07/04/2025

Phase-2
CODE-C

Aakash
Medical | IIT-JEE | Foundations

***Corporate Office*:** AESL, 3rd Floor, Incuspaze Campus-2, Plot no. 13, Sector-18, Udyog Vihar, Gurugram, Haryana-122015

FINAL TEST SERIES for NEET-2025

MM : 720 **Test - 4** **Time : 180 Mins.**

Answers

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

Hints and Solutions

PHYSICS

(1) **Answer :** (2)
Solution:
$K_i = \frac{1}{2}mv^2$
$= \frac{1}{2} \times 10 \times 4 = 20$ J
$U_i = mgh = 10 \times 10 \times 2 = 200$ J
Initial total energy = 220 J
$K_f = ?$
$U_f =$ Zero
$\therefore K_f = 220$ J

(2) **Answer :** (2)
Solution:
$k = as^2$
$\frac{1}{2} mv^2 = as^2$
$mv^2 = 2as^2$
Different w.r.t. time
$2mv\frac{dv}{dt} = 4as\frac{ds}{dt}$
$2mv\frac{dv}{dt} = 4asv$
Tangential force = $F_t = 2as$
Centripetal force $F_c = \frac{mv^2}{R} = \frac{2as^2}{R}$
Force acting on particle
$F = \sqrt{F_t^2 + F_c^2}$
$= \sqrt{(2as)^2 + \left[\frac{2as^2}{R}\right]^2} = 2as\sqrt{1 + \frac{s^2}{R^2}}$

(3) **Answer :** (2)
Solution:
As tensile stress = $\frac{\text{Normal force}}{\text{Area}}$
Here, A_N = area = $\frac{A}{\cos\theta}$ and normal force
$F_N = F\cos\theta$
So tensile stress = $\frac{F\cos\theta}{\left(\frac{A}{\cos\theta}\right)} = \frac{F\cos^2\theta}{A}$

(4) **Answer :** (2)
Solution:
$W_{12} + W_{21} \neq 0$
It may sometime be true.

(5) **Answer :** (4)
Solution:
When a body falls freely under the action of gravity alone in vacuum, potential energy decreases continuously and kinetic energy increases continuously, so total mechanical energy remains constant during their journey in vacuum.

(6) **Answer :** (3)
Solution:
Hint & Sol.:
•

Uniform compressive stress in the rod

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Uniform tensile stresses in the rod

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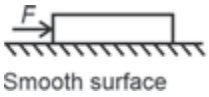
Non uniform tensile stresses in the rod

- 

Non uniform compressive stresses in the rod

(7) **Answer :** (2)
Solution:
COM of system remains at its initial position.
$m_1r_1 = m_2r_2$
$2r_1 = 4r_2$
$2(r_1 + 8) = 4(r_2 + x)$
$2r_1 + 16 = 4r_2 + 4x$
$x = 4$ m

(8) **Answer :** (3)
Solution:
$\rho = \frac{M_A}{\pi r^2 t}$
$M_A = \rho\pi r^2 t$
$M_B = \rho\pi 4r^2 \frac{t}{2}$
$\frac{I_A}{I_B} = \frac{\frac{M_A r^2}{2}}{\frac{M_B(2r)^2}{2}} \Rightarrow \frac{I_A}{I_B} = \frac{1}{8}$

(9) **Answer :** (1)
Solution:
$P_1 = P_2$
$P_1 = \frac{F_2}{A_2} = \frac{4000 \times 10}{625 \times 10^{-4}}$
$P_1 = 64 \times 10^4$ Pa
$= 6.4 \times 10^5$ Pa

(10) **Answer :** (3)
Solution:
$a = \frac{2mg}{2m + \frac{m}{2}} = \frac{2mg}{\frac{5m}{2}} = \frac{4g}{5}$

(11) **Answer :** (3)
Solution:
Ball will move along with the spaceship.

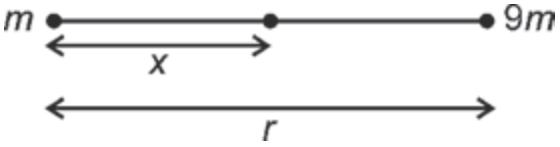
(12) **Answer :** (1)
Solution:
Work done depends on frame of reference as displacement is frame dependent quantity while force is frame independent.

(13) **Answer :** (3)
Solution:
Frictional force can do positive, negative or zero work. Depending on the work done by friction, kinetic energy may increase or decrease.

(14) **Answer :** (4)
Solution:
MOI of a rigid body depends on mass of body, its shape and size, distribution of mass about the axis of rotation and position and orientation of axis of rotation.

(15) Answer : (1)
Solution:
By conservation of angular momentum
$I_1\omega = I_2\omega'$
as I remains same
Therefore ω remains same.

(16) Answer : (2)
Solution:



Let at P gravitational field is zero.

$\therefore \frac{Gm}{x^2} - \frac{G(9m)}{(r-x)^2} = 0$

$\frac{1}{x^2} = \frac{9}{(r-x)^2}$

$\left(\frac{1}{x}\right)^2 = \left(\frac{3}{r-x}\right)^2$

$\frac{1}{x} = \frac{3}{r-x}$

$r - x = 3x$

$x = \frac{r}{4}$

(17) Answer : (4)
Solution:
All statements are correct
Statement A: A spherically symmetric shell exerts the same gravitational force on an external particles as if all its mass were concentrated at a single point at its center.
Statement B: The shell behaves as a point mass for external particles, meaning it does exert a non zero gravitational force.
Statement C: For a soild sphere of uniform density gravitational force inside varies linearly with distance from the center and always points toward the center.

(18) Answer : (1)
Solution:
$\frac{\Delta l}{l} \times 100 = 0.02\,\%$

$\frac{\Delta l}{l} = 0.02 \times 10^{-2}$

$= 2 \times 10^{-4}$

P.E.D. = $\frac{1}{2} \times Y \times (\text{Strain})^2$

$= \frac{1}{2} \times 2 \times 10^9 \times 4 \times 10^{-8}$

$= 40\ \text{J/m}^3$

(19) Answer : (2)
Solution:
Material with large plastic-region is ductile.

(20) Answer : (3)
Solution:
$Y_P = Y_Q$
Volume of P = Volume of Q
$l_P = 4l_Q$
$F_P = F_Q$

$\Delta l = \left(\frac{Fl}{AY}\right) \times \frac{l}{l} = \frac{Fl^2}{VY}$

$\Delta l \propto l^2$

$\frac{\Delta l_p}{\Delta l_Q} = \left(\frac{l_P}{l_Q}\right)^2 = \left(\frac{4}{1}\right)^2 = \frac{16}{1}$

(21) Answer : (1)

Solution:
Hydraulic lift is based on Pascal law.
Excess pressure inside liquid drop is due to surface tension. Dynamic lift is based on Bernoulli's principle. Falling of a rain drop is based on Stokes law.

(22) **Answer :** (2)
Solution:

MOI of cylinder about its axis = $\frac{MR^2}{2}$

By parallel axis theorem, $I = I_{CM} + MR^2$

= $\frac{3}{2}MR^2$

(23) **Answer :** (3)
Hint:
(Pressure at a point) $P_0 = P_{atm} + \rho gh$
Solution:
$P_{atm} + \rho gh = 10\,[P_{atm} + \rho g5]$
$\rho g \times 10 + \rho gh = 10\rho g \times 10 + \rho g \times 10 \times 5$
$\rho g10 + \rho gh = 150\,\rho g$
$h = 140$ m

(24) **Answer :** (3)
Solution:
$v = \sqrt{2gh}$
$= \sqrt{2 \times 10 \times 10} = 10\sqrt{2}$ m/s

$T = \sqrt{\frac{2\left(H-h\right)}{g}} = \sqrt{\frac{2(15-10)}{g}} = 1$ s

$R = vT$
$= \left(10\sqrt{2}\right) \times 1$
$= \left(10\sqrt{2}\right)$ m

(25) **Answer :** (1)
Solution:

W. D. $= 4\pi R^2 T\left(n^{\frac{1}{3}} - 1\right)$

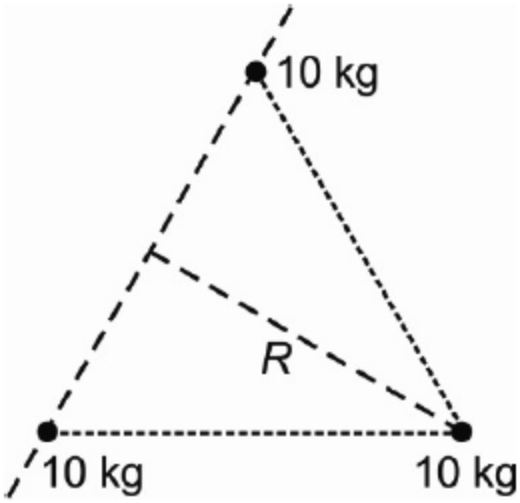
= $4 \times \frac{22}{7} \times (1)^2 \times 70(10 - 1)$
= 7920 erg
= 7920×10^{-7} J
= 7.92×10^{-4} J

(26) **Answer :** (4)
Solution:
The slope of graph indicates Young's modulus and distance between the points yield strength and fracture point measure ductility of the material.

(27) **Answer :** (3)
Solution:
From work energy theorem
$W = \Delta KE = -\left(\frac{1}{2}\right) \times \frac{10}{1000}(900 - 400) = -2.5$ J

(28) **Answer :** (2)
Solution:

Moment of inertia of a point mass = mR^2.



$R = \sqrt{2^2 - 1}$

$= \sqrt{3}$

$I = 10(0)^2 + 10(0)^2 + 10\left(\sqrt{3}\right)^2$

= 30 kg m^2

(29) Answer : (2)

Solution:

$f = \frac{3000}{60} = 50$

$\omega = 2\pi f$

$= 6.28 \times 50$

$P = \tau \times \omega \Rightarrow \tau = \frac{P}{\omega}$

$\tau = \frac{6.28 \times 1000}{6.28 \times 50} = 20$ N m

(30) Answer : (1)

Solution:

$\frac{F}{10} = \frac{10}{100}$

Apply Pascal's law:

$\Rightarrow F = 1$ N

(31) Answer : (2)

Hint:

At height h, $g = \frac{GM}{(R_e+h)^2}$

Solution:

$g' = \frac{gR_e^2}{(R_e+h)^2}$

so, $mg' = \frac{120 \times R_e^2}{\left(\frac{3R_e}{2}\right)^2}$

$W' = \frac{480}{9} = \frac{160}{3}$ N

(32) Answer : (2)

Solution:

$Y_s = \frac{FL_1}{A_1 \Delta l}$

$Y_{cu} = \frac{FL_2}{A_2 \Delta l}$

$\frac{Y_s}{Y_{cu}} = \frac{L_1 A_2}{L_2 A_1} = \frac{4.2 \times 4 \times 10^{-5}}{3.5 \times 3 \times 10^{-5}}$

$Y_S : Y_{CU} = 8 : 5$

(33) Answer : (2)

Hint:

Longitudinal stress $= \frac{\text{Force}}{\text{Area}}$

Solution:
Force = 20 N + 10 × 10 N = 120 N
$\sigma = \frac{F}{A} = \frac{120}{2\times10^{-4}} = 6\times10^{5}$ Pa $=$ 0.6 MPa

(34) Answer : (1)
Solution:
$\Delta l = \frac{Fl_0}{AY}$
$l_1 - l_0 = \frac{T_1 l_0}{AY}$ ....(i)
$l_2 - l_0 = \frac{T_2 l_0}{AY}$ ....(ii)
Eliminating Ay from both the equations:
$\frac{T_1 l_0}{l_1 - l_0} = \frac{T_2 l_0}{l_2 - l_0} \Rightarrow T_1 l_2 - T_1 l_0 = T_2 l_1 - T_2 l_0$
$l_0 = \frac{T_2 l_1 - T_1 l_2}{T_2 - T_1}$

(35) Answer : (4)
Solution:
$g = \frac{4\pi}{3}\rho GR$
$\frac{g_A}{g_B} = \frac{\rho_A}{\rho_B}\left(\frac{R_A}{R_B}\right)$ ... (i)
$\frac{R_A}{R_B} = \left(\frac{V_A}{V_B}\right)^{1/3} = \frac{1}{3}$ ... (ii)
$\frac{g_A}{g_B} = \left(\frac{2}{1}\right)\left(\frac{1}{3}\right) = \frac{2}{3}$

(36) Answer : (2)
Solution:
Total mechanical energy of orbiting satellite is negative.
$U = \frac{-GMm}{R}$

(37) Answer : (1)
Solution:
$\frac{K_1}{K_2} = \frac{\frac{{p_1}^2}{2m_1}}{\frac{{p_2}^2}{2m_2}} = \frac{{p_1}^2}{{p_2}^2} \therefore \; m_1 = m_2$
$\frac{p_1}{p_2} = \sqrt{\frac{K_1}{K_2}} = \sqrt{\frac{1}{3}} = \frac{1}{\sqrt{3}}$

(38) Answer : (2)
Hint:
$\vec{E} = \frac{-\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$
Solution:
$\vec{E} = +\left[2x\hat{i} + 2y\hat{j} + 2z\hat{k}\right]$
At point (2, 1, 2)
$\vec{E} = 4\hat{i} + 2\hat{j} + 4\hat{k}$

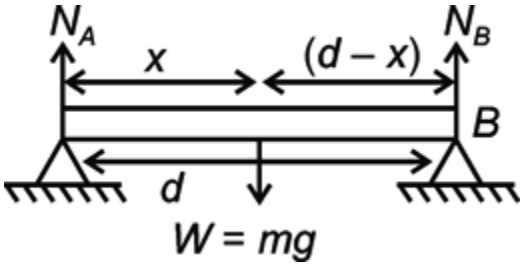
(39) Answer : (1)
Solution:
During free fall no pressure difference will be there between two points of liquid.

(40) Answer : (2)
Solution:
$\frac{GmM}{r^2} = mr\omega^2$
$\therefore \; \omega^2 = \frac{GM}{r^3}$
For 4*m* mass
$(\omega')^2 = \frac{GM}{(4r)^3}$

$\therefore \frac{(\omega)^2}{(\omega')^2} = (4)^3 = 64$

$\therefore \frac{\omega}{\omega'} = 8$

(41) Answer : (3)
Solution:



$N_A + N_B = W$

$\left(\vec{\tau}_{\text{net}}\right)_{\text{about } B} = W(d - x) - N_A d = 0$

$(Wd - Wx) = N_A d$

$N_A = \frac{W(d-x)}{d} = \frac{10(5-2.5)}{5}$

$N_A = 5$ N

(42) Answer : (2)
Solution:

$P = P_0 + \rho g h$

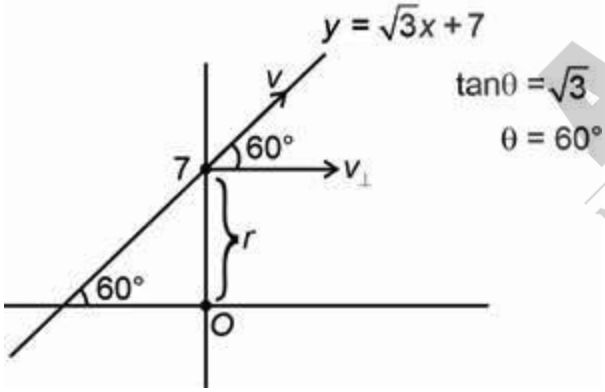
$= 1 \times 10^5 + 10^3 \times 10 \times 5$

$= 1.5 \times 10^5$ Pa

(43) Answer : (1)
Hint:

Hint: Angular momentum about a point is $\vec{r} \times \vec{p} = m\left(\vec{r} \times \vec{v}\right)$

Solution:



$\left|\vec{L}_0\right| = mrv_\perp = 2 \times 7 \times 5 \times \frac{1}{2}$

$= 35 \ \frac{\text{kgm}^2}{\text{s}}$

(44) Answer : (3)
Solution:

$W = 8\pi T(R_2^2 - R_1^2)$

$= 8\pi TR^2 (9 - 4)$

$= 40\pi TR^2$

(45) Answer : (3)
Solution:

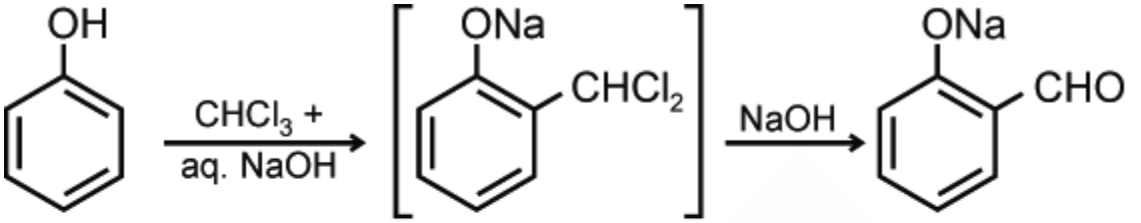
$v_e = \sqrt{\frac{2GM_e}{R_e}} = 11.2$ km/s

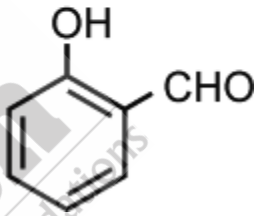
$v_p = \sqrt{\frac{2G8M_e}{2R_e}} = 2 \times 11.2 = 22.4$ km/s

CHEMISTRY

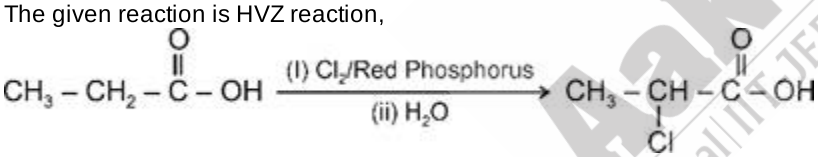
(46) Answer : (2)
Solution:
Sucrose is dextrorotatory.
Maltose is composed of two α-D-glucose units

(47) Answer : (3)
Solution:





(48) Answer : (2)
Solution:
The given reaction is HVZ reaction,

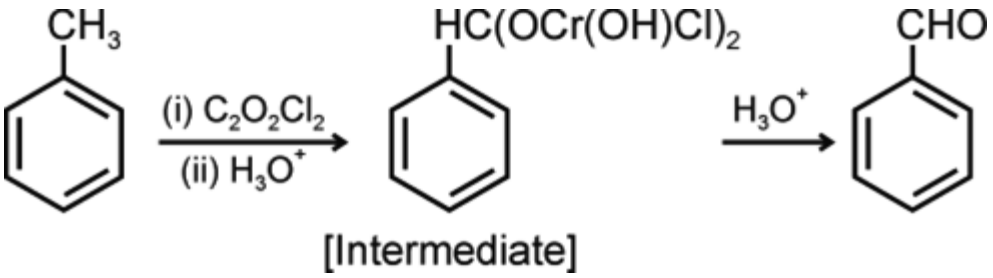


(49) Answer : (2)
Solution:
We get inference of Pb_{2+} with observation of yellow colour residue when hot and grey metal when cold in charcoal cavity test.

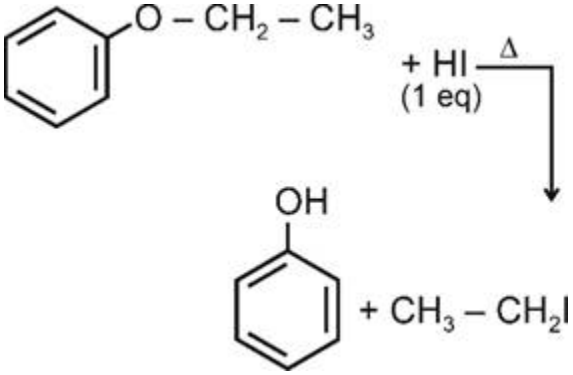
(50) Answer : (3)
Solution:
Glucose does not give Schiff's test and do not react with $NaHSO_3$.

(51) Answer : (3)
Solution:
CH_3CH_2OH show hydrogen bonding, hence, exhibit highest boiling point
Order of boiling point: $CH_3CH_2OH > CH_3OCH_3 > CH_3CH_2CH_3$

(52) Answer : (2)
Solution:
The given reaction is Etard reaction,



(53) Answer : (3)
Solution:



(54) Answer : (4)
Solution:
Picric acid is most acidic among the given compounds.
pK_a of picric acid ~ 0.4.

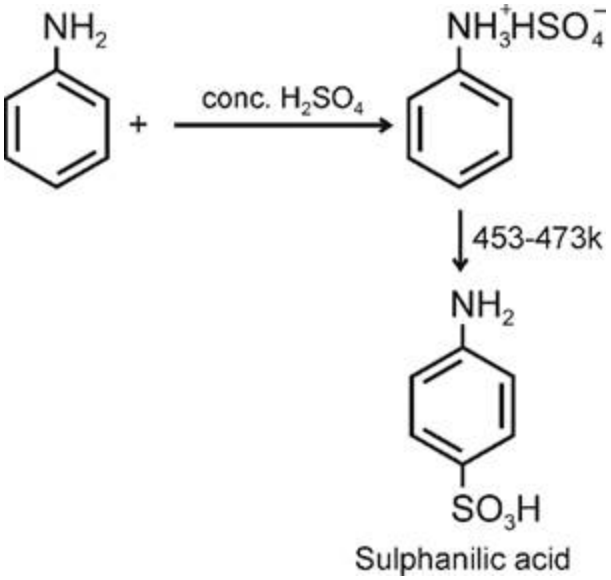
(55) Answer : (2)
Solution:
Histidine and Methionine are essential amino acids.

(56) Answer : (1)
Solution:

	Vitamins	Deficiency disease
a.	Vitamin A	Xerophthalmia
b.	Vitamin B_2	Cheilosis
c.	Vitamin B_{12}	Pernicious Anemia
d.	Vitamin E	Muscular weakness

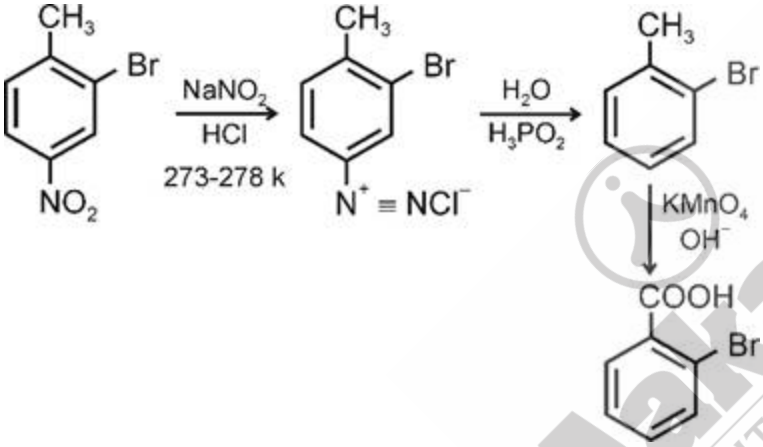
(57) Answer : (2)
Solution:
1°amine will give carbylamine test.

(58) Answer : (4)
Solution:



Sulphanilic acid

(59) Answer : (4)
Solution:

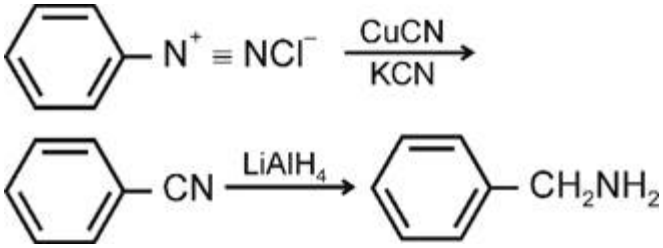


(60) Answer : (2)
Solution:
Order of basic strength is
$(C_2H_5)_2NH > C_2H_5NH_2 > NH_3 > C_6H_5NH_2$

(61) Answer : (1)
Solution:
In DNA, Adenine forms hydrogen bonds with thymine and guanine forms hydrogen bonds with cytosine.

(62) Answer : (2)
Solution:
All disaccharide except sucrose are reducing in nature.

(63) Answer : (2)
Solution:



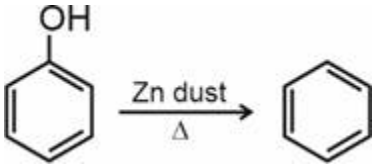
(64) Answer : (3)
Solution:

Glucose is obtained by hydrolysis of starch by boiling it with dilute H_2SO_4 at 393 K under pressure.

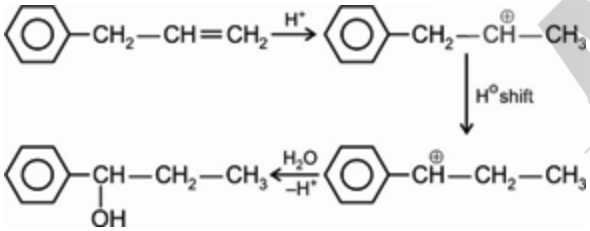
(65) **Answer :** (2)
Solution:
When protein in native form is subjected to physical change like change in temperature etc causes the destruction of secondary and tertiary structures.

(66) **Answer :** (4)
Hint:
Lesser the stability of carbocation, lesser will be the reactivity of corresponding alcohol towards Lucas reagent.
Solution:
Primary alcohol reacts slowly with lucas reagent.

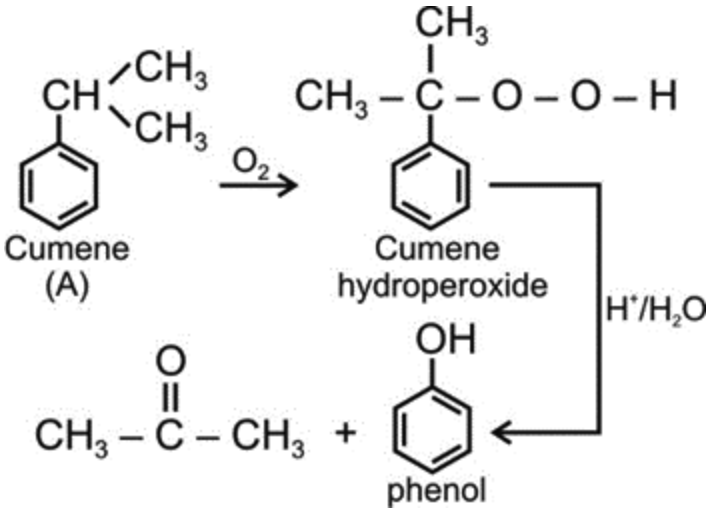
(67) **Answer :** (1)
Hint:
In hydroboration oxidation reaction, rearrangement does not occur and anti-Markovnikov's alcohol is formed as major product.
Solution:
$$\mathrm{B_2H_e/THF}$$
$$\mathrm{(ii)H_2O_2/\overline{O}H}$$

(68) **Answer :** (1)
Hint:


Solution:
$$CO + 2H_2 \xrightarrow[200-300\ \text{atm}]{ZnO-Cr_2O_3} CH_3OH\ (\text{Methanol})$$
573–673 K

(69) **Answer :** (4)
Hint:
Reaction occurs via carbocation intermediate.
Solution:


(70) **Answer :** (1)
Hint:
Preparation of phenol from cumene.
Solution:



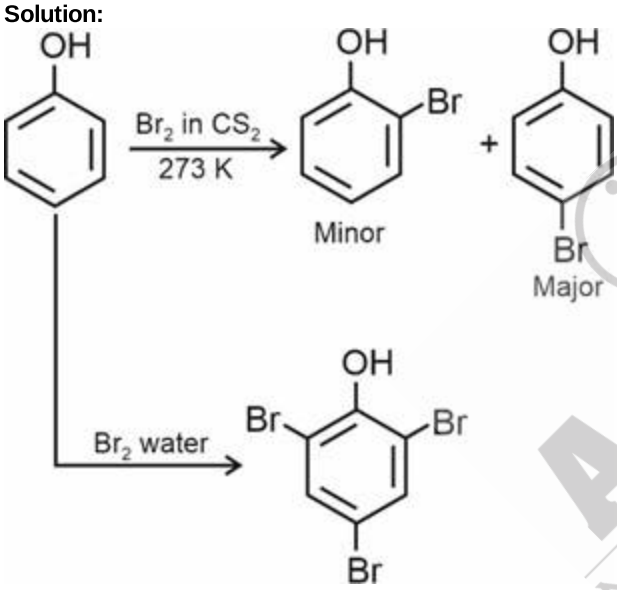
(71) Answer : (3)

Hint:

Halogenation of phenol with bromine results in the formation of different products under different experimental conditions.

On reaction with Br_2 in the solvent of low polarity, mono bromophenol is formed.

Solution:

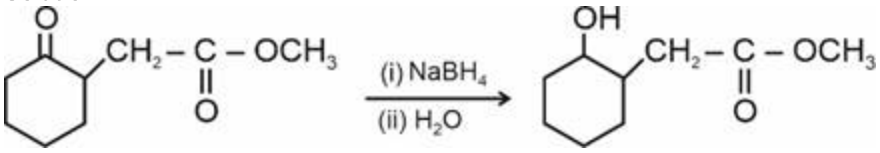


(72) Answer : (2)

Hint:

$NaBH_4$ reduces aldehydes and ketones to corresponding alcohols but it does not reduce carboxylic acids or esters.

Solution:

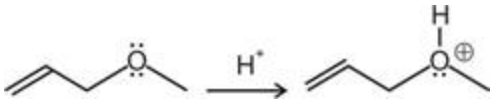


(73) Answer : (1)

Hint:

If lone pair on O–atom in ethers or alcohols is not delocalised then it will be more easily protonated.

Solution:

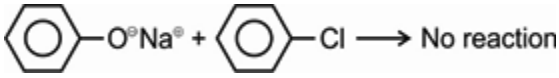


(74) Answer : (1)

Hint:

C— Cl bond in aryl halide has double bond character.

Solution:

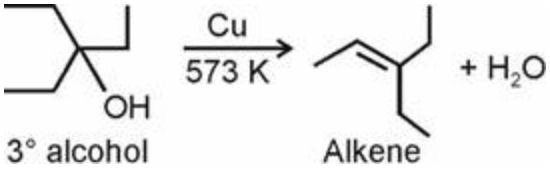


(75) Answer : (4)

Hint:

Primary and secondary alcohols when passed over heated copper at 573 K give aldehyde and ketone respectively.

Solution:



(76) Answer : (1)

Solution:

Ion	Flame colour (by naked eye)
Cu^{2+}	Green flame with blue centre
Sr^{2+}	Crimson red
Ba^{2+}	Apple green
Ca^{2+}	Brick red

(77) Answer : (3)

Solution:

Starch forms iodo starch complex with Iodine which is blue coloured.

(78) Answer : (2)

Solution:

Lead chromate is soluble in hot NaOH solution.

$$PbSO_4 + 4\,CH_3\,COONH_4 \rightarrow \underset{\text{Ammonium tetraacetoplumbate (II)}}{(NH_4)_2\,[Pb\,(CH_3\,COO)_4]} + (NH_4)_2\,SO_4$$

(79) Answer : (2)

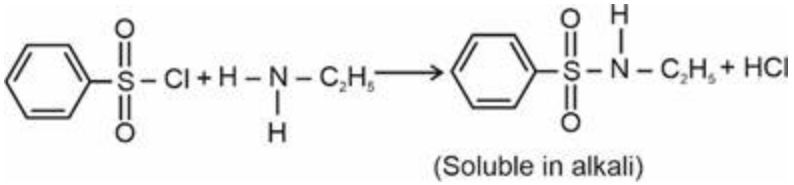
Solution:

In salt analysis cations are divided into groups as

Cations	Group
Ba^{2+}	V
Sr^{2+}	V
Mg^{2+}	VI
Co^{2+}	IV

(80) Answer : (1)

Solution:



(Soluble in alkali)

(81) Answer : (4)

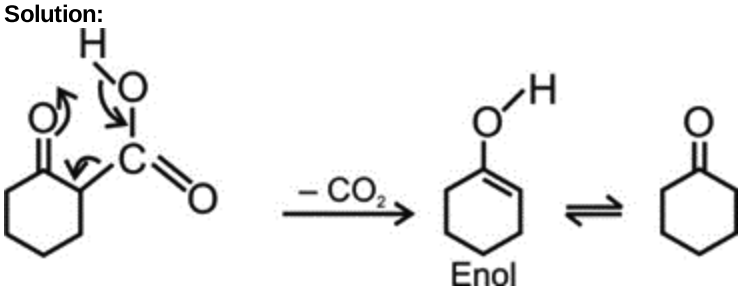
Solution:

$$\underset{\text{Nitroprusside anion}}{S^{2-} + [Fe\,(CN)_5\,NO]^{2-}} \rightarrow \underset{\text{Violet colour}}{[Fe\,(CN)_5\,NOS]^{4-}}$$

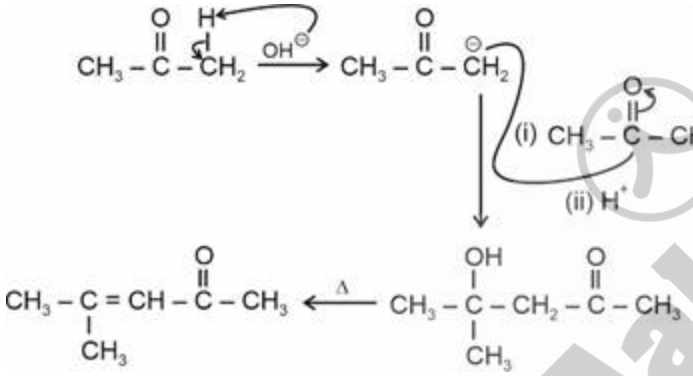
(82) **Answer :** (4)
Solution:

$$2Br^- + MnO_2 + 2H_2SO_4 \rightarrow SO_4^{2-} + MnSO_4 + 2H_2O + \underset{\text{reddish brown fumes}}{Br_2}$$

(83) **Answer :** (3)
Hint:
β-keto acid readily decarboxylates on heating.
Solution:



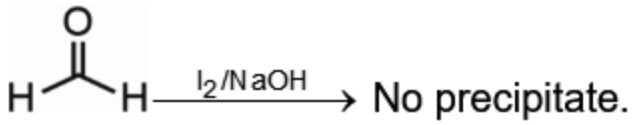
(84) **Answer :** (3)
Hint:
Aldehydes or ketones on aldol condensation gives α-β unsaturated aldehydes or ketones.
Solution:



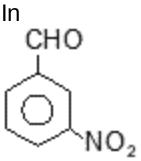
(85) **Answer :** (4)
Hint:
Species with "$CH_3 - \underset{OH}{CH}-$" and "$CH_3 - \underset{O}{C}-$" groups can give Haloform reaction.
Solution:

$$CH_3CH_2OH \xrightarrow{I_2/NaOH} HCOONa + CHI_3$$

yellow precipitate



(86) **Answer :** (4)
Hint:
Lesser the electron density on carbonyl carbon, more will be its reactivity towards nucleophilic addition.
Solution:
In



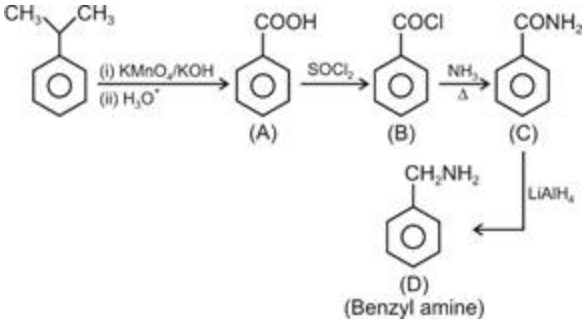
, due to –I effect of NO_2 group, the carbonyl carbon will be more electron deficient.

(87) Answer : (4)

Hint:

Alkyl benzene on oxidation with alkaline $KMnO_4$ gives benzoic acid.

Solution:



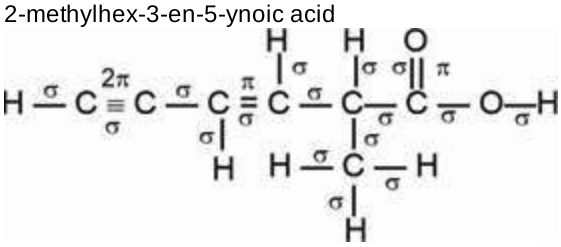
(88) Answer : (4)

Hint:

In multiple bond, only one bond is σ and the rest are π bonds.

Solution:

2-methylhex-3-en-5-ynoic acid



Number of σ bonds = 16

Number of π bonds = 4

(89) Answer : (3)

Hint:

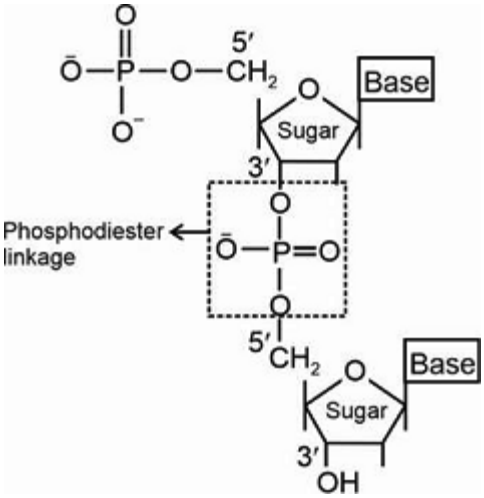
Cannizzaro reaction.

Solution:

$$2HCHO \xrightarrow[\Delta]{\text{conc.NaOH}} CH_3OH + HCOO^-Na^+$$

(90) Answer : (2)

Hint:



Solution:

Nucleotides are joined together by phosphodiester linkage between 5′ and 3′ carbon atoms of the pentose sugar.

BOTANY

(91) Answer : (2)
Solution:
For the upright ecological pyramid, the number and biomass of herbivores should be more than the carnivores.

(92) Answer : (1)
Solution:
The concept of hotspot was developed to designate priority areas for *in situ* conservation.

(93) Answer : (4)
Solution:
India has only 2.4 per cent of the world's land area, its share of the global species diversity is an impressive 8.1 per cent.
Species diversity decreases as we move from equator to the poles.

(94) Answer : (2)
Solution:
Edward Wilson popularized the term Biodiversity
While exploring the wilderness of South American jungles, the great German naturalist and geographer Alexander von Humboldt observed that within a region, species richness increased with increasing explored area, but only up to a limit.
Tilman found through his experiments that increased diversity contributed to higher productivity.
The effect of reduction in biodiversity has been explained by Paul Ehrlich through Rivet Popper hypothesis.

(95) Answer : (4)
Solution:
Wildlife sanctuary is an *in-situ* strategy of conservation of biodiversity.

(96) Answer : (2)
Solution:
The historic Convention on Biological Diversity ('The Earth Summit') held in Rio de Janeiro in 1992, called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits.

(97) Answer : (4)
Solution:
Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are the causes for biodiversity loss.

(98) Answer : (1)
Solution:
In general, loss of biodiversity in a region may lead to (a) decline in plant production, (b) lowered resistance to environmental perturbations such as drought and (c) increased variability in certain ecosystem processes such as plant productivity, water use, and pest and disease cycles.

(99) Answer : (3)
Solution:
Decomposers are also known as reducers. They are capable of degrading the dead organisms. The are natural scavengers as they can reduce the organic remains of the earth. They replenish the soil naturally with minerals that are essential for growth of plants and hence maintain the ecosystem.

(100) Answer : (1)
Solution:
In an ecosystem, the given GFC shows that solar radiations are absorbed by the producers and then herbivores are consumed by the secondary consumers.

(101) Answer : (1)
Solution:
Primary producers are autotrophic organism which trap the solar energy and manufacture their own food from inorganic raw material and so they form base of the ecological pyramid.

(102) Answer : (2)
Solution:
Biological control methods adopted in agriculture pest control are based on ability of the predator to regulate prey population.

(103) Answer : (2)
Solution:

Primary productivity is the rate at which biomass or organic matter is produces per unit area over time period by plants or producers during photosynthesis.
Diversity of scavengers will not affect the primary productivity of an ecosystem.

(104) Answer : (4)
Solution:
In parasitic food chain, the size of the organism reduces at higher trophic level.

(105) Answer : (3)
Solution:
Primary production is defined as the amount of the biomass or organic matter produced per unit area over time period by plants during photosynthesis.

(106) Answer : (1)
Solution:
Following are the number of species in the amazonian rain forest :
Birds- 1300
Reptiles-378
Amphibians- 427
Fishes- 3000
Plant species more than 40,000

(107) Answer : (3)
Solution:
Food and firewood are narrowly utilitarian services of biodiversity. Pollination and flood control are broadly utilitarian service.

(108) Answer : (3)
Solution:
In the given pie chart, A is angiosperms. Angiosperms are heterosporous in nature, *i.e.*, they produce two types of spores.

(109) Answer : (3)
Solution:
Estuary is an example of aquatic ecosystem.

(110) Answer : (1)
Solution:
Asymptote is seen during logistic growth where resources are limited.
Asymptote occurs when the population density reaches the carrying capacity.

(111) Answer : (4)
Solution:
Mycorrhizae are the fungal associations with the roots of higher plants which help to increase the absorption of water and minerals. This association benefits both the interacting species.

(112) Answer : (3)
Solution:
If N is the population density at time t, then its density at time t +1 is $N_{t+1} = N_t + [(B + I) – (D + E)]$

(113) Answer : (1)
Solution:
Logistic growth show S-shaped growth curve.

(114) Answer : (3)
Solution:
The pyramid is bell-shaped with pre-reproductive individuals being only marginally more than the reproductive individuals. Population is said to be mature or stable.

(115) Answer : (4)
Solution:
Competition can occur when two related species have requirement of similar resources. Competition can occur between closely related species or unrelated species. It also occurs when resources are limited or unlimited.

(116) Answer : (4)
Solution:
Exponential growth is represented by equation $\frac{dN}{dt} = rN$, resulting in J-shaped growth curve.

(117) Answer : (1)
Solution:

Herbivores are present at second trophic level and they have plants only as their prey. Herbivores have lesser number of alternative resources, *i.e.*, plants only. While carnivores being at higher trophic level have more alternative resources.

(118) Answer : (4)
Solution:
Predators maintain prey population as they are prudent in nature.

(119) Answer : (2)
Solution:
Tertiary consumers are also called secondary carnivores. Tertiary consumers are the animals which feed on the secondary consumer and constitute the fourth trophic level.

(120) Answer : (4)
Solution:
(i) In interference competition, the feeding efficiency of one species is affected due to the inhibitory presence of the other.
(ii) Resources may not be limiting for competition to occur.

(121) Answer : (3)
Solution:
In accordance with life styles, parasites have evolved with high reproductive capacity.

(122) Answer : (3)
Solution:
Amensalism shows –, 0 interaction.

(123) Answer : (4)
Solution:
Connell's elegant field experiments showed that on a rocky sea coast of Scotland, the larger and competitively superior barnacle dominates the intertidal area and excludes smaller barnacles.

(124) Answer : (3)
Solution:
In newly colonised habitat immigration play a significant role in population growth.

(125) Answer : (2)
Solution:
Marine fishes were infected with ectoparasites copepods. Competitively superior barnacle *Balanus* excludes the smaller barnacle C*hathamalus* from that zone.
Commensalism is shown by clown fish with sea anemone. Protocooperation is shown by sea anemone and hermit crab.

(126) Answer : (4)
Solution:
Verhulst-pearl logistic growth is described by
$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$

(127) Answer : (3)
Hint:
An individual is either a male or a female but a population has a sex-ratio.
Solution:
An individual may have birth and death, but a population has birth rates (natality) and death rates (mortality).

(128) Answer : (3)
Hint:
The feeding efficiency of one species might be reduced due to inhibitory presence of the other species. This is called "interference competition".
Solution:
If in a competition, inferior species is eliminated when two closely related species are competing for the same resource, is called "Competitive exclusion".

(129) Answer : (4)
Solution:
In aquatic ecosystem, the pyramid of biomass is usually inverted.

(130) Answer : (4)
Hint:
Only 10% of the energy of previous trophic level is received by next trophic level.
Solution:
According to 10% law, the amount of energy available at each trophic level is as follows:

$$\underset{2000\text{ J}}{\text{Plant}} \rightarrow \underset{200\text{ J}}{\text{Mice}} \rightarrow \underset{20\text{ J}}{\text{Snake}} \rightarrow \underset{2\text{ J}}{\text{Peacock}}$$

(131) Answer : (4)
Solution:
Tropics show rich biodiversity as it receives more solar energy, has relatively constant environment and is less seasonal.

(132) Answer : (2)
Solution:
A single species might show high diversity at the genetic level over its distributional range. The genetic variation shown by the medicinal plant *Rauwolfia vomitoria* growing in different Himalayan range might be in terms of potency and concentration of active chemical reserpine.

(133) Answer : (3)
Solution:
Robert May estimated global species diversity at about 7 million.

(134) Answer : (2)
Solution:
Cutting and clearing of Amazon Rain Forest for the cultivation of soyabean exemplifies the loss of species due to habitat loss and fragmentation.

(135) Answer : (1)
Solution:
India has 14 biosphere reserves, 90 national parks and 448 wildlife sanctuaries.

ZOOLOGY

(136) Answer : (1)
Solution:
Deoxyribose sugar is present in DNA which is the genetic material of humans. It is a five carbon compound with heterocyclic ring which lacks O at 2′ position.

(137) Answer : (4)
Solution:
A sigmoid curve is obtained when percentage saturation of haemoglobin with O_2 is plotted against the pO_2. This curve is called the Oxygen dissociation curve.
In the alveoli, where there is high pO_2, low pCO_2, lesser H^+ concentration and lower temperature, all the factors are favourable for the formation of oxyhaemoglobin, whereas in the tissues, where low pO_2, high pCO_2, high H^+ concentration and higher temperature exist, the conditions are favourable for dissociation of oxygen from the oxyhaemoglobin.

(138) Answer : (2)
Solution:
Simple spirometer cannot measure RV and the pulmonary capacities which include RV in them.
Residual Volume (RV): Volume of air remaining in the lungs even after a forcible expiration. This averages 1100 mL to 1200 mL.
Functional Residual Capacity (FRC): Volume of air that will remain in the lungs after a normal expiration. This includes ERV+RV.
Vital Capacity (VC): The maximum volume of air a person can breathe in after a forced expiration. This includes ERV, TV and IRV.
Total Lung Capacity (TLC): Total volume of air accommodated in the lungs at the end of a forced inspiration. This includes RV, ERV, TV and IRV or VC+RV.

(139) Answer : (3)
Solution:
Transition state is a high energy state and it is highly unstable.

(140) Answer : (3)
Solution:
Hydrolases are the enzymes which catalyses breakage of bond between the glycerol and fatty acids in a molecule of triglyceride and their enzyme commission number starts with 3.

(141) Answer : (3)
Solution:

When the inhibitor closely resembles the substrate in its molecular structure and inhibits the activity of the enzyme, it is known as competitive inhibitor. Due to its close structural similarity with the substrate, the inhibitor competes with the substrate for the substrate binding site of the enzyme.
• Enzymes are specific towards its substrate in a chemical reaction.

(142) Answer : (3)
Solution:
The pO_2 in systemic vein is 40 mmHg and pCO_2 in aorta is 40 mmHg.

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
O_2	159	104	40	95	40
CO_2	0.3	40	45	40	45

(143) Answer : (3)
Solution:
Alveoli are the primary sites of exchange of gases. Exchange of gases also occurs between blood and tissues. O_2 and CO_2 are exchanged in these sites by simple diffusion mainly based on pressure/concentration gradient. Solubility of the gases as well as the thickness of the membranes involved in diffusion are some important factors that can affect the rate of diffusion.

(144) Answer : (2)
Solution:
During quiet inspiration, diaphragm and external inter-costal muscles contract.
Humans have the ability to increase the strength of inspiration and expiration with the help of additional muscles in the abdomen. Contraction of abdominal muscles and internal inter-costal muscles takes place during forced inspiration.

(145) Answer : (2)
Solution:
Zwitterionic form of amino acid contains equal number of positive and negative charges. The ionisable nature of functional groups are responsible for the formation of zwitterionic form. Different amino acids have different pH at which their zwitterionic forms exist.

(146) Answer : (4)
Solution:
There is one feature common to all those compounds found in the acid-soluble pool obtained upon chemical analysis of a living tissue *i.e.*, they have molecular weights ranging from 18 to around 800 daltons (Da) approximately.
Acid-soluble pool contains monomers, sulphate and phosphate ions. Lipids are obtained in the acid-insoluble fraction whose molecular weight are less than 800Da.

(147) Answer : (3)
Solution:
Trihydroxypropane is the another name of glycerol which is component of lipids. In the nucleotide named adenylic acid, adenine (nitrogenous base), phosphate moiety and ribose sugar is present.

(148) Answer : (2)
Solution:
Enzymes eventually bring down the energy barrier making the transition of 'S' to 'P' more easy.
If 'P' is at a lower level than 'S', the reaction is an exothermic reaction. However, whether it is an exothermic or spontaneous reaction or an endothermic or energy requiring reaction, the 'S' has to go through a much higher energy state or transition state. The difference in average energy content of 'S' from that of this transition state is called 'activation energy'.

(149) Answer : (3)
Solution:
Glycogen and cellulose are the polymers of glucose. Chitin is the polymer of N-acetylglucosamine.

(150) Answer : (4)
Solution:
The part starting with the external nostrils upto the terminal bronchioles constitute the conducting part whereas the alveoli and their ducts form the respiratory or exchange part of the respiratory system.

(151) Answer : (3)
Solution:

In the tissues, where low pO_2, high pCO_2, high H^+ concentration (low pH) and higher temperature exist, the conditions are favourable for dissociation of oxygen from the oxyhaemoglobin.

(152) Answer : (3)
Solution:

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
O_2	159	104	40	95	40
CO_2	0.3	40	45	40	45

(153) Answer : (3)
Solution:
Non-protein constituents which bind to enzymes are called co-factors and protein portion is called apoenzyme.

(154) Answer : (4)
Solution:
The chemical and physical properties of amino acids are essentially of the amino, carboxyl and the R functional groups.

(155) Answer : (1)
Hint:
Less than 900 Da
Solution:
The molecular weight of lipids do not exceed 800 Da. So, they are not strictly macromolecules. But it is present in acid-insoluble fraction.
Lipids are present not as such but also arranged into structures like cell membrane and other membranes. When a tissue is grinded, then cell membranes and other membranes are broken into pieces, form vesicles which are not water soluble.

(156) Answer : (4)
Solution:
Cysteine is a sulphur containing amino acid.

(157) Answer : (2)
Hint:
Difficulty in breathing
Solution:

Asthma	Inflammation of bronchi and bronchiole
Emphysema	Decreased respiratory surface area
Fibrosis	Occupational Respiratory Disorders

(158) Answer : (2)
Solution:
Any substance that can diminish the velocity of an enzyme-catalyzed reaction is called an inhibitor.

(159) Answer : (1)
Solution:
Trachea divides into right and left primary bronchi at the level of 5^{th} thoracic vertebra.

(160) Answer : (1)
Hint:
Conducting part of respiratory system
Solution:
A pair of external nostrils lead to nasal chamber through the nasal passage. The nasal chamber opens into pharynx, a portion of which is the common passage for food and air.

(161) Answer : (3)
Hint:
Carry deoxygenated blood
Solution:
Systemic veins and pulmonary artery
pO_2 = 40 mm Hg
pCO_2 = 45 mm Hg
Systemic arteries and pulmonary vein
pO_2= 95 mm Hg
pCO_2 = 40 mm Hg

(162) Answer : (1)
Hint:
Includes ground substance of blood.
Solution:
RBCs contain a very high concentration of enzyme carbonic anhydrase and minute quantities of the same is present in the plasma too.

(163) Answer : (4)

Hint:

Think about basement membrane

Solution:

At the tissue site where pCO_2 is high due to catabolism, CO_2 diffuses into RBCs and forms HCO_3^- and H^+ in presence of enzyme carbonic anhydrase. Diffusion membrane is formed by two cellular layers and an acellular basement membrane in between them.

(164) Answer : (4)

Solution:

Breathing is simply the inhalation of atmospheric air and exhalation of CO_2 rich alveolar air.

(165) Answer : (3)

Solution:

The thoracic chamber is formed dorsally by the vertebral column, ventrally by the sternum, laterally by the ribs and on the lower side by dome-shaped diaphragm.

(166) Answer : (3)

Hint:

Ranges between 2100-2300 mL

Solution:

Functional residual capacity includes ERV and RV.

Inspiratory reserve volume = IC – TV

Inspiratory capacity = TV + IRV or VC – ERV

(167) Answer : (3)

Solution:

Sacrum is the vertebral bone.

(168) Answer : (3)

Hint:

Facilitates diffusion

Solution:

The primary site for exchange of gases in the human respiratory tract is alveoli. Alveoli are lined by a single thin layer of flattened cells with irregular boundaries *i.e*., simple squamous epithelium, which helps in exchange of gases.

Secretion and absorption are the main functions of simple cuboidal and simple columnar epithelium. The function of compound epithelium is to provide protection against chemical and mechanical stresses.

(169) Answer : (3)

Solution:

While primary metabolites have identifiable functions and play known roles in normal physiological processes, we do not at the moment, understand the role or functions of all the secondary metabolites.

(170) Answer : (1)

Solution:

Protein	**Functions**
Collagen	Intercellular ground substance
Trypsin	Enzyme
Insulin	Hormone
Antibody	Fights infectious agents
Receptor	Sensory reception (smell, taste, hormone, *etc*.)
GLUT-4	Enables glucose transport into cells

(171) Answer : (3)

Solution:

All proteins are heteropolymers while carbohydrates can be homopolymer or heteropolymer.

(172) Answer : (3)

Solution:

CO_2 is carried by haemoglobin as carbamino-haemoglobin and CO as carboxyhaemoglobin.

Nearly 20-25 per cent of CO_2 is transported by RBCs whereas 70 percent of it is carried as bicarbonate. About 7 percent of CO_2 is carried in a dissolved state through plasma.

(173) Answer : (4)

Solution:

Vinblastine is an anticancerous drug and curcumin is antiseptic and antibacterial in nature. Both are examples of secondary metabolites (drugs).

(174) Answer : (2)

Solution:

• For analysis of organic compounds in living organisms, a living tissue is grinded in trichloroacetic acid (Cl_3CCOOH) using a mortar and a pestle.

(175) Answer : (3)

Solution:

Co-factor plays a crucial role in the catalytic activity of the enzyme.

(176) Answer : (3)

Solution:

Guanine pairs with cytosine and adenine pairs with thymine in a DNA molecule.

(177) Answer : (4)

Solution:

Palmitic acid is a saturated fatty acid that contains 16 carbon atoms including the carboxyl carbon. Oleic acid is 18 C unsaturated fatty acid.

(178) Answer : (3)

Solution:

Increase in pCO_2 and H^+ concentration activates the central chemoreceptors that signal the rhythm centre to make necessary adjustments.

(179) Answer : (4)

Solution:

$\underset{\text{(Carbon dioxide)}}{CO_2} + \underset{\text{(Haemoglobin)}}{Hb} \rightarrow$ Carbamino - haemoglobin

$\underset{\text{(Carbon monoxide)}}{CO} + \underset{\text{(Haemoglobin)}}{Hb} \rightarrow$ Carboxy - haemoglobin

$\underset{\text{(Oxygen)}}{O_2} + \underset{\text{(Haemoglobin)}}{Hb} \rightarrow$ Oxyhaemoglobin

Myoglobin is a red coloured oxygen storing pigment present in muscles.

(180) Answer : (1)

Hint:

VC = TLC – RV

Solution:

Total lung capacity = VC + RV
Vital capacity = ERV + TV + IRV
Functional residual capacity = ERV + RV
Inspiratory capacity = TV + IRV