $W_{AB} = 4 \times 20 + \frac{1}{2} \times 60 \times 4$

$= 80 + 120$

$= 200$ J

$W_{BC} = -4 \times 20$

$= -80$ J

$\left|\frac{W_{AB}}{W_{BC}}\right| = \frac{200}{80} = \left(\frac{5}{2}\right)$

2. Answer (3)

Hint: Heat absorbed by gas, $Q = nC\Delta T$

Sol.: $\Delta U = Q - \frac{2Q}{5}$

$\frac{3Q}{5} = \frac{3}{2} nR\Delta T$

$Q = \frac{5}{2} nR\Delta T$

$nC\Delta T = \frac{5}{2} nR\Delta T$

$C = \frac{5R}{2}$

3. Answer (3)

Hint & Sol.: Volume occupied by one mole of any gas at STP is 22.4 L

No. of moles of N_2 gas = $\frac{28}{28} = 1$

4. Answer (4)

Hint & Sol.: $P = \frac{1}{3} \frac{mN}{V} v_{rms}^2$

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

If V & T = constant, then pressure $P \propto mN$ (where mN = mass of the gas)

5. Answer (2)

Hint: Use concept of Boyle's law

Sol.: $PV = nRT$

$PV = \frac{m}{M} RT$

m and T are constant

then PV = constant

6. Answer (1)

Hint: Kinetic energy of centre of mass w.r.t. ground = $\frac{1}{2} Mv^2$

Sol.: Kinetic energy of gas w.r.t. ground

= (kinetic energy of centre of mass w.r.t. ground) + (kinetic energy of gas w.r.t. centre of mass)

= $\frac{1}{2} Mv^2 + \frac{3}{2} nRT$

7. Answer (3)

Hint: Use concept of conservation of energy

Sol.: $(K.E)_{mix} = (K.E)_{mono} + (K.E)_{diatomic\ gas}$

$= \frac{3}{2} n_1 RT_1 + \frac{5}{2} n_2 RT_2$

$= \frac{3}{2} \times 3R \times 2T + \frac{5}{2} \times 2R \times T$

$= 9RT + 5RT$

$= 14RT$

8. Answer (1)

Hint: Ratio of specific heat, $\frac{C_p}{C_v} = \gamma = \left(\frac{f+2}{f}\right)$

Sol.: By conservation of energy

$\frac{1}{2}(n_1 + n_2) f_{mix} RT = \frac{1}{2} n_1 f_1 RT + \frac{1}{2} n_2 f_2 RT$

$\frac{1}{2}(1+3) f_{mix} RT = \frac{1}{2} 1 \times 5RT + \frac{1}{2} \times 3 \times 3RT$

$2 f_{mix} RT = 7RT$

$f_{mix} = \frac{7}{2}$

$$\gamma = \frac{f_{mix} + 2}{f_{mix}}$$

$$\Rightarrow \gamma = \frac{\frac{7}{2} + 2}{\frac{7}{2}}$$

$$\Rightarrow \gamma = \frac{\frac{11}{2}}{\frac{7}{2}}$$

$$\therefore \gamma = \left(\frac{11}{7}\right)$$

9. Answer (1)

Hint & Sol.: Specific heat of an ideal gas is different for different processes.

Rotational degree of freedom of monoatomic gas is zero, so rotational kinetic energy will be zero.

10. Answer (4)

Hint & Sol.: $PV = nRT$, here temperature is in kelvin

$PV = nR(t + 273)$, here t is in degree Celsius

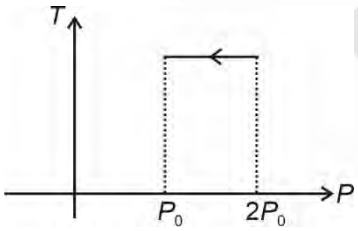
$PV = \frac{5nR}{9}(F + 459)$, here F is in Fahrenheit

11. Answer (3)

Hint: Use PV = constant

Sol.: $P = \left(\frac{nRT}{V}\right)$

T is constant



Slope will remain zero.

12. Answer (2)

Hint: Process A to B is isobaric

Sol.: $Q = nC_P\Delta T$

$$C_P = \frac{\gamma R}{\gamma - 1}$$

$$C_P = \frac{\frac{5}{3}R}{\frac{5}{3} - 1} = \frac{5R}{2}$$

$$T_A = \frac{2P_0V_0}{nR}$$

$$T_B = \frac{6P_0V_0}{nR}$$

$$\Delta T = \left(\frac{4P_0V_0}{nR}\right)$$

$$Q = \frac{n5R}{2} \times \frac{4P_0V_0}{nR}$$

$= 10P_0V_0$

13. Answer (3)

Hint & Sol.: $\left(\frac{dP}{dV}\right)_{\text{at constant volume}} = \infty$

14. Answer (1)

Hint & Sol.: Volume of the gas increases continuously, so work done by gas will be positive for process $A \rightarrow B \rightarrow C$

15. Answer (4)

Hint: Use first law of thermodynamics

Sol.: $Q = \Delta U + W$

$Q = 200$ J

$W = P\Delta V$

$= 2 \times 10^5 \times (1000 - 600) \times 10^{-6}$

$= 2 \times 10^5 \times 400 \times 10^{-6}$

$= 8 \times 10^7 \times 10^{-6}$

$= 80$ J

$\Delta U = 200 - 80$

$= 120$ J

16. Answer (2)

Hint: Use first law of thermodynamics

Sol.: $Q = \Delta U + W$

$W = nR\Delta T$

$$Q = \frac{nR\gamma\Delta T}{\gamma - 1}$$

$$nR\Delta T = \frac{Q(\gamma - 1)}{\gamma}$$

$$W = \frac{Q\left(\frac{7}{5} - 1\right)}{\frac{7}{5}}$$

$$\Rightarrow W = \left(\frac{2Q}{7}\right)$$

$\therefore \Delta U = Q - W$

$= Q - \frac{2Q}{7}$

$= \left(\frac{5Q}{7}\right)$

17. Answer (1)

Hint & Sol.:

Isochoric process $\rightarrow W = 0,\ Q \neq 0,\ \Delta U \neq 0$

Isobaric process $\rightarrow Q \neq 0,\ \Delta U \neq 0,\ W \neq 0$

Isothermal process $\rightarrow Q \neq 0,\ \Delta U = 0,\ W \neq 0$

Adiabatic process $\rightarrow Q = 0,\ W \neq 0,\ \Delta U \neq 0$

18. Answer (4)

Hint: For diatomic gas, number of degrees of freedom is 5.

Sol.: $\gamma = \frac{f+2}{f}$

$= \frac{5+2}{5}$

$= \left(\frac{7}{5}\right)$

PV^{γ} = constant

$PV^{7/5}$ = constant

19. Answer (2)

Hint: Efficiency of carnot engine, $\eta = 1 - \frac{T_L}{T_H}$

Sol.: Case I

$\frac{40}{100} = 1 - \frac{400}{T_H}$

$\frac{2}{5} = 1 - \frac{400}{T_H}$

$\frac{400}{T_H} = \frac{3}{5}$

$T_H = \left(\frac{2000}{3}\right)\text{K}$

Case II

$\frac{50}{100} = 1 - \frac{T_L}{\frac{2000}{3}}$

$\frac{T_L}{\frac{2000}{3}} = \frac{1}{2}$

$T_L = \left(\frac{1000}{3}\right)\text{K} \approx 333\ \text{K}$

$\Delta T = 400 - 333$

$= 67\ \text{K}$

20. Answer (1)

Hint: For adiabatic process, $Q = 0$

Sol.: $Q = \Delta U + W$

$Q = 0$

$\Delta U + W = 0$

$\Delta U = -W$, here W = –ve

$\Rightarrow \Delta U$ = + ve

So, temperature of the gas will increase

21. Answer (3)

Hint & Sol.: $\Delta U = nC_v\Delta T$

Change in internal energy depends on initial and final temperature.

22. Answer (2)

Hint & Sol.: $Q = \Delta U + W$

For process $A \rightarrow B$,

W = –ve, ΔU = –ve

$\therefore Q$ = – ve

For process $B \rightarrow C$,

$W = 0,\ \Delta U$ = +ve

$\therefore Q$ = +ve

23. Answer (3)

Hint: The given process is isothermal.

Sol.: $Q = W + \Delta U$

In isothermal process,

$\Delta U = 0$

$\therefore \frac{W}{Q} = 1$

24. Answer (2)

Hint: Angular frequency$(\omega) = \sqrt{\frac{k}{m}}$

Sol.: $F = -20x + 4$

$(F - 4) = -20x$

$F_1 = -20x$

$ma = -20x$

$a = \frac{-20}{0.2}x = -100x = -\omega^2 x$

$\omega = \sqrt{100}$ = 10 rad/s

$T = \frac{2\pi}{10} = \frac{\pi}{5}$ s

25. Answer (3)

Hint: Maximum velocity of particle, $v_{max} = \omega A$

Sol.: $A_R = \sqrt{A^2 + A^2 + 2A^2\cos 90^\circ}$

$= \sqrt{2}A$

$v_{max} = \sqrt{2}A\omega$

26. Answer (1)

Hint: $U = \frac{1}{2}kx^2$ & $K = \frac{1}{2}m\omega^2A^2 - \frac{1}{2}m\omega^2x^2$

Sol.: $\frac{1}{2}kx^2 = \frac{1}{2}kA^2 - \frac{1}{2}kx^2$

$x = \frac{A}{\sqrt{2}}$

27. Answer (4)

Hint: Velocity of particle in S.H.M., $v = \pm\omega\sqrt{A^2 - x^2}$

Sol.: $T = \frac{2\pi}{\omega}$

$\omega = \frac{2\pi}{6}$

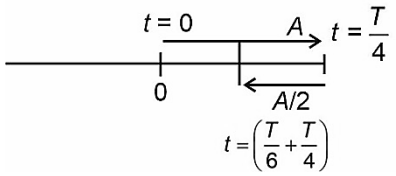
$\omega = \frac{\pi}{3}$ rad

$v = \frac{\pi}{3}\sqrt{5^2 - 4^2}$ = π cm/s

28. Answer (3)

Hint: Time period of S.H.M., $T = \frac{2\pi}{\omega}$

Sol.: $t = \frac{T}{4} + \frac{T}{6} = \frac{5T}{12} = \frac{5}{12}\left(\frac{2\pi}{\omega}\right) = \frac{5\pi}{6\omega}$ s



Total distance travelled = $A + \frac{A}{2}$

$= \frac{3A}{2}$

29. Answer (4)

Hint & Sol.: Time period of oscillation of physical pendulum, $T = 2\pi\sqrt{\frac{I}{mgd}}$

30. Answer (3)

Hint & Sol.: Time period of spring-mass system is independent of its acceleration.

31. Answer (1)

Hint: Minimum time taken to travel from mean position to extreme position = $\frac{T}{4}$

Sol.: $a = -bx$

$\omega = \sqrt{b}$

$T = \frac{2\pi}{\omega} = \frac{2\pi}{\sqrt{b}}$

$\therefore t = \frac{T}{4} = \frac{\pi}{2\sqrt{b}}$ s

32. Answer (2)

Hint & Sol.: $v = \pm\omega\sqrt{A^2 - x^2}$

$v^2 = \omega^2A^2 - \omega^2x^2$

$v^2 + \omega^2x^2 = \omega^2A^2$

$\frac{v^2}{\omega^2A^2} + \frac{x^2}{A^2} = 1$

This is equation of ellipse (for $\omega \neq 1$)

33. Answer (3)

Hint & Sol.: In S.H.M., displacement is always in opposite phase with acceleration.

34. Answer (3)

Hint: Angular frequency of simple pendulum, $\omega = \sqrt{\frac{g}{\ell}}$

Sol.: $g_{eff} = g + \frac{g}{4}$

$g_{eff} = \frac{5g}{4}$

$\omega_1 = \frac{\sqrt{5}}{2}\sqrt{g/\ell} = \frac{\sqrt{5}}{2}\omega$

35. Answer (2)

Hint: Wavelength of the wave, $\lambda = \frac{v}{f}$

Sol.: $f = \frac{45}{15} = 3\ s^{-1}$

$v = \frac{450}{10} = 45$ cm/s

$\lambda = \frac{v}{f}$

$= \frac{45}{3}$

= 15 cm

36. Answer (3)

Hint: Velocity of transverse wave in string, $v = \sqrt{\frac{T}{\mu}}$

Sol.: $\frac{\Delta v}{v} \times 100 = \frac{1}{2}\frac{\Delta T}{T} \times 100 = \frac{1}{2} \times 4\%$

= 2%

37. Answer (1)

Hint & Sol.: The echo of sound wave is due to reflection.

38. Answer (4)

Hint: Time interval between two consecutive minimum intensities = $\frac{1}{\text{beats frequency}}$

Sol.: Beats frequency = $\frac{4}{2}$ = 2 Hz

$\therefore$ Required time interval $= \frac{1}{2}$ = 0.5 s

39. Answer (1)

Hint: For open pipe, frequency $f = \frac{v}{2\ell}$

Sol.: For closed pipe, $f_2 = \frac{v}{4\ell'}$

$f_2 = \frac{v}{4 \times \frac{2\ell}{3}}$

$= \frac{3}{4} \times \left(\frac{v}{2\ell}\right)$

$= \frac{3f}{4}$

40. Answer (1)

Hint: Amplitude of particle (R) as a function of position (x) according to given equation is $R = 8\sin\left(\frac{\pi x}{12}\right)$ cm

Sol.: $R = 8\sin\left(\frac{\pi x}{12}\right)$

$R = 8\sin\left(\frac{\pi \times 2}{12}\right)$

$= 8\sin\frac{\pi}{6} = 8 \times \frac{1}{2} = 4$ cm

41. Answer (1)

Hint & Sol.: A set of tones whose frequencies are integral multiple of the fundamental frequency are called harmonics.

42. Answer (1)

Hint & Sol.: In solids mechanical wave may be longitudinal or transverse depending on mode of excitation while wave on string is transverse.

43. Answer (4)

Hint: Frequency of n^{th} harmonic, $f = \frac{nv}{2\ell}$

Sol.: For third harmonic n = 3

$f = \frac{3v}{2 \times \frac{1}{2}}$

$900 = 3v$

v = 300 m/s

44. Answer (4)

Hint: Any function of the form

$y = f(x \pm vt)$ represents progressive wave

Sol.: $y = A\sin(ax^2 - bt^2)$ does not have the form of function $y = f(x \pm vt)$, so it is not progressive wave.

45. Answer (1)

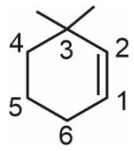
Hint & Sol.: Particle B located at mean position has maximum velocity.

[CHEMISTRY]

46. Answer (4)

Hint: Substituent should get minimum number in IUPAC nomenclature.

Sol.:

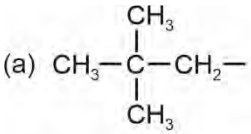


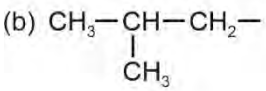
3, 3-Dimethylcylohexene.

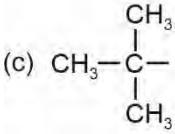
47. Answer (1)

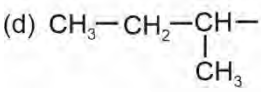
Hint: A primary alkyl group is named by substituting 'yl' for 'ane' in the corresponding alkane.

Sol.:


(a) (i) Neopentyl


(b) (ii) Isobutyl


(c) (iii) tert-Butyl


(d) (iv) sec-Butyl

48. Answer (4)

Hint: Double bond have more priority than the triple bond, if they have same number.

Sol.: $\overset{1}{CH_2}=\overset{2}{CH}-\overset{3}{CH_2}-\overset{4}{C}\equiv\overset{5}{C}-\overset{6}{CH_3}$

$sp^2 \quad sp^2 \quad sp^3 \quad sp^3 \quad sp \quad sp^3$

49. Answer (2)

Hint: Compounds having the same molecular formula but different structures are classified as structural isomers.

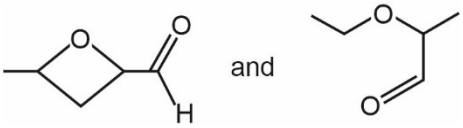
Sol.:

50. Answer (3)

Hint: $-\overset{O}{\overset{\|}{C}}-H \rightarrow$ aldehyde

$R-O-R \rightarrow$ Ether

Sol.:



These two compounds have aldehyde and ether functional groups.

51. Answer (4)

Hint: The choice of principal functional group is made on the basis of order of preference.

Sol.: The correct decreasing priority order of given functional groups is

$-COOR > -CN > -\overset{O}{\overset{\|}{C}}-H > -\overset{|}{C}=O$

52. Answer (4)

Hint: Two or more compounds having the same molecular formula but different functional groups are called functional isomers.

Sol.: Alcohol and phenol are functional isomers.

53. Answer (1)

Hint: The permanent shift of sigma electrons away from the carbon atom due to more electronegative atom or group of atoms is called –I effect

Sol.: The correct order of –I effect will be –CN > –COOH > –Cl > –OH

54. Answer (3)

Hint: Allyl free radical is more stable than benzyl free radical due to the bond dissociation energy.

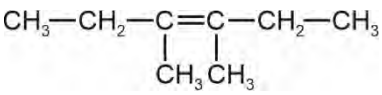
Sol.: Methyl carbocation is sp^2 hybridised and has trigonal planar shape.

$\Rightarrow$ Due to the presence of lone pair of electrons ammonia act as nucleophile.

55. Answer (3)

Hint: Those isomers which have different arrangement of atoms or group of atoms around carbon-carbon double bond are known as geometrical isomers.

Sol.:



3, 4-Dimethylhex-3-ene

It will show geometrical isomerism.

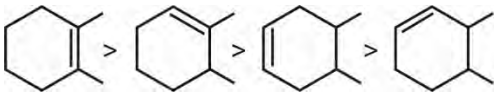
Cyclohexene will not show geometrical isomerism because its trans-form is unstable.

56. Answer (4)

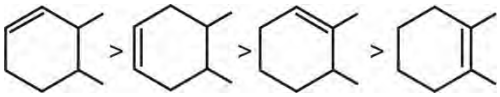
Hint: If the product is same on the hydrogenation then

$$\text{Heat of hydrogenation} \propto \frac{1}{\text{Stability of alkene}}$$

Sol.: The correct order of stability of alkene is



Heat of hydrogenation will be



57. Answer (1)

Hint: Paper chromatography is a type of partition chromatography.

Sol.: In column chromatography, the most readily adsorbed substances are retained near the top and others come down the various distances in the column.

58. Answer (1)

Hint: Percentage of halogen

$$= \frac{\text{Atomic mass of X} \times m_1 \times 100}{\text{Molecular mass of AgX} \times m}$$

Sol.:

$$\text{Percentage of chlorine} = \frac{35.5 \times 0.1435 \times 100}{143.5 \times 0.05}$$

$$= 71\%$$

59. Answer (2)

Hint: Aniline is separated by steam distillation from aniline water mixture.

Sol.: Steam distillation is applied to separate substance which are steam volatile and are immiscible with water.

60. Answer (1)

Hint:

(a) $(NH_4)_3PO_4.12MoO_3$ Yellow

Sol.:

(b) $[Fe(CN)_5NOS]^{4-}$ Violet

(c) $Fe_4[Fe(CN)_6]_3.xH_2O$ Prussian blue

(d) $[Fe(SCN)]^{2+}$ Blood red

61. Answer (3)

Hint: % of carbon

$$= \frac{12 \times \text{mass of } CO_2 \times 100}{44 \times \text{mass of organic compound}}$$

% of hydrogen

$$= \frac{2 \times \text{mass of } H_2O \times 100}{18 \times \text{mass of organic compound}}$$

Sol.:

$$\% \text{ of carbon} = \frac{12 \times 0.147 \times 100}{44 \times 0.2} = 20.04\%$$

$$\% \text{ of hydrogen} = \frac{2 \times 0.12 \times 100}{18 \times 0.2} = 6.66\%$$

% of oxygen = 100 – 26.66 = 73.30%

62. Answer (4)

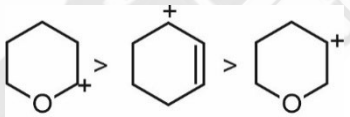
Hint: In the test of halogen, cyanide or sulphide interfere with silver nitrate test for halogen.

Sol.: If nitrogen or sulphur is also present in the organic compound, the sodium fusion extract is first boiled with concentrated nitric acid to decompose cyanide or sulphide of sodium formed during Lassaigne's test.

63. Answer (1)

Hint: Stability of carbocation depends on the + R effect, +I effect and hyperconjugation.

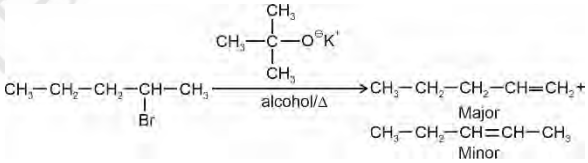
Sol.: Therefore, the correct order of stability will be.



64. Answer (2)

Hint: In dehydrohalogenation by bulky base gives less substituted alkene as the major product [Hofmann product]

Sol.:



65. Answer (4)

Hint: Neutral resonating structure is more stable than the charged resonating structure.

Negative charge at more electronegative atom will be more stable.

Sol.: Therefore stability order will be

(a) $CH_2=CH-CH=CH_2 > \overset{+}{C}H_2-CH=CH-\overset{-}{C}H_2$

(b) 

(c) $CH_2=\overset{+}{N}=\overset{-}{N} > \overset{-}{C}H_2-\overset{+}{N}\equiv N$

66. Answer (2)

Hint: Hyperconjugation occurs due to delocalization of C–H σ bonded electrons to an atom of unsaturated system or to an atom with an unshared p orbital.

Sol.: In carbocations (a) and (c) alpha hydrogen is present therefore hyperconjugation takes place.

67. Answer (3)

Hint: $-NO_2$ group show – R and –I effect

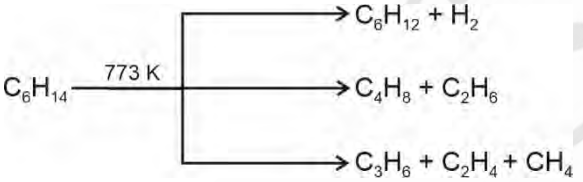
Sol.:

Group	Type of effect
$-NO_2$	–R, –I
$-CH_3$	+I, Hyperconjugation
$-NH_2$	+R, –I
–CN	–R, –I

68. Answer (3)

Hint: Higher alkanes on heating to high temperatures decompose into lower alkanes.

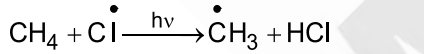
Sol.:

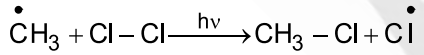


69. Answer (3)

Hint: In chain propagation step new radical is formed at each step.

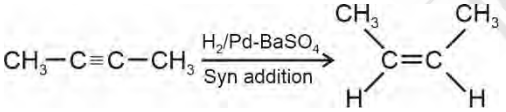
Sol.: Therefore, step (a) and step (b) are chain propagation steps



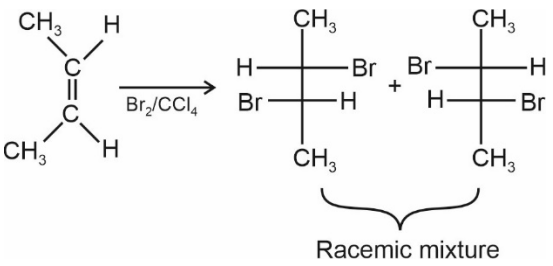


70. Answer (4)

Hint:

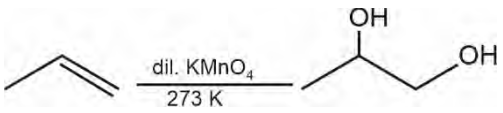


Sol.:

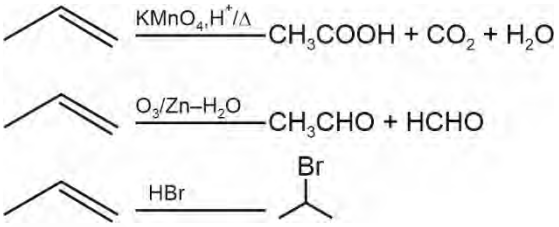


71. Answer (1)

Hint:



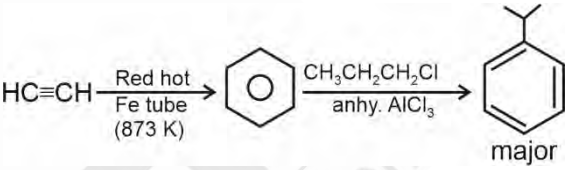
Sol.:



72. Answer (3)

Hint: $CaC_2 \xrightarrow{H_2O} \underset{(A)}{CH \equiv CH}$

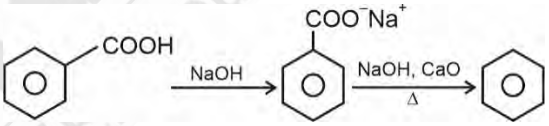
Sol.:



73. Answer (3)

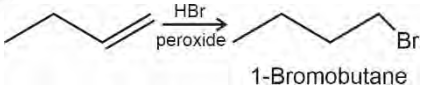
Hint: Decarboxylation of sodium salt of acid gives alkane as major product.

Sol.:



74. Answer (1)

Hint:



Sol.: Peroxide effect proceeds via free radical chain mechanism.

75. Answer (1)

Hint: Percentage of nitrogen = $\frac{14 \times M \times 2(V - V_1/2)}{1000} \times \frac{100}{M}$

Sol.: 0.1 M of 100 mL H_2SO_4 = 1 M of 20 mL NH_3

1000 mL of 1 M ammonia contains 14 g nitrogen

20 mL of 1 M ammonia contains = $\frac{14 \times 20}{1000}$ g nitrogen

Percentage of nitrogen = $\frac{14 \times 20 \times 100}{1000 \times 0.5} = 56\%$

76. Answer (4)

Hint: $2CH_4 + O_2 \xrightarrow{Cu/523\,K/100\,atm} 2CH_3OH$

Sol.: $CH_4 + O_2 \xrightarrow[\Delta]{Mo_2O_3} HCHO + H_2O$

$2CH_3CH_3 + 3O_2 \xrightarrow[\Delta]{(CH_3COO)_2Mn} 2CH_3COOH$

$(CH_3)_3CH \xrightarrow{KMnO_4} (CH_3)_3COH$

77. Answer (2)

Hint: During the electrolysis of salt of carboxylic acid at cathode reduction takes place

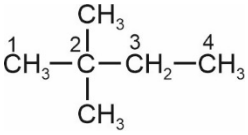
$2H_2O + 2e^- \longrightarrow H_2 \uparrow + 2OH^-$

Therefore, pOH of solution decreases.

Sol.: Methane cannot be prepared by the electrolysis of an aqueous solution of salt of carboxylic acid. Alkanes containing even number of carbon atoms are obtained.

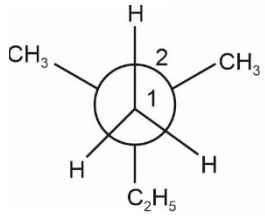
78. Answer (3)

Hint: Structural formula of 2, 2-Dimethylbutane is

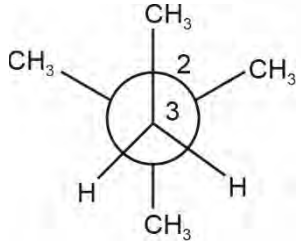


Sol.:

(I) Newman projection using C_1–C_2 bond



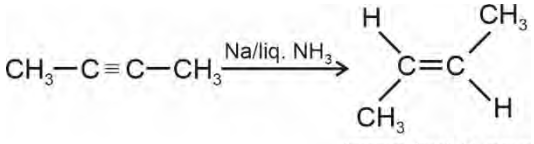
(II) Newman projection using C_3 – C_2 bond



79. Answer (4)

Hint: Na in liquid NH_3 converts non-terminal alkyne into trans-alkene.

Sol.:



trans-but-2-ene

80. Answer (3)

Hint: $pK_a = -\log K_a$

Larger the value of K_a smaller the value of pK_a

Sol.:

Terminal alkynes are more acidic in nature than alkene, alkane and non-terminal alkyne

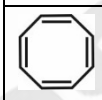
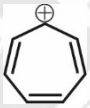
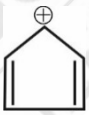
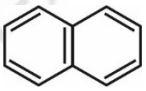
The correct acidic strength order will be b > a > c

Therefore, pKa value order will be c > a > b

81. Answer (2)

Hint: Aromatic species are cyclic, planar and having $(4n + 2)\pi$ electrons in the ring where n is an integer.

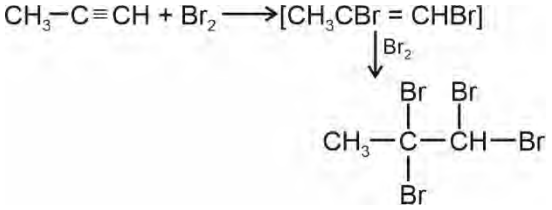
Sol.:

	Antiaromatic
	Aromatic
	Non-aromatic
	Aromatic
	Antiaromatic
	Aromatic

82. Answer (1)

Hint: During unsaturation test of alkynes, reddish orange colour of solution decolourises.

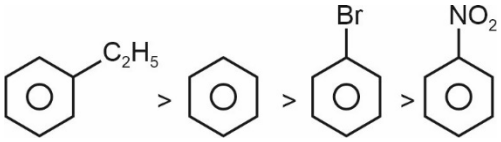
Sol.:



83. Answer (2)

Hint: Electron donating group at benzene increases rate of electrophilic aromatic substitution reaction.

Sol.: The correct order of reactivity towards electrophilic aromatic substitution reaction will be



84. Answer (3)

Hint: The groups which direct the incoming electrophile towards meta position when attached with benzene are called meta directing groups.

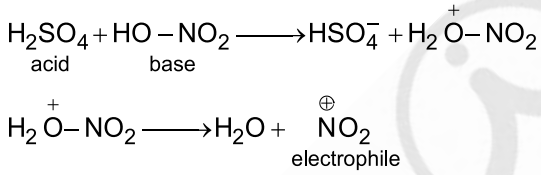
Sol.: Meta directing groups are $-NO_2$, $-CN$

o and p-directing groups are $-NHCOCH_3$, $-OCH_3$, $-Cl$

85. Answer (2)

Hint: In nitrating mixture of conc. HNO_3 and conc. H_2SO_4, H_2SO_4 act as an acid and HNO_3 acts as a base.

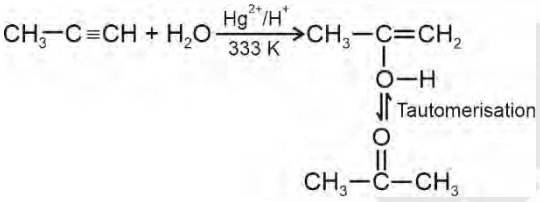
Sol.:



86. Answer (3)

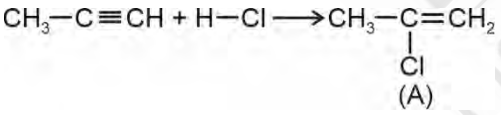
Hint: Hydration of alkynes results in formation of carbonyl compounds.

Sol.:

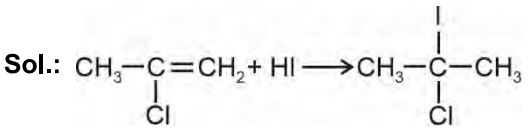


87. Answer (1)

Hint:

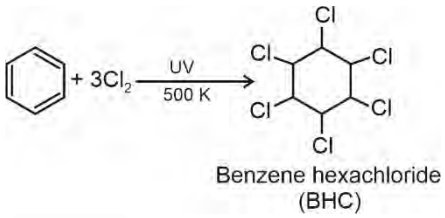


Sol.:

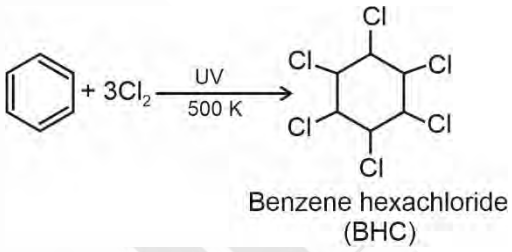


88. Answer (1)

Hint:



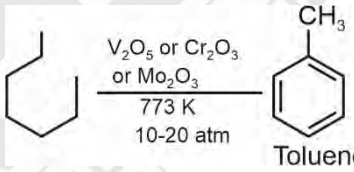
Sol.:



89. Answer (4)

Hint: $CH_4 + H_2O \xrightarrow[\Delta]{Ni} CO + 3H_2$

Sol.:



90. Answer (1)

Hint:	**Boiling point/K**
Pentane	309.1
Sol.:	
2-Methylbutane	300.9
2,2-Dimethylpropane	282.5
Hexane	341.9

[BOTANY]

91. Answer (3)

Hint: Abscisic acid is a plant growth inhibitor.

Sol.: Apical dominance inhibits the growth of lateral buds. Abscisic acid does not induce parthenocarpy.

92. Answer (1)

Hint: Ethylene promotes leaf and flower senescence.

Sol.: Cytokinins promote nutrient mobilization that helps in the delay of leaf senescence.

93. Answer (4)

Hint: In plants, by the activity of meristems, new cells are always being added to the plant body.

Sol.: Root apical meristem and shoot apical meristem are responsible for the elongation of a plant. This increase in length of the plant body is referred to as primary growth.

94. Answer (3)

Hint: Chlorenchyma is specialised to perform photosynthesis.

Sol.: During tissue culture, higher concentration of auxin than cytokinin favours root formation.

95. Answer (3)

Hint: Optimum temperature is essential for seed germination.

Sol.: Light is not essential for early growth of the plants but is sustained only in its presence.

96. Answer (2)

Hint: RQ value of organic acids is more than unity.

Sol.: The ratio of the volume of CO_2 evolved to the volume of O_2 consumed in respiration is 0.9 and 0.7, when the respiratory substrates are protein and tripalmitin respectively.

97. Answer (3)

Hint: Aerobic respiration requires the presence of molecular oxygen.

Sol.: Aerobic respiration leads to the complete oxidation of organic molecules into water and carbon dioxide.

98. Answer (1)

Hint: Fats are not the favoured substrates for respiration.

Sol.: Glucose is the favoured substrate for respiration.

99. Answer (4)

Hint: In link reaction, CO_2 is released from pyruvate.

Sol.: FAD^+ is converted to $FADH_2$ during the conversion of succinic acid to fumaric acid.

100. Answer (4)

Hint: The end product of glycolysis is pyruvic acid.

Sol.: Glycolysis leads to the net gain of 2 ATP molecules.

101. Answer (2)

Hint: Phosphofructokinase is the pacemaker enzyme of EMP pathway.

Sol.: The enzyme which helps in the transfer of phosphate from ATP to fructose-6-phosphate is the pacemaker enzyme of EMP pathway.

102. Answer (3)

Hint: Citrate synthase is found in the mitochondrial matrix.

Sol.: Succinate dehydrogenase is found attached to the inner mitochondrial membrane.

103. Answer (2)

Hint: In the last step of Krebs' cycle, malic acid is converted into OAA.

Sol.: In muscle cells, under inadequate oxygen, pyruvic acid is reduced to lactic acid. Plant parts like roots, stems and leaves respire at rates far lower than animals do.

104. Answer (2)

Hint: Fatty acid would be broken down to 2-C molecule before entering respiratory pathway.

Sol.: The common intermediate for aerobic respiration of proteins and fatty acids is acetyl CoA.

105. Answer (4)

Hint: Six carbon oxalosuccinate undergoes decarboxylation to form five carbon α–ketoglutaric acid.

Sol.: Fumaric acid is a 4C compound. It is formed by the activity of succinate dehydrogenase that is found attached to inner mitochondrial membrane.

106. Answer (2)

Hint: Pyruvate dehydrogenase catalyses the formation of acetyl CoA from pyruvic acid.

Sol.: Fumarase – Catalyses the formation of malic acid

Enolase – Catalyses the formation of phosphoenolpyruvate

Complex II of ETS – Succinate dehydrogenase

107. Answer (3)

Hint: Plant cells are closely packed and located quite close to the surface of the plant.

Sol.: During respiration, plant cells catabolize glucose in several steps, so that not all the liberated energy goes out as heat, instead some steps are large enough, such that the energy can be coupled to synthesise ATP.

108. Answer (3)

Hint: For the calculation of the net gain of ATP for every glucose molecule oxidised, it is assumed that glycolysis, TCA cycle and ETS pathway are following one after another.

Sol.: For the calculation of the net gain of ATP for every glucose molecule oxidised, it is assumed that none of the intermediates in the pathway are utilised to synthesise other compounds.

109. Answer (2)

Hint: Pyruvate formed by the glycolytic catabolism of carbohydrates in the cytosol, enters mitochondrial matrix to form acetyl CoA that further enters TCA cycle.

Sol.: From one glucose molecule, 6 $NADH_2$, 2-$FADH_2$ and 2 ATP molecules are released. Succinate dehydrogenase converts succinic acid to fumaric acid which yields a molecule of $FADH_2$.

110. Answer (4)

Hint: Cytochrome *c* oxidase complex contains cytochromes *a* and a_3 and two copper centres.

Sol.: Cytochrome *c* is a mobile electron carrier that transfers electrons between complex III and IV of the ETS in the inner mitochondrial membrane.

111. Answer (3)

Hint: Gaseous PGR lead to apical hook formation.

Sol.: Para-ascorbic acid promotes seed dormancy.

112. Answer (2)

Hint: Acetyl CoA is raw material for gibberellins.

Sol.: Auxin promotes the abscission of older mature leaves and fruits.

113. Answer (3)

Hint: Removal of the tip of stem is called decapitation.

Sol.: Decapitation leads to the removal of auxin and hence, growth of lateral shoots is enhanced which is beneficial for the preparation of hedges and bushy growth in certain plants.

114. Answer (4)

Hint: Aerenchyma is a specialised parenchyma which is developed to provide buoyancy, particularly in aquatic plants.

Sol.: Cork is formed as a result of redifferentiation.

115. Answer (2)

Hint: Abscisic acid is also known as the stress hormone.

Sol.: ABA is derivative of carotenoids.

116. Answer (2)

Hint: Auxins are used to produce parthenocarpic fruits in tomato.

Sol.: Auxin was first isolated from human urine.

117. Answer (3)

Hint: Differentiation in plants is open.

Sol.: Tissues arising out of the same meristem have different structures at maturity. The final structure at maturity of a tissue is also determined by the location of the cells within.

118. Answer (3)

Hint: Indole-3-acetic acid and Indole-3-butyric acid are the natural auxins.

Sol.: 2, 4, 5-T and NAA are the synthetic auxins.

119. Answer (3)

Hint: Absolute growth rate is the measurement and the comparison of total growth per unit time.

Sol.: Relative growth rate of leaf 'X' = $\frac{100-25}{25} \times 100 = 300\%$

Relative growth rate of leaf 'Y' = $\frac{40-10}{10} \times 100 = 300\%$

Hence, it can be concluded that both the leaves have the same relative growth rate.

120. Answer (1)

Hint: Gibberellin induces early maturity in juvenile conifers.

Sol.: When gibberellins are sprayed on sugarcane crop, the length of the stem increases which eventually increases the yield of the crop.

121. Answer (2)

Hint: Abscisic acid acts as an anti-transpirant.

Sol.: Ethylene is a volatile substance that synchronises fruit-set and initiates flowering in pineapple. Cytokinin is a modified purine that enhances the supply of water and minerals to the lateral buds.

122. Answer (3)

Hint: E. Kurosawa found that the 'bakanae' disease of rice seedlings is caused by a fungus and extracted gibberellin from the fungus.

Sol.: Auxin was isolated from the tips of coleoptiles of oat seedlings by F.W. Went.

123. Answer (3)

Hint: Gibberellins stimulate seed germination by synthesising various types of hydrolytic enzymes.

Sol.: Phenolic acid is a chemical inhibitor that prevents the breakdown of seed dormancy.

124. Answer (2)

Hint: The extracts of vascular tissues, yeast extract have cytokinin.

Sol.: Cytokinin promotes cell division and lateral shoot growth and also increase shelf life of cut shoots, vegetables and flowers.

125. Answer (2)

Hint: The given graphical representation is of geometrical growth.

Sol.: 'A' represents the lag phase of growth. A tree showing seasonal activities does not show a typical S-shaped curve.

126. Answer (1)

Hint: Ethylene is a fruit ripening hormone.

Sol.: Ethephon, in an aqueous solution, is readily absorbed and transported within the plants and releases ethylene slowly.

127. Answer (3)

Hint: ABA is a plant growth inhibitor.

Sol.: Ethylene induces flowering in mango.

128. Answer (2)

Hint: During plant development, maturation is followed by flowering.

Sol.: The correct sequence of development is as follows:

Seed germination → Seedling → Juvenile phase → Maturation → Flowering → Seed formation → Senescence

129. Answer (3)

Hint: A root elongating at a constant rate represents arithmetic growth.

Sol.: The suspension of growth for a period of time is referred to as dormancy. It is due to the exogenous as well as endogenous factors.

130. Answer (1)

Hint: During the conversion of glyceraldehyde-3-phosphate into 1, 3-bisphosphoglyceric acid, one molecule of NADH + H^+ is formed.

Sol.: When respiratory substrate is a fat or a carbohydrate, the term, floating respiration is used.

131. Answer (4)

Hint: During the removal of redox equivalent in glycolysis their is addition of phosphate by H_3PO_4

Sol.: G-6-P, G-3-P and 3-PGA have ^{32}P in their phosphate group.

132. Answer (1)

Sol.: In the ETC, reduced ubiquinone (ubiquinol) is oxidised with the transfer of electrons to cyt *c* via complex III (cytochrome bc_1)

133. Answer (4)

Hint: First half of the glycolytic pathway utilizes energy.

Sol.: ATP is formed during the conversion of 1, 3-bisphosphoglyceric acid to 3-phosphoglyceric acid.

134. Answer (4)

Hint: Substrate level phosphorylation refers to the direct synthesis of ATP/GTP from the metabolites.

Sol.: During the conversion of succinyl CoA to succinic acid, one GTP molecule is formed.

135. Answer (4)

Hint: Yeasts poison themselves to death when the concentration of alcohol reaches about 13%.

Sol.: Maximum concentration of alcohol in the beverages that are naturally fermented is 13%.

[ZOOLOGY]

136. Answer (3)

Hint: An adult frog has lungs.

Sol.: Respiration in amphibians occur *via* gills, lungs and through skin.

Amphibians can live in aquatic as well as terrestrial habitats. Most of them have two pairs of limbs. A tympanum represents the ear. They are oviparous and development is indirect with larval stages.

137. Answer (2)

Hint: Eliminate the names of the phyla.

Sol.: In the members of the sub-phylum Vertebrata, notochord is present during the embryonic period. The notochord is replaced by cartilaginous or bony vertebral column in the adults.

Chordata is a phylum.

Hemichordata is a phylum.

Agnatha is a division under the sub-phylum Vertebrata.

138. Answer (2)

Hint: Includes the organism whose common name is rohu.

Sol.: *Myxine* belongs to the class Cyclostomata.

Cartilaginous fishes – *Carcharodon* and *Trygon*

Bony fishes – *Exocoetus, Labeo, Catla, Clarias* and *Betta*

139. Answer (1)

Hint: Feature seen in *Ascidia*

Sol.: The given image represents *Ascidia*, a member of the sub-phylum Urochordata. In urochordates, notochord is present only in the larval tail, while in cephalochordates, it extends from head to tail region and is persistent throughout their life.

They are exclusively marine and lack paired appendages.

140. Answer (2)

Hint: *Ichthyophis* does not possess limbs

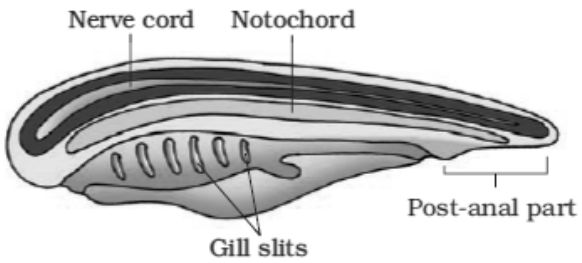
Sol.:

Pterophyllum	Angel fish
Ichthyophis	Limbless amphibian
Torpedo	Electric fish
Betta	Fighting fish

141. Answer (3)

Hint: True for non chordates.

Sol.:



S.NO.	Chordates	Non-chordates
1.	Notochord present.	Notochord absent.
2.	Central nervous system is dorsal hollow and single.	Central nervous system is ventral solid and double.
3.	Pharynx perforated by gill slits	Gill slits are absent
4.	Heart is ventral	Heart is dorsal (if present)
5.	A post-anal part (tail) is present	Post-anal tail is absent

142. Answer (2)

Hint: Some mammals lay eggs.

Sol.: *Aptenodytes* (Penguin) and *Ornithorhynchus* (Platypus) are oviparous.

Macropus (Kangaroo), *Pteropus* (Flying fox), *Canis* (Dog), *Felis* (Cat), *Macaca* (Monkey) are viviparous animals.

143. Answer (3)

Hint: Milk producing glands are called mammary glands.

Sol.: The most unique mammalian characteristic is the presence of milk producing glands by which young ones are nourished. The skin of mammals is unique in possessing hair.

They have two pairs of limbs, adapted for walking, running, climbing, burrowing, swimming or flying.

144. Answer (3)

Hint: Assist in their movement.

Sol.: Chordates possess a ventral heart. Some mammals lay eggs, *e.g.*, *Platypus*.

Fishes have streamlined bodies to reduce drag and resistance while swimming, allowing for efficient movement through water.

The characteristic features of birds are the presence of feathers and most of them can fly except for flightless birds (*e.g.*, Ostrich).

145. Answer (1)

Hint: Choose a bird.

Sol: The characteristic features of birds is the presence of feathers and most of them can fly, except flightless birds. Their endoskeleton is fully ossified and the long bones are hollow with air cavities.

Hemidactylus and *Naja* are reptiles.

Salpa is a member of the sub-phylum Urochordata.

146. Answer (2)

Hint: True for amphibians as well

Sol.: In members of the class Chondrichthyes and Osteichthyes, heart is two chambered which sends deoxygenated blood to gills for oxygenation. Many members of the class Chondrichthyes are viviparous. Bony fishes are mostly oviparous.

Sexes are separate in fishes.

147. Answer (4)

Hint: Assist in mating.

Sol.: Male members of the class Chondrichthyes bear claspers on pelvic fins. Fighting fish is a bony fish.

Male frogs have sound producing vocal sacs and also copulatory pads on the first digit of their fore limbs.

Male cockroaches have anal style which is absent in female cockroaches. Anal cerci is present in both the sexes.

148. Answer (2)

Hint: It is a member of the class Reptilia.

Sol.:

(1)	*Struthio* (Ostrich)	Oviparous and shows direct development
(2)	*Calotes* (Garden lizard)	Sheds its scales as skin cast
(3)	*Elephas* (Elephant)	External ears or pinnae are present
(4)	*Bufo* (Toad)	Exhibits external fertilization

149. Answer (1)

Hint: Horse is a mammal.

Sol: *Equus* belongs to the class Mammalia. They are viviparous with few exceptions and show direct development. Different types of teeth are present in the jaw.

Mammals are found in a variety of habitats.

150. Answer (4)

Hint: Have persistent notochord

Sol.: *Branchiostoma* (Amphioxus or lancelet) belongs to phylum Chordata and sub-phylum Cephalochordata.

151. Answer (4)

Hint: Vertebrates possess notochord during the embryonic stage.

Sol.: All vertebrates are chordates but all chordates are not vertebrates.

The members of the sub-phylum Vertebrata possess notochord during the embryonic period. The notochord is replaced by a cartilaginous or bony vertebral column in the adults.

Besides the basic chordate characters, vertebrates have muscular heart, two kidneys for excretion and paired appendages which may be fins or limbs.

152. Answer (3)

Hint: In chordates, pharynx is perforated by these gill slits.

Sol.: In mammals, gills slits and notochord are only present during the embryonic development.

153. Answer (4)

Hint: Belongs to the class Aves.

Sol.: Poikilothermous (cold-blooded) animals lack the capacity to regulate their body temperature. *Hippocampus* (Sea horse), *Torpedo* (Electric fish) and *Chameleon* (Tree lizard) are cold-blooded animals.

Psittacula(Parrot) is a homeotherm (warm-blooded) and belongs to the class Aves.

154. Answer (1)

Hint: Both are mammals.

Sol.: *Pteropus* is flying fox.

Delphinus is dolphin.

Both perform pulmonary respiration and have 4-chambered heart. Both exhibit internal fertilization.

155. Answer (2)

Hint: Belongs to Agnatha

Sol.: Cyclostomes have a sucking and circular mouth without jaws, hence they are called jawless vertebrates.

Their circulatory system is of closed type and body is devoid of scales and paired fins. Cyclostomes are marine animals but migrate for spawning to fresh water.

After spawning, within few days, they die.

Their larvae, after metamorphosis, return to the ocean.

156. Answer (2)

Hint: Common name of *Pristis* is saw fish

Sol.: Most cartilaginous fishes exhibit viviparity.

Magur is a bony fish and it lacks scales.

Hippocampus is a marine bony fish

157. Answer (1)

Hint: *Pteropus* is flying fox.

Sol.:

Some of the mammals have adapted to fly or live in water.

Aves and mammals have four-chambered heart and are able to maintain a constant body temperature.

158. Answer (1)

Hint: Exclusive feature of males

Sol.: Bidder's canal in the male frogs communicates with the urinogenital duct that comes out of the kidneys and open into the cloaca.

In male frogs, the ureters function as both urinary and genital ducts, transporting urine and sperm to the cloaca.

159. Answer (4)

Hint: Recall the common feature between adult frogs and humans.

Sol.: Habitat of tadpole is water only whereas adult frogs can live on both land and water.

The alimentary canal of adult frogs is short because adults are carnivores and hence the length of intestine gets reduced.

The adult frog excretes urea and thus, is ureotelic animal.

Tadpoles have a tail.

160. Answer (3)

Hint: Spinal cord is protected by vertebral column.

Sol.: Hind brain consists of cerebellum and medulla oblongata. Medulla oblongata passes out through the foramen magnum and continues into spinal cord, which is enclosed in the vertebral column.

The nervous system of frogs is organised into a central nervous system (brain and spinal cord), a peripheral nervous system (cranial and spinal nerves) and an autonomic nervous system (sympathetic and parasympathetic).

161. Answer (2)

Hint: More than 1000

Sol: A mature female frog can lay 2500-3000 ova at a time. Fertilisation is external and takes place in water. Development involves a larval stage called tadpole.

162. Answer (2)

Hint: Female frogs do not have urinogenital duct.

Sol: Frogs are beneficial for mankind because they eat insects and protect crops.

The ovaries in female frogs are situated near kidneys and there is no functional connection with kidneys.

In some countries, the muscular legs of frogs are used as food by man.

163. Answer (4)

Hint: Related to blood

Sol.: Hind brain of humans consists of cerebellum, pons and medulla oblongata but frogs lack pons.

Human heart is four-chambered while frog's heart contains three-chambers.

Renal portal system is present in frogs but absent in humans.

WBCs are present in the blood of both the organisms.

164. Answer (2)

Hint: Cutaneous respiration.

Sol.: Frogs respire on land and in water by two different methods. In water, skin act as the respiratory organ (Cutaneous respiration). Dissolved oxygen in the water is exchanged through the skin by diffusion. On land, the buccal cavity, skin and lungs act as the respiratory organs.

165. Answer (3)

Hint: One is equal to the number of fingers in human hands.

Sol.: The hind limb of frog ends in five digits and it is larger and muscular than the fore limb that ends in four digits.

166. Answer (3)

Hint: Eliminate the parts of the frog's brain.

Sol.: In frogs, the undigested solid waste moves into the rectum and passes out through cloaca.

In frogs, the forebrain includes olfactory lobes, paired cerebral hemispheres and unpaired diencephalon. The midbrain is characterised by a pair of optics lobes.

Two ureters emerge from the kidneys.

167. Answer (3)

Hint: Related to the reproductive system

Sol.: Special venous connection between liver and intestine as well as the kidney and lower parts of the body are present in frogs. The former is called hepatic portal system and the latter is called renal portal system.

The ureters act as urinogenital duct which opens into the cloaca in male frogs only.

Male reproductive organs consist of a pair of yellowish ovoid testes adhered to the upper parts of kidneys by a double fold of peritoneum called mesorchium.

Trunk is present in both sexes.

168. Answer (2)

Hint: Leucocytes are present in both blood and lymph.

Sol.: The lymph is different from blood. It lacks few proteins and RBCs. The lymphatic system consists of lymph, lymph channels and lymph nodes. Some of the WBCs are phagocytic cells. They are present in lymph.

169. Answer (1)

Hint: Eliminate the mammal

Sol.: Ureotelic animal – *Panthera*

Uricotelic animals – *Corvus, Periplaneta, Hemidactylus*

170. Answer (3)

Hint: Assists in emulsification of fats.

Sol: In frogs, food is captured by a bilobed tongue. Liver secretes bile that is stored in the gall bladder. The duodenum receives bile from gall bladder and pancreatic juice from the pancreas through a common bile duct.

Partially digested food called chyme is passed from stomach to the first part of the small intestine, the duodenum.

171. Answer (3)

Hint: Skin act as respiratory organ.

Sol.: Alimentary canal is well developed with a pharynx, oesophagus, crop and gizzard in cockroaches.

Frogs being chordate, have a dorsal nerve cord.

In frogs, the ventricle opens into a sac-like conus arteriosus on the ventral side of the heart. During aestivation and hibernation, gaseous exchange takes place through skin.

172. Answer (4)

Hint: Present exclusively in male *Periplaneta*

Sol.: *Periplaneta* is a uricotelic animal. In them, excretion is performed by Malpighian tubules. In addition, fat bodies, nephrocytes and uricose glands also help in excretion. Uricose gland is absent in female cockroaches.

173. Answer (2)

Hint: It develops through nymphal stages.

Sol.: The development of *P.americana* is paurometabolous type, meaning, there is development through nymphal stages. The nymph looks very much like adults. The nymph grows by moulting about 13 times to reach the adult form. The next to last nymphal stage has wing pads but only adult cockroaches have wings.

174. Answer (1)

Hint: Oothecae are lesser in number as compared to the number of eggs.

Sol.: Ootheca is a dark reddish to blackish brown capsule, about 3/8" (8 mm) long. They are dropped or glued to a suitable surface, usually in a crack or crevice of high relative humidity near a food surface. On an average, females produce 9-10 oothecae, each containing 14-16 eggs.

175. Answer (4)

Hint: Ovaries are present between 2^{nd} to 6^{th} abdominal segments.

Sol.:

Mushroom shaped gland	6^{th} to 7^{th} abdominal segments of males
Pair of ovaries	2^{nd} to 6^{th} abdominal segments of females
A pair of spermatheca	6^{th} abdominal segment of females
A pair of testes	4^{th} to 6^{th} abdominal segments of males

176. Answer (4)

Hint: Osculum is present in porifers.

Sol.:

- The blood of cockroach is colourless and composed of colourless plasma and haematocytes. Its heart consists of 13 elongated muscular tube lying along mid dorsal line of thorax and abdomen. Heart of cockroach is differentiated into funnel-shaped chambers with ostia on either sides.
- Blood from sinuses enter heart through ostia and is pumped anteriorly to sinuses again.

177. Answer (1)

Hint: Gonopore is the anterior part of the genital pouch.

Sol.:

The body of cockroach is segmented and divisible into three distinct regions. In each segment, exoskeleton has hardened plates called sclerites. Head is triangular in shape and lies anteriorly at right angles to the longitudinal body axis. In females, the 7^{th} sternum is boat-shaped and together with the 8^{th} and 9^{th} sterna forms a brood or genital pouch, whose anterior part contains female gonopore.

178. Answer (3)

Hint: Anal style is present in the 9^{th} segment of male cockroaches only.

Sol.:

- Anal styles are present in male cockroach only.
- In both sexes of cockroaches, the 10^{th} abdominal segment bears a pair of jointed filamentous structures called anal cerci.

179. Answer (3)

Hint: The function of tracheal tubes.

Sol.: The respiratory system consists of a network of trachea, that open through 10 pairs of small holes called spiracles present on the lateral sides of the body. Thin branching tubes carry oxygen from the air to all the parts of body. The spiracles are regulated by the sphincters. Exchange of gases takes place at the tracheoles by diffusion.

180. Answer (2)

Hint: Nocturnal vision.

Sol.: Each eye consists of about 2000 hexagonal ommatidia. With the help of several ommatidia, a cockroach can receive several images of an object. This kind of vision is known as mosaic vision with more sensitivity but less resolution, being common during night (hence called nocturnal vision).

❑ ❑ ❑

All India Aakash Test Series for NEET - 2027

TEST - 6 (Code-D)

Click here for Code-C Sol.

Test Date : 08/03/2026

ANSWERS

1. (1)	37. (1)	73. (1)	109. (3)	145. (1)
2. (4)	38. (1)	74. (4)	110. (2)	146. (2)
3. (4)	39. (3)	75. (3)	111. (2)	147. (4)
4. (1)	40. (1)	76. (1)	112. (4)	148. (2)
5. (1)	41. (2)	77. (2)	113. (3)	149. (1)
6. (1)	42. (4)	78. (1)	114. (2)	150. (4)
7. (1)	43. (3)	79. (1)	115. (3)	151. (4)
8. (4)	44. (3)	80. (4)	116. (4)	152. (3)
9. (1)	45. (1)	81. (3)	117. (2)	153. (4)
10. (3)	46. (1)	82. (3)	118. (3)	154. (1)
11. (2)	47. (4)	83. (1)	119. (3)	155. (2)
12. (3)	48. (1)	84. (4)	120. (2)	156. (2)
13. (3)	49. (1)	85. (4)	121. (4)	157. (3)
14. (2)	50. (3)	86. (3)	122. (2)	158. (3)
15. (1)	51. (2)	87. (2)	123. (2)	159. (1)
16. (3)	52. (3)	88. (4)	124. (3)	160. (4)
17. (4)	53. (2)	89. (1)	125. (2)	161. (4)
18. (3)	54. (1)	90. (4)	126. (4)	162. (1)
19. (4)	55. (2)	91. (4)	127. (4)	163. (2)
20. (1)	56. (3)	92. (4)	128. (1)	164. (4)
21. (3)	57. (4)	93. (4)	129. (3)	165. (3)
22. (2)	58. (3)	94. (1)	130. (2)	166. (3)
23. (3)	59. (2)	95. (4)	131. (3)	167. (1)
24. (2)	60. (4)	96. (1)	132. (3)	168. (2)
25. (3)	61. (1)	97. (3)	133. (4)	169. (3)
26. (1)	62. (1)	98. (2)	134. (1)	170. (3)
27. (2)	63. (3)	99. (3)	135. (3)	171. (3)
28. (4)	64. (3)	100. (1)	136. (3)	172. (2)
29. (1)	65. (1)	101. (2)	137. (2)	173. (4)
30. (2)	66. (4)	102. (2)	138. (2)	174. (2)
31. (4)	67. (3)	103. (3)	139. (1)	175. (2)
32. (1)	68. (3)	104. (3)	140. (2)	176. (3)
33. (3)	69. (3)	105. (2)	141. (3)	177. (4)
34. (2)	70. (2)	106. (1)	142. (2)	178. (1)
35. (3)	71. (4)	107. (3)	143. (3)	179. (1)
36. (4)	72. (2)	108. (3)	144. (3)	180. (2)

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (1)

Hint & Sol.: Particle *B* located at mean position has maximum velocity.

2. Answer (4)

Hint: Any function of the form

$y = f(x \pm vt)$ represents progressive wave

Sol.: $y = A\sin(ax^2 - bt^2)$ does not have the form of function $y = f(x \pm vt)$, so it is not progressive wave.

3. Answer (4)

Hint: Frequency of n^{th} harmonic, $f = \frac{nv}{2\ell}$

Sol.: For third harmonic $n = 3$

$$f = \frac{3v}{2\times\frac{1}{2}}$$

$900 = 3v$

$v = 300$ m/s

4. Answer (1)

Hint & Sol.: In solids mechanical wave may be longitudinal or transverse depending on mode of excitation while wave on string is transverse.

5. Answer (1)

Hint & Sol.: A set of tones whose frequencies are integral multiple of the fundamental frequency are called harmonics.

6. Answer (1)

Hint: Amplitude of particle (R) as a function of position (x) according to given equation is $R = 8\sin\left(\frac{\pi x}{12}\right)$ cm

Sol.: $R = 8\sin\left(\frac{\pi x}{12}\right)$

$$R = 8\sin\left(\frac{\pi\times 2}{12}\right)$$

$$= 8\sin\frac{\pi}{6} = 8\times\frac{1}{2} = 4 \text{ cm}$$

7. Answer (1)

Hint: For open pipe, frequency $f = \frac{v}{2\ell}$

Sol.: For closed pipe, $f_2 = \frac{v}{4\ell'}$

$$f_2 = \frac{v}{4\times\frac{2\ell}{3}}$$

$$= \frac{3}{4}\times\left(\frac{v}{2\ell}\right)$$

$$= \frac{3f}{4}$$

8. Answer (4)

Hint: Time interval between two consecutive minimum intensities = $\frac{1}{\text{beats frequency}}$

Sol.: Beats frequency = $\frac{4}{2} = 2$ Hz

$\therefore$ Required time interval $= \frac{1}{2} = 0.5$ s

9. Answer (1)

Hint & Sol.: The echo of sound wave is due to reflection.

10. Answer (3)

Hint: Velocity of transverse wave in string, $v = \sqrt{\frac{T}{\mu}}$

Sol.: $\frac{\Delta v}{v}\times 100 = \frac{1}{2}\frac{\Delta T}{T}\times 100 = \frac{1}{2}\times 4\%$

$= 2\%$

11. Answer (2)

Hint: Wavelength of the wave, $\lambda = \frac{v}{f}$

Sol.: $f = \frac{45}{15} = 3\ s^{-1}$

$$v = \frac{450}{10} = 45 \text{ cm/s}$$

$$\lambda = \frac{v}{f}$$

$$= \frac{45}{3}$$

$= 15$ cm

12. Answer (3)

Hint: Angular frequency of simple pendulum, $\omega = \sqrt{\frac{g}{\ell}}$

Sol.: $g_{\text{eff}} = g + \frac{g}{4}$

$g_{\text{eff}} = \frac{5g}{4}$

$\omega_1 = \frac{\sqrt{5}}{2}\sqrt{g/\ell} = \frac{\sqrt{5}}{2}\omega$

13. Answer (3)

Hint & Sol.: In S.H.M., displacement is always in opposite phase with acceleration.

14. Answer (2)

Hint & Sol.: $v = \pm\omega\sqrt{A^2 - x^2}$

$v^2 = \omega^2A^2 - \omega^2x^2$

$v^2 + \omega^2x^2 = \omega^2A^2$

$\frac{v^2}{\omega^2A^2} + \frac{x^2}{A^2} = 1$

This is equation of ellipse (for $\omega \neq 1$)

15. Answer (1)

Hint: Minimum time taken to travel from mean position to extreme position = $\frac{T}{4}$

Sol.: $a = -bx$

$\omega = \sqrt{b}$

$T = \frac{2\pi}{\omega} = \frac{2\pi}{\sqrt{b}}$

$\therefore\ t = \frac{T}{4} = \frac{\pi}{2\sqrt{b}}$ s

16. Answer (3)

Hint & Sol.: Time period of spring-mass system is independent of its acceleration.

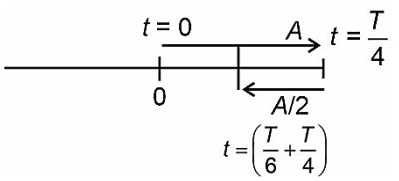
17. Answer (4)

Hint & Sol.: Time period of oscillation of physical pendulum, $T = 2\pi\sqrt{\frac{I}{mgd}}$

18. Answer (3)

Hint: Time period of S.H.M., $T = \frac{2\pi}{\omega}$

Sol.: $t = \frac{T}{4} + \frac{T}{6} = \frac{5T}{12} = \frac{5}{12}\left(\frac{2\pi}{\omega}\right) = \frac{5\pi}{6\omega}$ s



Total distance travelled = $A + \frac{A}{2}$

$= \frac{3A}{2}$

19. Answer (4)

Hint: Velocity of particle in S.H.M., $v = \pm\omega\sqrt{A^2 - x^2}$

Sol.: $T = \frac{2\pi}{\omega}$

$\omega = \frac{2\pi}{6}$

$\omega = \frac{\pi}{3}$ rad

$v = \frac{\pi}{3}\sqrt{5^2 - 4^2} = \pi$ cm/s

20. Answer (1)

Hint: $U = \frac{1}{2}kx^2$ & $K = \frac{1}{2}m\omega^2A^2 - \frac{1}{2}m\omega^2x^2$

Sol.: $\frac{1}{2}kx^2 = \frac{1}{2}kA^2 - \frac{1}{2}kx^2$

$x = \frac{A}{\sqrt{2}}$

21. Answer (3)

Hint: Maximum velocity of particle, $v_{\max} = \omega A$

Sol.: $A_R = \sqrt{A^2 + A^2 + 2A^2\cos 90^\circ}$

$= \sqrt{2}A$

$v_{\max} = \sqrt{2}A\omega$

22. Answer (2)

Hint: Angular frequency$(\omega) = \sqrt{\frac{k}{m}}$

Sol.: $F = -20x + 4$

$(F - 4) = -20x$

$F_1 = -20x$

$ma = -20x$

$a = \frac{-20}{0.2}x = -100x = -\omega^2x$

$\omega = \sqrt{100} = 10$ rad/s

$T = \frac{2\pi}{10} = \frac{\pi}{5}$ s

23. Answer (3)

Hint: The given process is isothermal.

Sol.: $Q = W + \Delta U$

In isothermal process,

$\Delta U = 0$

$\therefore \frac{W}{Q} = 1$

24. Answer (2)

Hint & Sol.: $Q = \Delta U + W$

For process $A \rightarrow B$,

W = –ve, ΔU = –ve

$\therefore Q$ = – ve

For process $B \rightarrow C$,

$W = 0$, ΔU = +ve

$\therefore Q$ = +ve

25. Answer (3)

Hint & Sol.: $\Delta U = nC_v\Delta T$

Change in internal energy depends on initial and final temperature.

26. Answer (1)

Hint: For adiabatic process, $Q = 0$

Sol.: $Q = \Delta U + W$

$Q = 0$

$\Delta U + W = 0$

$\Delta U = -W$, here W = –ve

$\Rightarrow \Delta U$ = + ve

So, temperature of the gas will increase

27. Answer (2)

Hint: Efficiency of carnot engine, $\eta = 1 - \frac{T_L}{T_H}$

Sol.: Case I

$\frac{40}{100} = 1 - \frac{400}{T_H}$

$\frac{2}{5} = 1 - \frac{400}{T_H}$

$\frac{400}{T_H} = \frac{3}{5}$

$T_H = \left(\frac{2000}{3}\right)$K

Case II

$\frac{50}{100} = 1 - \frac{T_L}{\frac{2000}{3}}$

$\frac{T_L}{\frac{2000}{3}} = \frac{1}{2}$

$T_L = \left(\frac{1000}{3}\right)$K ≈ 333 K

ΔT = 400 – 333

= 67 K

28. Answer (4)

Hint: For diatomic gas, number of degrees of freedom is 5.

Sol.: $\gamma = \frac{f+2}{f}$

$= \frac{5+2}{5}$

$= \left(\frac{7}{5}\right)$

PV^{γ} = constant

$PV^{7/5}$ = constant

29. Answer (1)

Hint & Sol.:

Isochoric process $\rightarrow W = 0$, $Q \neq 0$, $\Delta U \neq 0$

Isobaric process $\rightarrow Q \neq 0$, $\Delta U \neq 0$, $W \neq 0$

Isothermal process $\rightarrow Q \neq 0$, $\Delta U = 0$, $W \neq 0$

Adiabatic process $\rightarrow Q = 0$, $W \neq 0$, $\Delta U \neq 0$

30. Answer (2)

Hint: Use first law of thermodynamics

Sol.: $Q = \Delta U + W$

$W = nR\Delta T$

$Q = \frac{nR\gamma\Delta T}{\gamma - 1}$

$nR\Delta T = \frac{Q(\gamma - 1)}{\gamma}$

$W = \frac{Q\left(\frac{7}{5} - 1\right)}{\frac{7}{5}}$

$\Rightarrow W = \left(\frac{2Q}{7}\right)$

$\therefore \Delta U = Q - W$

$= Q - \frac{2Q}{7}$

$= \left(\frac{5Q}{7}\right)$

31. Answer (4)

Hint: Use first law of thermodynamics

Sol.: $Q = \Delta U + W$

$Q = 200$ J

$W = P\Delta V$

$= 2 \times 10^5 \times (1000 - 600) \times 10^{-6}$

$= 2 \times 10^5 \times 400 \times 10^{-6}$

$= 8 \times 10^7 \times 10^{-6}$

$= 80$ J

$\Delta U = 200 - 80$

$= 120$ J

32. Answer (1)

Hint & Sol.: Volume of the gas increases continuously, so work done by gas will be positive for process $A \rightarrow B \rightarrow C$

33. Answer (3)

Hint & Sol.: $\left(\frac{dP}{dV}\right)_{\text{at constant volume}} = \infty$

34. Answer (2)

Hint: Process A to B is isobaric

Sol.: $Q = nC_P\Delta T$

$$C_P = \frac{\gamma R}{\gamma - 1}$$

$$C_P = \frac{\frac{5}{3}R}{\frac{5}{3} - 1} = \frac{5R}{2}$$

$$T_A = \frac{2P_0V_0}{nR}$$

$$T_B = \frac{6P_0V_0}{nR}$$

$$\Delta T = \left(\frac{4P_0V_0}{nR}\right)$$

$$Q = \frac{n5R}{2} \times \frac{4P_0V_0}{nR}$$

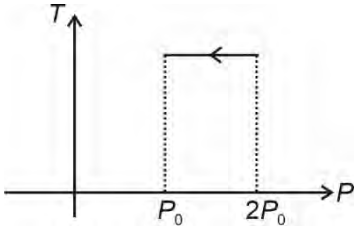
$= 10P_0V_0$

35. Answer (3)

Hint: Use PV = constant

Sol.: $P = \left(\frac{nRT}{V}\right)$

T is constant



Slope will remain zero.

36. Answer (4)

Hint & Sol.: $PV = nRT$, here temperature is in kelvin

$PV = nR(t + 273)$, here t is in degree Celsius

$PV = \frac{5nR}{9}(F + 459)$, here F is in Fahrenheit

37. Answer (1)

Hint & Sol.: Specific heat of an ideal gas is different for different processes.

Rotational degree of freedom of monoatomic gas is zero, so rotational kinetic energy will be zero.

38. Answer (1)

Hint: Ratio of specific heat, $\frac{C_p}{C_v} = \gamma = \left(\frac{f+2}{f}\right)$

Sol.: By conservation of energy

$$\frac{1}{2}(n_1 + n_2)f_{\text{mix}}RT = \frac{1}{2}n_1f_1RT + \frac{1}{2}n_2f_2RT$$

$$\frac{1}{2}(1+3)f_{\text{mix}}RT = \frac{1}{2}1 \times 5RT + \frac{1}{2} \times 3 \times 3RT$$

$2f_{\text{mix}}RT = 7RT$

$$f_{\text{mix}} = \frac{7}{2}$$

$$\gamma = \frac{f_{\text{mix}} + 2}{f_{\text{mix}}}$$

$$\Rightarrow \gamma = \frac{\frac{7}{2} + 2}{\frac{7}{2}}$$

$$\Rightarrow \gamma = \frac{\frac{11}{2}}{\frac{7}{2}}$$

$$\therefore \gamma = \left(\frac{11}{7}\right)$$

39. Answer (3)

Hint: Use concept of conservation of energy

Sol.: $(K.E)_{mix} = (K.E)_{mono} + (K.E)_{diatomic\ gas}$

$$= \frac{3}{2}n_1RT_1 + \frac{5}{2}n_2RT_2$$

$$= \frac{3}{2} \times 3R \times 2T + \frac{5}{2} \times 2R \times T$$

$= 9RT + 5RT$

$= 14RT$

40. Answer (1)

Hint: Kinetic energy of centre of mass w.r.t. ground = $\frac{1}{2}Mv^2$

Sol.: Kinetic energy of gas w.r.t. ground

= (kinetic energy of centre of mass w.r.t. ground) + (kinetic energy of gas w.r.t. centre of mass)

$$= \frac{1}{2}Mv^2 + \frac{3}{2}nRT$$

41. Answer (2)

Hint: Use concept of Boyle's law

Sol.: $PV = nRT$

$$PV = \frac{m}{M}RT$$

m and T are constant

then PV = constant

42. Answer (4)

Hint & Sol.: $P = \frac{1}{3}\frac{mN}{V}v_{rms}^2$

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

If V & T = constant, then pressure $P \propto mN$ (where mN = mass of the gas)

43. Answer (3)

Hint & Sol.: Volume occupied by one mole of any gas at STP is 22.4 L

No. of moles of N_2 gas = $\frac{28}{28} = 1$

44. Answer (3)

Hint: Heat absorbed by gas, $Q = nC\Delta T$

Sol.: $\Delta U = Q - \frac{2Q}{5}$

$$\frac{3Q}{5} = \frac{3}{2}nR\Delta T$$

$$Q = \frac{5}{2}nR\Delta T$$

$$nC\Delta T = \frac{5}{2}nR\Delta T$$

$$C = \frac{5R}{2}$$

45. Answer (1)

Hint: Area under ($P - V$) curve is work done by gas

Sol.: $W_{AB} = 4 \times 20 + \frac{1}{2} \times 60 \times 4$

= 80 + 120

= 200 J

$W_{BC} = -4 \times 20$

= –80 J

$$\left|\frac{W_{AB}}{W_{BC}}\right| = \frac{200}{80} = \left(\frac{5}{2}\right)$$

[CHEMISTRY]

46. Answer (1)

Hint:

	Boiling point/K
Pentane	309.1

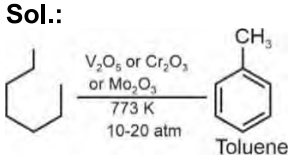
Sol.:

2-Methylbutane	300.9
2,2-Dimethylpropane	282.5
Hexane	341.9

47. Answer (4)

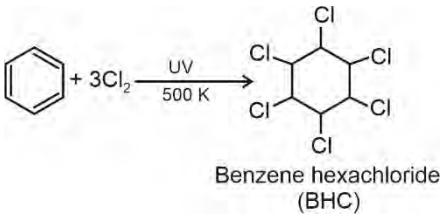
Hint: $CH_4 + H_2O \xrightarrow[\Delta]{Ni} CO + 3H_2$

Sol.:



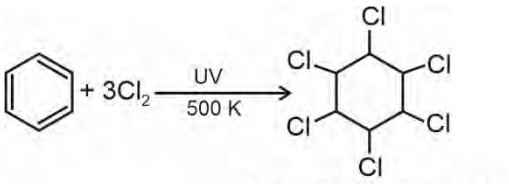
48. Answer (1)

Hint:



Benzene hexachloride (BHC)

Sol.:



Benzene hexachloride (BHC)

49. Answer (1)

Hint:

$CH_3-C\equiv CH + H-Cl \longrightarrow CH_3-\underset{\underset{Cl}{|}}{C}=CH_2$ (A)

Sol.: $CH_3-\underset{\underset{Cl}{|}}{C}=CH_2 + HI \longrightarrow CH_3-\underset{\underset{Cl}{|}}{\overset{\overset{I}{|}}{C}}-CH_3$

50. Answer (3)

Hint: Hydration of alkynes results in formation of carbonyl compounds.

Sol.:

$CH_3-C\equiv CH + H_2O \xrightarrow[333\ K]{Hg^{2+}/H^+} CH_3-\underset{\underset{O-H}{|}}{C}=CH_2 \rightleftharpoons CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ (Tautomerisation)

51. Answer (2)

Hint: In nitrating mixture of conc. HNO_3 and conc. H_2SO_4. H_2SO_4 act as an acid and HNO_3 acts as a base.

Sol.:

$$\underset{\text{acid}}{H_2SO_4} + \underset{\text{base}}{HO-NO_2} \longrightarrow HSO_4^- + H_2\overset{+}{O}-NO_2$$

$$H_2\overset{+}{O}-NO_2 \longrightarrow H_2O + \underset{\text{electrophile}}{\overset{\oplus}{N}O_2}$$

52. Answer (3)

Hint: The groups which direct the incoming electrophile towards meta position when attached with benzene are called meta directing groups.

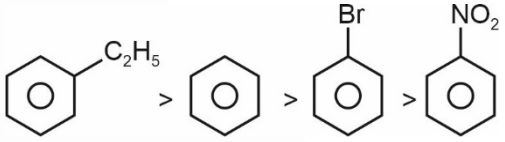
Sol.: Meta directing groups are $-NO_2$, $-CN$

o and p-directing groups are $-NHCOCH_3$, $-OCH_3$, $-Cl$

53. Answer (2)

Hint: Electron donating group at benzene increases rate of electrophilic aromatic substitution reaction.

Sol.: The correct order of reactivity towards electrophilic aromatic substitution reaction will be



54. Answer (1)

Hint: During unsaturation test of alkynes, reddish orange colour of solution decolourises.

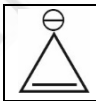
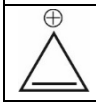
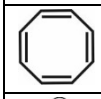
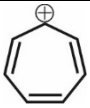
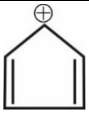
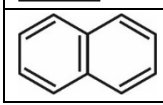
Sol.:

$CH_3-C\equiv CH + Br_2 \longrightarrow [CH_3CBr = CHBr] \xrightarrow{Br_2} CH_3-\underset{\underset{Br}{|}}{\overset{\overset{Br}{|}}{C}}-\overset{\overset{Br}{|}}{CH}-Br$

55. Answer (2)

Hint: Aromatic species are cyclic, planar and having $(4n + 2)\pi$ electrons in the ring where n is an integer.

Sol.:

	Antiaromatic
	Aromatic
	Non-aromatic
	Aromatic
	Antiaromatic
	Aromatic

56. Answer (3)

Hint: $pK_a = -\log K_a$

Larger the value of K_a smaller the value of pK_a

Sol.:

Terminal alkynes are more acidic in nature than alkene, alkane and non-terminal alkyne

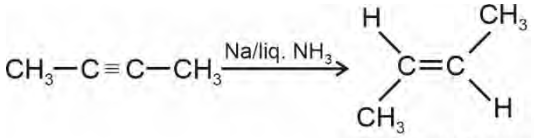
The correct acidic strength order will be b > a > c

Therefore, pKa value order will be c > a > b

57. Answer (4)

Hint: Na in liquid NH_3 converts non-terminal alkyne into trans-alkene.

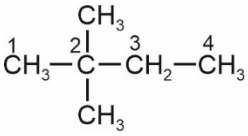
Sol.:



trans-but-2-ene

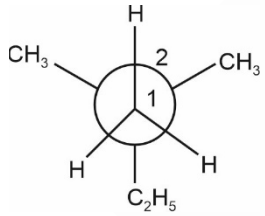
58. Answer (3)

Hint: Structural formula of 2, 2-Dimethylbutane is

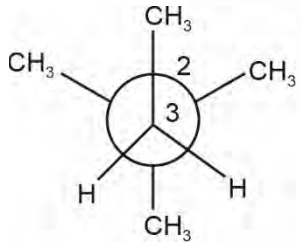


Sol.:

(I) Newman projection using C_1–C_2 bond



(II) Newman projection using C_3 – C_2 bond



59. Answer (2)

Hint: During the electrolysis of salt of carboxylic acid at cathode reduction takes place

$$2H_2O + 2e^- \longrightarrow H_2 \uparrow + 2OH^-$$

Therefore, pOH of solution decreases.

Sol.: Methane cannot be prepared by the electrolysis of an aqueous solution of salt of carboxylic acid. Alkanes containing even number of carbon atoms are obtained.

60. Answer (4)

Hint: $2CH_4 + O_2 \xrightarrow{Cu/523\ K/100\ atm} 2CH_3OH$

Sol.: $CH_4 + O_2 \xrightarrow[\Delta]{Mo_2O_3} HCHO + H_2O$

$$2CH_3CH_3 + 3O_2 \xrightarrow[\Delta]{(CH_3COO)_2Mn} 2CH_3COOH$$

$$(CH_3)_3CH \xrightarrow{KMnO_4} (CH_3)_3COH$$

61. Answer (1)

Hint: Percentage of nitrogen = $\frac{14 \times M \times 2(V - V_1/2)}{1000} \times \frac{100}{M}$

Sol.: 0.1 M of 100 mL H_2SO_4 = 1 M of 20 mL NH_3

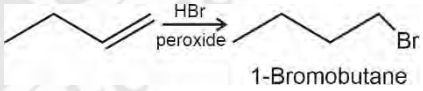
1000 mL of 1 M ammonia contains 14 g nitrogen

20 mL of 1 M ammonia contains = $\frac{14 \times 20}{1000}$ g nitrogen

Percentage of nitrogen = $\frac{14 \times 20 \times 100}{1000 \times 0.5} = 56\%$

62. Answer (1)

Hint:



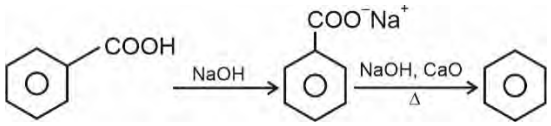
1-Bromobutane

Sol.: Peroxide effect proceeds via free radical chain mechanism.

63. Answer (3)

Hint: Decarboxylation of sodium salt of acid gives alkane as major product.

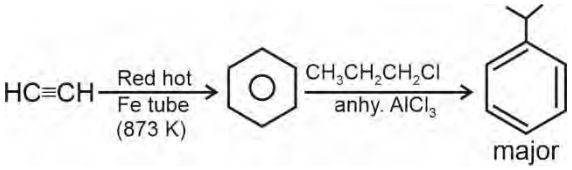
Sol.:



64. Answer (3)

Hint: $CaC_2 \xrightarrow{H_2O} \underset{(A)}{CH \equiv CH}$

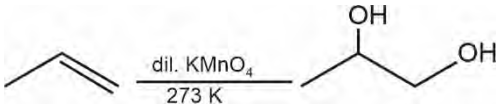
Sol.:



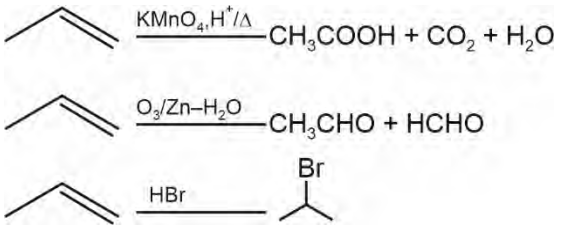
major

65. Answer (1)

Hint:

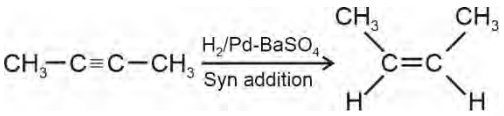


Sol.:

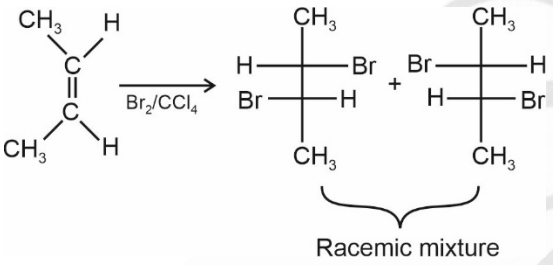


66. Answer (4)

Hint:



Sol.:



67. Answer (3)

Hint: In chain propagation step new radical is formed at each step.

Sol.: Therefore, step (a) and step (b) are chain propagation steps

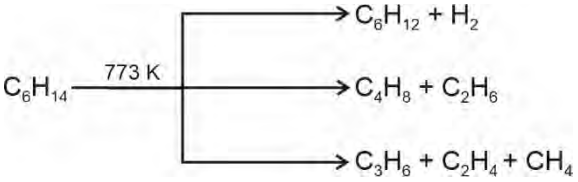
$$CH_4 + \dot{Cl} \xrightarrow{h\nu} \dot{C}H_3 + HCl$$

$$\dot{C}H_3 + Cl - Cl \xrightarrow{h\nu} CH_3 - Cl + \dot{Cl}$$

68. Answer (3)

Hint: Higher alkanes on heating to high temperatures decompose into lower alkanes.

Sol.:



69. Answer (3)

Hint: $-NO_2$ group show – R and –I effect

Sol.:

Group	Type of effect
$-NO_2$	–R, –I
$-CH_3$	+I, Hyperconjugation
$-NH_2$	+R, –I
–CN	–R, –I

70. Answer (2)

Hint: Hyperconjugation occurs due to delocalization of C–H σ bonded electrons to an atom of unsaturated system or to an atom with an unshared p orbital.

Sol.: In carbocations (a) and (c) alpha hydrogen is present therefore hyperconjugation takes place.

71. Answer (4)

Hint: Neutral resonating structure is more stable than the charged resonating structure.

Negative charge at more electronegative atom will be more stable.

Sol.: Therefore stability order will be

(a) $CH_2=CH-CH=CH_2 > \overset{+}{C}H_2-CH=CH-\overset{-}{C}H_2$

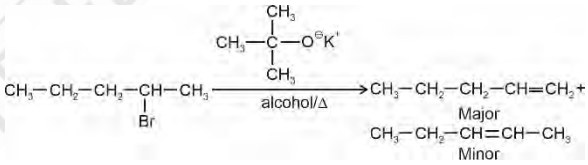
(b) 

(c) $CH_2=\overset{+}{N}=\overset{-}{N} > \overset{-}{C}H_2-\overset{+}{N}\equiv N$

72. Answer (2)

Hint: In dehydrohalogenation by bulky base gives less substituted alkene as the major product [Hofmann product]

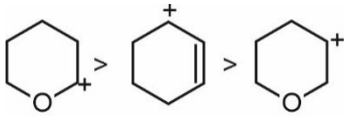
Sol.:



73. Answer (1)

Hint: Stability of carbocation depends on the + R effect, +I effect and hyperconjugation.

Sol.: Therefore, the correct order of stability will be.



74. Answer (4)

Hint: In the test of halogen, cyanide or sulphide interfere with silver nitrate test for halogen.

Sol.: If nitrogen or sulphur is also present in the organic compound, the sodium fusion extract is first boiled with concentrated nitric acid to decompose cyanide or sulphide of sodium formed during Lassaigne's test.

75. Answer (3)

Hint: % of carbon

$$= \frac{12 \times \text{mass of } CO_2 \times 100}{44 \times \text{mass of organic compound}}$$

% of hydrogen

$$= \frac{2 \times \text{mass of } H_2O \times 100}{18 \times \text{mass of organic compound}}$$

Sol.:

$$\% \text{ of carbon} = \frac{12 \times 0.147 \times 100}{44 \times 0.2} = 20.04\%$$

$$\% \text{ of hydrogen} = \frac{2 \times 0.12 \times 100}{18 \times 0.2} = 6.66\%$$

% of oxygen = 100 – 26.66 = 73.30%

76. Answer (1)

Hint:

(a) $(NH_4)_3PO_4.12MoO_3$ Yellow

Sol.:

(b) $[Fe(CN)_5NOS]^{4-}$ Violet

(c) $Fe_4[Fe(CN)_6]_3.xH_2O$ Prussian blue

(d) $[Fe(SCN)]^{2+}$ Blood red

77. Answer (2)

Hint: Aniline is separated by steam distillation from aniline water mixture.

Sol.: Steam distillation is applied to separate substance which are steam volatile and are immiscible with water.

78. Answer (1)

Hint: Percentage of halogen

$$= \frac{\text{Atomic mass of X} \times m_1 \times 100}{\text{Molecular mass of AgX} \times m}$$

Sol.:

$$\text{Percentage of chlorine} = \frac{35.5 \times 0.1435 \times 100}{143.5 \times 0.05}$$

= 71%

79. Answer (1)

Hint: Paper chromatography is a type of partition chromatography.

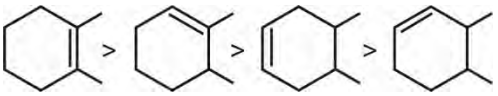
Sol.: In column chromatography, the most readily adsorbed substances are retained near the top and others come down the various distances in the column.

80. Answer (4)

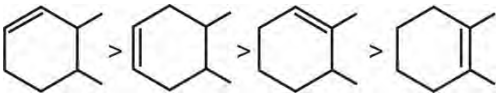
Hint: If the product is same on the hydrogenation then

$$\text{Heat of hydrogenation} \propto \frac{1}{\text{Stability of alkene}}$$

Sol.: The correct order of stability of alkene is



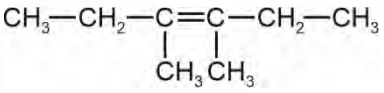
Heat of hydrogenation will be



81. Answer (3)

Hint: Those isomers which have different arrangement of atoms or group of atoms around carbon-carbon double bond are known as geometrical isomers.

Sol.:



3, 4-Dimethylhex-3-ene

It will show geometrical isomerism.

Cyclohexene will not show geometrical isomerism because its trans-form is unstable.

82. Answer (3)

Hint: Allyl free radical is more stable than benzyl free radical due to the bond dissociation energy.

Sol.: Methyl carbocation is sp^2 hybridised and has trigonal planar shape.

$\Rightarrow$ Due to the presence of lone pair of electrons ammonia act as nucleophile.

83. Answer (1)

Hint: The permanent shift of sigma electrons away from the carbon atom due to more electronegative atom or group of atoms is called –I effect

Sol.: The correct order of –I effect will be –CN > –COOH > –Cl > –OH

84. Answer (4)

Hint: Two or more compounds having the same molecular formula but different functional groups are called functional isomers.

Sol.: Alcohol and phenol are functional isomers.

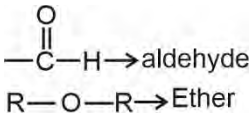
85. Answer (4)

Hint: The choice of principal functional group is made on the basis of order of preference.

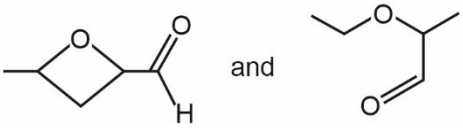
Sol.: The correct decreasing priority order of given functional groups is

$$-COOR > -CN > -\overset{O}{\overset{\|}{C}}-H > -\overset{|}{C}=O$$

86. Answer (3)

Hint: 

Sol.:



These two compounds have aldehyde and ether functional groups.

87. Answer (2)

Hint: Compounds having the same molecular formula but different structures are classified as structural isomers.

Sol.: 

88. Answer (4)

Hint: Double bond have more priority than the triple bond, if they have same number.

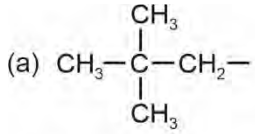
Sol.: $\overset{1}{CH_2}=\overset{2}{CH}-\overset{3}{CH_2}-\overset{4}{C}\equiv\overset{5}{C}-\overset{6}{CH_3}$

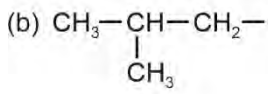
$sp^2 \quad sp^2 \quad sp^3 \quad sp^3 \quad sp \quad sp^3$

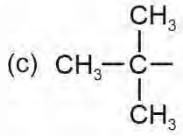
89. Answer (1)

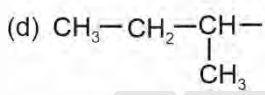
Hint: A primary alkyl group is named by substituting 'yl' for 'ane' in the corresponding alkane.

Sol.:

(a)  (i) Neopentyl

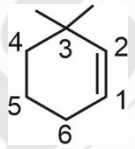
(b)  (ii) Isobutyl

(c)  (iii) tert-Butyl

(d)  (iv) sec-Butyl

90. Answer (4)

Hint: Substituent should get minimum number in IUPAC nomenclature.

Sol.: 

3, 3-Dimethylcylohexene.

[BOTANY]

91. Answer (4)

Hint: Yeasts poison themselves to death when the concentration of alcohol reaches about 13%.

Sol.: Maximum concentration of alcohol in the beverages that are naturally fermented is 13%.

92. Answer (4)

Hint: Substrate level phosphorylation refers to the direct synthesis of ATP/GTP from the metabolites.

Sol.: During the conversion of succinyl CoA to succinic acid, one GTP molecule is formed.

93. Answer (4)

Hint: First half of the glycolytic pathway utilizes energy.

Sol.: ATP is formed during the conversion of 1, 3-bisphosphoglyceric acid to 3-phosphoglyceric acid.

94. Answer (1)

Sol.: In the ETC, reduced ubiquinone (ubiquinol) is oxidised with the transfer of electrons to cyt *c* via complex III (cytochrome bc_1)

95. Answer (4)

Hint: During the removal of redox equivalent in glycolysis their is addition of phosphate by H_3PO_4

Sol.: G-6-P, G-3-P and 3-PGA have ^{32}P in their phosphate group.

96. Answer (1)

Hint: During the conversion of glyceraldehyde-3-phosphate into 1, 3-bisphosphoglyceric acid, one molecule of NADH + H^+ is formed.

Sol.: When respiratory substrate is a fat or a carbohydrate, the term, floating respiration is used.

97. Answer (3)

Hint: A root elongating at a constant rate represents arithmetic growth.

Sol.: The suspension of growth for a period of time is referred to as dormancy. It is due to the exogenous as well as endogenous factors.

98. Answer (2)

Hint: During plant development, maturation is followed by flowering.

Sol.: The correct sequence of development is as follows:

Seed germination → Seedling → Juvenile phase → Maturation → Flowering → Seed formation → Senescence

99. Answer (3)

Hint: ABA is a plant growth inhibitor.

Sol.: Ethylene induces flowering in mango.

100. Answer (1)

Hint: Ethylene is a fruit ripening hormone.

Sol.: Ethephon, in an aqueous solution, is readily absorbed and transported within the plants and releases ethylene slowly.

101. Answer (2)

Hint: The given graphical representation is of geometrical growth.

Sol.: 'A' represents the lag phase of growth. A tree showing seasonal activities does not show a typical S-shaped curve.

102. Answer (2)

Hint: The extracts of vascular tissues, yeast extract have cytokinin.

Sol.: Cytokinin promotes cell division and lateral shoot growth and also increase shelf life of cut shoots, vegetables and flowers.

103. Answer (3)

Hint: Gibberellins stimulate seed germination by synthesising various types of hydrolytic enzymes.

Sol.: Phenolic acid is a chemical inhibitor that prevents the breakdown of seed dormancy.

104. Answer (3)

Hint: E. Kurosawa found that the 'bakanae' disease of rice seedlings is caused by a fungus and extracted gibberellin from the fungus.

Sol.: Auxin was isolated from the tips of coleoptiles of oat seedlings by F.W. Went.

105. Answer (2)

Hint: Abscisic acid acts as an anti-transpirant.

Sol.: Ethylene is a volatile substance that synchronises fruit-set and initiates flowering in pineapple. Cytokinin is a modified purine that enhances the supply of water and minerals to the lateral buds.

106. Answer (1)

Hint: Gibberellin induces early maturity in juvenile conifers.

Sol.: When gibberellins are sprayed on sugarcane crop, the length of the stem increases which eventually increases the yield of the crop.

107. Answer (3)

Hint: Absolute growth rate is the measurement and the comparison of total growth per unit time.

Sol.: Relative growth rate of leaf 'X' = $\frac{100-25}{25}$ × 100 = 300%

Relative growth rate of leaf 'Y' = $\frac{40-10}{10}$ × 100 = 300%

Hence, it can be concluded that both the leaves have the same relative growth rate.

108. Answer (3)

Hint: Indole-3-acetic acid and Indole-3-butyric acid are the natural auxins.

Sol.: 2, 4, 5-T and NAA are the synthetic auxins.

109. Answer (3)

Hint: Differentiation in plants is open.

Sol.: Tissues arising out of the same meristem have different structures at maturity. The final structure at maturity of a tissue is also determined by the location of the cells within.

110. Answer (2)

Hint: Auxins are used to produce parthenocarpic fruits in tomato.

Sol.: Auxin was first isolated from human urine.

111. Answer (2)

Hint: Abscisic acid is also known as the stress hormone.

Sol.: ABA is derivative of carotenoids.

112. Answer (4)

Hint: Aerenchyma is a specialised parenchyma which is developed to provide buoyancy, particularly in aquatic plants.

Sol.: Cork is formed as a result of redifferentiation.

113. Answer (3)

Hint: Removal of the tip of stem is called decapitation.

Sol.: Decapitation leads to the removal of auxin and hence, growth of lateral shoots is enhanced which is beneficial for the preparation of hedges and bushy growth in certain plants.

114. Answer (2)

Hint: Acetyl CoA is raw material for gibberellins.

Sol.: Auxin promotes the abscission of older mature leaves and fruits.

115. Answer (3)

Hint: Gaseous PGR lead to apical hook formation.

Sol.: Para-ascorbic acid promotes seed dormancy.

116. Answer (4)

Hint: Cytochrome *c* oxidase complex contains cytochromes *a* and a_3 and two copper centres.

Sol.: Cytochrome *c* is a mobile electron carrier that transfers electrons between complex III and IV of the ETS in the inner mitochondrial membrane.

117. Answer (2)

Hint: Pyruvate formed by the glycolytic catabolism of carbohydrates in the cytosol, enters mitochondrial matrix to form acetyl CoA that further enters TCA cycle.

Sol.: From one glucose molecule, 6 $NADH_2$, 2-$FADH_2$ and 2 ATP molecules are released. Succinate dehydrogenase converts succinic acid to fumaric acid which yields a molecule of $FADH_2$.

118. Answer (3)

Hint: For the calculation of the net gain of ATP for every glucose molecule oxidised, it is assumed that glycolysis, TCA cycle and ETS pathway are following one after another.

Sol.: For the calculation of the net gain of ATP for every glucose molecule oxidised, it is assumed that none of the intermediates in the pathway are utilised to synthesise other compounds.

119. Answer (3)

Hint: Plant cells are closely packed and located quite close to the surface of the plant.

Sol.: During respiration, plant cells catabolize glucose in several steps, so that not all the liberated energy goes out as heat, instead some steps are large enough, such that the energy can be coupled to synthesise ATP.

120. Answer (2)

Hint: Pyruvate dehydrogenase catalyses the formation of acetyl CoA from pyruvic acid.

Sol.: Fumarase – Catalyses the formation of malic acid

Enolase – Catalyses the formation of phosphoenolpyruvate

Complex II of ETS – Succinate dehydrogenase

121. Answer (4)

Hint: Six carbon oxalosuccinate undergoes decarboxylation to form five carbon α–ketoglutaric acid.

Sol.: Fumaric acid is a 4C compound. It is formed by the activity of succinate dehydrogenase that is found attached to inner mitochondrial membrane.

122. Answer (2)

Hint: Fatty acid would be broken down to 2-C molecule before entering respiratory pathway.

Sol.: The common intermediate for aerobic respiration of proteins and fatty acids is acetyl CoA.

123. Answer (2)

Hint: In the last step of Krebs' cycle, malic acid is converted into OAA.

Sol.: In muscle cells, under inadequate oxygen, pyruvic acid is reduced to lactic acid. Plant parts like roots, stems and leaves respire at rates far lower than animals do.

124. Answer (3)

Hint: Citrate synthase is found in the mitochondrial matrix.

Sol.: Succinate dehydrogenase is found attached to the inner mitochondrial membrane.

125. Answer (2)

Hint: Phosphofructokinase is the pacemaker enzyme of EMP pathway.

Sol.: The enzyme which helps in the transfer of phosphate from ATP to fructose-6-phosphate is the pacemaker enzyme of EMP pathway.

126. Answer (4)

Hint: The end product of glycolysis is pyruvic acid.

Sol.: Glycolysis leads to the net gain of 2 ATP molecules.

127. Answer (4)

Hint: In link reaction, CO_2 is released from pyruvate.

Sol.: FAD^+ is converted to $FADH_2$ during the conversion of succinic acid to fumaric acid.

128. Answer (1)

Hint: Fats are not the favoured substrates for respiration.

Sol.: Glucose is the favoured substrate for respiration.

129. Answer (3)

Hint: Aerobic respiration requires the presence of molecular oxygen.

Sol.: Aerobic respiration leads to the complete oxidation of organic molecules into water and carbon dioxide.

130. Answer (2)

Hint: RQ value of organic acids is more than unity.

Sol.: The ratio of the volume of CO_2 evolved to the volume of O_2 consumed in respiration is 0.9 and 0.7, when the respiratory substrates are protein and tripalmitin respectively.

131. Answer (3)

Hint: Optimum temperature is essential for seed germination.

Sol.: Light is not essential for early growth of the plants but is sustained only in its presence.

132. Answer (3)

Hint: Chlorenchyma is specialised to perform photosynthesis.

Sol.: During tissue culture, higher concentration of auxin than cytokinin favours root formation.

133. Answer (4)

Hint: In plants, by the activity of meristems, new cells are always being added to the plant body.

Sol.: Root apical meristem and shoot apical meristem are responsible for the elongation of a plant. This increase in length of the plant body is referred to as primary growth.

134. Answer (1)

Hint: Ethylene promotes leaf and flower senescence.

Sol.: Cytokinins promote nutrient mobilization that helps in the delay of leaf senescence.

135. Answer (3)

Hint: Abscisic acid is a plant growth inhibitor.

Sol.: Apical dominance inhibits the growth of lateral buds. Abscisic acid does not induce parthenocarpy.

[ZOOLOGY]

136. Answer (3)

Hint: An adult frog has lungs.

Sol.: Respiration in amphibians occur *via* gills, lungs and through skin.

Amphibians can live in aquatic as well as terrestrial habitats. Most of them have two pairs of limbs. A tympanum represents the ear. They are oviparous and development is indirect with larval stages.

137. Answer (2)

Hint: Eliminate the names of the phyla.

Sol.: In the members of the sub-phylum Vertebrata, notochord is present during the embryonic period. The notochord is replaced by cartilaginous or bony vertebral column in the adults.

Chordata is a phylum.

Hemichordata is a phylum.

Agnatha is a division under the sub-phylum Vertebrata.

138. Answer (2)

Hint: Includes the organism whose common name is rohu.

Sol.: *Myxine* belongs to the class Cyclostomata.

Cartilaginous fishes – *Carcharodon* and *Trygon*

Bony fishes – *Exocoetus, Labeo, Catla, Clarias* and *Betta*

139. Answer (1)

Hint: Feature seen in *Ascidia*

Sol.: The given image represents *Ascidia*, a member of the sub-phylum Urochordata. In urochordates, notochord is present only in the larval tail, while in cephalochordates, it extends from head to tail region and is persistent throughout their life.

They are exclusively marine and lack paired appendages.

140. Answer (2)

Hint: *Ichthyophis* does not possess limbs

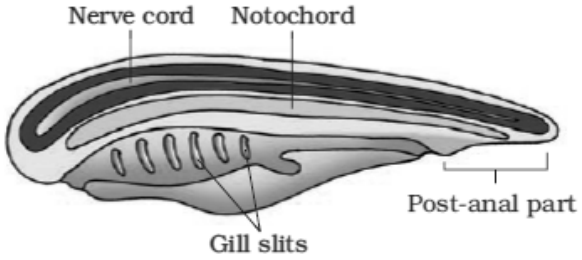
Sol.:

Pterophyllum	Angel fish
Ichthyophis	Limbless amphibian
Torpedo	Electric fish
Betta	Fighting fish

141. Answer (3)

Hint: True for non chordates.

Sol.:



S.NO.	Chordates	Non-chordates
1.	Notochord present.	Notochord absent.
2.	Central nervous system is dorsal hollow and single.	Central nervous system is ventral solid and double.
3.	Pharynx perforated by gill slits	Gill slits are absent
4.	Heart is ventral	Heart is dorsal (if present)
5.	A post-anal part (tail) is present	Post-anal tail is absent

142. Answer (2)

Hint: Some mammals lay eggs.

Sol.: *Aptenodytes* (Penguin) and *Ornithorhynchus* (Platypus) are oviparous.

Macropus (Kangaroo), *Pteropus* (Flying fox), *Canis* (Dog), *Felis* (Cat), *Macaca* (Monkey) are viviparous animals.

143. Answer (3)

Hint: Milk producing glands are called mammary glands.

Sol.: The most unique mammalian characteristic is the presence of milk producing glands by which young ones are nourished. The skin of mammals is unique in possessing hair.

They have two pairs of limbs, adapted for walking, running, climbing, burrowing, swimming or flying.

144. Answer (3)

Hint: Assist in their movement.

Sol.: Chordates possess a ventral heart. Some mammals lay eggs, *e.g.*, *Platypus*.

Fishes have streamlined bodies to reduce drag and resistance while swimming, allowing for efficient movement through water.

The characteristic features of birds are the presence of feathers and most of them can fly except for flightless birds (*e.g.*, Ostrich).

145. Answer (1)

Hint: Choose a bird.

Sol: The characteristic features of birds is the presence of feathers and most of them can fly, except flightless birds. Their endoskeleton is fully ossified and the long bones are hollow with air cavities.

Hemidactylus and *Naja* are reptiles.

Salpa is a member of the sub-phylum Urochordata.

146. Answer (2)

Hint: True for amphibians as well

Sol.: In members of the class Chondrichthyes and Osteichthyes, heart is two chambered which sends deoxygenated blood to gills for oxygenation. Many members of the class Chondrichthyes are viviparous. Bony fishes are mostly oviparous.

Sexes are separate in fishes.

147. Answer (4)

Hint: Assist in mating.

Sol.: Male members of the class Chondrichthyes bear claspers on pelvic fins. Fighting fish is a bony fish.

Male frogs have sound producing vocal sacs and also copulatory pads on the first digit of their fore limbs.

Male cockroaches have anal style which is absent in female cockroaches. Anal cerci is present in both the sexes.

148. Answer (2)

Hint: It is a member of the class Reptilia.

Sol.:

(1)	*Struthio* (Ostrich)	Oviparous and shows direct development
(2)	*Calotes* (Garden lizard)	Sheds its scales as skin cast
(3)	*Elephas* (Elephant)	External ears or pinnae are present
(4)	*Bufo* (Toad)	Exhibits external fertilization

149. Answer (1)

Hint: Horse is a mammal.

Sol: *Equus* belongs to the class Mammalia. They are viviparous with few exceptions and show direct development. Different types of teeth are present in the jaw.

Mammals are found in a variety of habitats.

150. Answer (4)

Hint: Have persistent notochord

Sol.: *Branchiostoma* (Amphioxus or lancelet) belongs to phylum Chordata and sub-phylum Cephalochordata.

151. Answer (4)

Hint: Vertebrates possess notochord during the embryonic stage.

Sol.: All vertebrates are chordates but all chordates are not vertebrates.

The members of the sub-phylum Vertebrata possess notochord during the embryonic period. The notochord is replaced by a cartilaginous or bony vertebral column in the adults.

Besides the basic chordate characters, vertebrates have muscular heart, two kidneys for excretion and paired appendages which may be fins or limbs.

152. Answer (3)

Hint: In chordates, pharynx is perforated by these gill slits.

Sol.: In mammals, gills slits and notochord are only present during the embryonic development.

153. Answer (4)

Hint: Belongs to the class Aves.

Sol.: Poikilothermous (cold-blooded) animals lack the capacity to regulate their body temperature. *Hippocampus* (Sea horse), *Torpedo* (Electric fish) and *Chameleon* (Tree lizard) are cold-blooded animals.

Psittacula(Parrot) is a homeotherm (warm-blooded) and belongs to the class Aves.

154. Answer (1)

Hint: Both are mammals.

Sol.: *Pteropus* is flying fox.

Delphinus is dolphin.

Both perform pulmonary respiration and have 4-chambered heart. Both exhibit internal fertilization.

155. Answer (2)

Hint: Belongs to Agnatha

Sol.: Cyclostomes have a sucking and circular mouth without jaws, hence they are called jawless vertebrates.

Their circulatory system is of closed type and body is devoid of scales and paired fins. Cyclostomes are marine animals but migrate for spawning to fresh water.

After spawning, within few days, they die.

Their larvae, after metamorphosis, return to the ocean.

156. Answer (2)

Hint: Nocturnal vision.

Sol.: Each eye consists of about 2000 hexagonal ommatidia. With the help of several ommatidia, a cockroach can receive several images of an object. This kind of vision is known as mosaic vision with more sensitivity but less resolution, being common during night (hence called nocturnal vision).

157. Answer (3)

Hint: The function of tracheal tubes.

Sol.: The respiratory system consists of a network of trachea, that open through 10 pairs of small holes called spiracles present on the lateral sides of the body. Thin branching tubes carry oxygen from the air to all the parts of body. The spiracles are regulated by the sphincters. Exchange of gases takes place at the tracheoles by diffusion.

158. Answer (3)

Hint: Anal style is present in the 9^{th} segment of male cockroaches only.

Sol.:

- Anal styles are present in male cockroach only.
- In both sexes of cockroaches, the 10^{th} abdominal segment bears a pair of jointed filamentous structures called anal cerci.

159. Answer (1)

Hint: Gonopore is the anterior part of the genital pouch.

Sol.:

The body of cockroach is segmented and divisible into three distinct regions. In each segment, exoskeleton has hardened plates called sclerites. Head is triangular in shape and lies anteriorly at right angles to the longitudinal body axis. In females, the 7^{th} sternum is boat-shaped and together with the 8^{th} and 9^{th} sterna forms a brood or genital pouch, whose anterior part contains female gonopore.

160. Answer (4)

Hint: Osculum is present in porifers.

Sol.:

- The blood of cockroach is colourless and composed of colourless plasma and haematocytes. Its heart consists of 13 elongated muscular tube lying along mid dorsal line of thorax and abdomen. Heart of cockroach is differentiated into funnel-shaped chambers with ostia on either sides.
- Blood from sinuses enter heart through ostia and is pumped anteriorly to sinuses again.

161. Answer (4)

Hint: Ovaries are present between 2^{nd} to 6^{th} abdominal segments.

Sol.:

Mushroom shaped gland	6^{th} to 7^{th} abdominal segments of males
Pair of ovaries	2^{nd} to 6^{th} abdominal segments of females
A pair of spermatheca	6^{th} abdominal segment of females
A pair of testes	4^{th} to 6^{th} abdominal segments of males

162. Answer (1)

Hint: Oothecae are lesser in number as compared to the number of eggs.

Sol.: Ootheca is a dark reddish to blackish brown capsule, about 3/8" (8 mm) long. They are dropped or glued to a suitable surface, usually in a crack or crevice of high relative humidity near a food surface. On an average, females produce 9-10 oothecae, each containing 14-16 eggs.

163. Answer (2)

Hint: It develops through nymphal stages.

Sol.: The development of *P.americana* is paurometabolous type, meaning, there is development through nymphal stages. The nymph looks very much like adults. The nymph grows by moulting about 13 times to reach the adult form. The next to last nymphal stage has wing pads but only adult cockroaches have wings.

164. Answer (4)

Hint: Present exclusively in male *Periplaneta*

Sol.: *Periplaneta* is a uricotelic animal. In them, excretion is performed by Malpighian tubules. In addition, fat bodies, nephrocytes and uricose glands also help in excretion. Uricose gland is absent in female cockroaches.

165. Answer (3)

Hint: Skin act as respiratory organ.

Sol.: Alimentary canal is well developed with a pharynx, oesophagus, crop and gizzard in cockroaches.

Frogs being chordate, have a dorsal nerve cord.

In frogs, the ventricle opens into a sac-like conus arteriosus on the ventral side of the heart. During aestivation and hibernation, gaseous exchange takes place through skin.

166. Answer (3)

Hint: Assists in emulsification of fats.

Sol: In frogs, food is captured by a bilobed tongue. Liver secretes bile that is stored in the gall bladder. The duodenum receives bile from gall bladder and pancreatic juice from the pancreas through a common bile duct.

Partially digested food called chyme is passed from stomach to the first part of the small intestine, the duodenum.

167. Answer (1)

Hint: Eliminate the mammal

Sol.: Ureotelic animal – *Panthera*

Uricotelic animals – *Corvus, Periplaneta, Hemidactylus*

168. Answer (2)

Hint: Leucocytes are present in both blood and lymph.

Sol.: The lymph is different from blood. It lacks few proteins and RBCs. The lymphatic system consists of lymph, lymph channels and lymph nodes. Some of the WBCs are phagocytic cells. They are present in lymph.

169. Answer (3)

Hint: Related to the reproductive system

Sol.: Special venous connection between liver and intestine as well as the kidney and lower parts of the body are present in frogs. The former is called hepatic portal system and the latter is called renal portal system.

The ureters act as urinogenital duct which opens into the cloaca in male frogs only.

Male reproductive organs consist of a pair of yellowish ovoid testes adhered to the upper parts of kidneys by a double fold of peritoneum called mesorchium.

Trunk is present in both sexes.

170. Answer (3)

Hint: Eliminate the parts of the frog's brain.

Sol.: In frogs, the undigested solid waste moves into the rectum and passes out through cloaca.

In frogs, the forebrain includes olfactory lobes, paired cerebral hemispheres and unpaired diencephalon. The midbrain is characterised by a pair of optics lobes.

Two ureters emerge from the kidneys.

171. Answer (3)

Hint: One is equal to the number of fingers in human hands.

Sol.: The hind limb of frog ends in five digits and it is larger and muscular than the fore limb that ends in four digits.

172. Answer (2)

Hint: Cutaneous respiration.

Sol.: Frogs respire on land and in water by two different methods. In water, skin act as the respiratory organ (Cutaneous respiration). Dissolved oxygen in the water is exchanged through the skin by diffusion. On land, the buccal cavity, skin and lungs act as the respiratory organs.

173. Answer (4)

Hint: Related to blood

Sol.: Hind brain of humans consists of cerebellum, pons and medulla oblongata but frogs lack pons.

Human heart is four-chambered while frog's heart contains three-chambers.

Renal portal system is present in frogs but absent in humans.

WBCs are present in the blood of both the organisms.

174. Answer (2)

Hint: Female frogs do not have urinogenital duct.

Sol: Frogs are beneficial for mankind because they eat insects and protect crops.

The ovaries in female frogs are situated near kidneys and there is no functional connection with kidneys.

In some countries, the muscular legs of frogs are used as food by man.

175. Answer (2)

Hint: More than 1000

Sol: A mature female frog can lay 2500-3000 ova at a time. Fertilisation is external and takes place in water. Development involves a larval stage called tadpole.

176. Answer (3)

Hint: Spinal cord is protected by vertebral column.

Sol.: Hind brain consists of cerebellum and medulla oblongata. Medulla oblongata passes out through the foramen magnum and continues into spinal cord, which is enclosed in the vertebral column.

The nervous system of frogs is organised into a central nervous system (brain and spinal cord), a peripheral nervous system (cranial and spinal nerves) and an autonomic nervous system (sympathetic and parasympathetic).

177. Answer (4)

Hint: Recall the common feature between adult frogs and humans.

Sol.: Habitat of tadpole is water only whereas adult frogs can live on both land and water.

The alimentary canal of adult frogs is short because adults are carnivores and hence the length of intestine gets reduced.

The adult frog excretes urea and thus, is ureotelic animal.

Tadpoles have a tail.

178. Answer (1)

Hint: Exclusive feature of males

Sol.: Bidder's canal in the male frogs communicates with the urinogenital duct that comes out of the kidneys and open into the cloaca.

In male frogs, the ureters function as both urinary and genital ducts, transporting urine and sperm to the cloaca.

179. Answer (1)

Hint: *Pteropus* is flying fox.

Sol.:

Some of the mammals have adapted to fly or live in water.

Aves and mammals have four-chambered heart and are able to maintain a constant body temperature.

180. Answer (2)

Hint: Common name of *Pristis* is saw fish

Sol.: Most cartilaginous fishes exhibit viviparity.

Magur is a bony fish and it lacks scales.

Hippocampus is a marine bony fish

❑ ❑ ❑