



# Aakash

Medical | IIT-JEE | Foundations

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MM : 720

Final Test Series(P1)\_NEET2026\_Test-02B

Time : 180 Min.

**PHYSICS**

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|---------|---------|
| 1. (2)  | 24. (4) |
| 2. (4)  | 25. (4) |
| 3. (1)  | 26. (4) |
| 4. (1)  | 27. (3) |
| 5. (4)  | 28. (1) |
| 6. (1)  | 29. (1) |
| 7. (4)  | 30. (3) |
| 8. (4)  | 31. (3) |
| 9. (3)  | 32. (4) |
| 10. (3) | 33. (4) |
| 11. (2) | 34. (3) |
| 12. (1) | 35. (1) |
| 13. (1) | 36. (3) |
| 14. (1) | 37. (4) |
| 15. (2) | 38. (3) |
| 16. (2) | 39. (2) |
| 17. (3) | 40. (4) |
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| 19. (3) | 42. (1) |
| 20. (4) | 43. (1) |
| 21. (4) | 44. (4) |
| 22. (4) | 45. (3) |
| 23. (2) |         |

**CHEMISTRY**

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| 46. (2) | 69. (4) |
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| 47. (3) | 70. (2) |
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| 66. (2) | 89. (1) |
| 67. (4) | 90. (4) |
| 68. (2) |         |

**BOTANY**

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|----------|----------|
| 91. (1)  | 114. (1) |
| 92. (1)  | 115. (3) |
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| 94. (3)  | 117. (4) |
| 95. (2)  | 118. (2) |
| 96. (4)  | 119. (3) |
| 97. (3)  | 120. (4) |
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| 99. (2)  | 122. (3) |
| 100. (2) | 123. (2) |
| 101. (3) | 124. (3) |

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ZOOLOGY

- 136. (1)
- 137. (1)
- 138. (2)
- 139. (4)
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- 177. (1)
- 178. (1)
- 179. (3)

157. (4)

180. (4)

158. (4)



## Hints and Solutions

## PHYSICS

(1) Answer : (2)

Solution:

$$F = u_r \cdot \frac{dm}{dt} = M(g + a)$$

$$\frac{dm}{dt} = \frac{6000(10+20)}{1000} = 180 \text{ kg/s}$$

(2) Answer : (4)

Solution:

In the given situation, if block A apply force on block B then it would move in horizontal direction. Since the blocks are at rest hence no contact force between them.

(3) Answer : (1)

Solution:

For block  $M$ 

$$Mg - 2T = M\frac{a}{2} \dots (i)$$

For block  $m$ 

$$T = \frac{M}{4}a \dots (ii)$$

From equation (i) &amp; (ii)

$$Mg - 2\left(\frac{M}{4}a\right) = \frac{Ma}{2}$$

$$a = g$$

(4) Answer : (1)

Solution:

$$F = ma \Rightarrow \left| \vec{F} \right| = 10\sqrt{2} = m \times 1 \Rightarrow m = 10\sqrt{2} \text{ kg}$$

(5) Answer : (4)

Solution:

Pseudo force =  $-(\text{mass of object}) \times (\text{acceleration of observer})$ 

$$\vec{F}_s = -m_1 \vec{a}_2$$

(6) Answer : (1)

Solution:

$$F = MR\omega^2$$

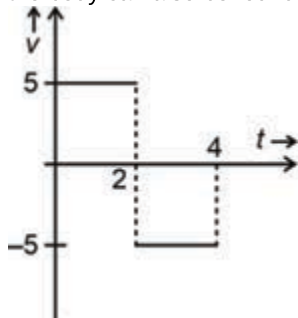
$$= 200 \times 70 \times 0.2^2$$

$$= 560 \text{ N}$$

(7) Answer : (4)

Solution:

Since we are given the  $x-t$  curve we can find the change in the velocity which will ultimately give us change in linear momentum of the body. The impulse of a force equals the change in linear momentum of body. Besides the acceleration of the body can also be found out with the help of  $x-t$  graph.



(8) Answer : (4)

Solution:

$$F = -\frac{dU}{dx}$$

$U$  is minimum for  $F = 0$

$$\Rightarrow -\frac{dv}{dx} = -(x-1) = 0$$

$$\Rightarrow x = 1$$

$$\Rightarrow U_{\min} = \frac{1}{2} - 1 = -\frac{1}{2} \text{ J}$$

Now  $E = \text{P.E.} + \text{K.E.}$

$$\Rightarrow (\text{K.E.})_{\max} = 8 + \frac{1}{2} = \frac{17}{2} \text{ J}$$

(9) Answer : (3)

**Solution:**

Minimum velocity at the lowest point  $v_L = \sqrt{5gL}$

Minimum velocity at the highest point  $v_H = \sqrt{gL}$

$$\frac{K_L}{K_H} = \frac{\frac{1}{2}mv_L^2}{\frac{1}{2}mv_H^2} = 5$$

(10) Answer : (3)

**Solution:**

Apply conservation of momentum

$$0 = 4 \times 8 + 16v$$

$$v = -2 \text{ m/s}$$

Kinetic energy of 4 kg,  $k = \frac{1}{2} \times 16 \times 4 = 32 \text{ J}$

(11) Answer : (2)

**Solution:**

$$\text{K.E.} = \frac{P^2}{2m}$$

$\therefore$  Nature of graph between them is parabolic.

(12) Answer : (1)

**Solution:**

If two identical mass collide elastically, they exchange their velocities after collision.

(13) Answer : (1)

**Solution:**

$$F = \frac{\Delta p}{t} = \frac{2mv \cos 30^\circ}{t} = 1500\sqrt{3} \text{ N}$$

(14) Answer : (1)

**Solution:**

$$T - mg = ma$$

$$T = 20m$$

$$P = \vec{T} \cdot \vec{v}$$

$$500 = 20m \times 10$$

$$m = 2.5 \text{ kg}$$

(15) Answer : (2)

**Solution:**

Conservative forces should do same work on particle for a given starting and ending point. So it cannot depend on velocity.

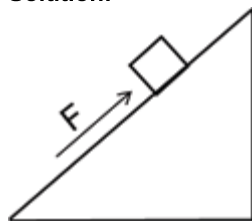
(16) Answer : (2)

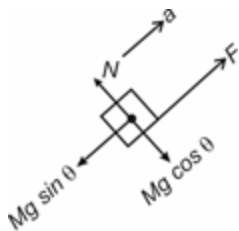
**Solution:**

$$N_B > N_A > N_C, \text{ as } N_A = mg, N_B = mg + \frac{mv^2}{r}, N_C = mg - \frac{mv^2}{r}$$

(17) Answer : (3)

**Solution:**





$$F_{\text{net}} = F_{\text{applied}} - Mg \sin \theta$$

(18) Answer : (4)

**Solution:**

Potential energy is minimum at position C.

For zero mechanical energy, the K.E. will be maximum at point C and for zero mechanical energy at point A,  $K_A > (\text{K.E.})_{\text{max}}$  which is not possible.

(19) Answer : (3)

**Solution:**

For a rotating body :  $\omega_A = \omega_B = \omega_C = \omega$

For a rotating body all particles have the same set of angular variables.

$$\therefore \boxed{\omega_A : \omega_B : \omega_C = 1 : 1 : 1}$$

(20) Answer : (4)

**Solution:**

$$\omega^2 - 0^2 = 2\alpha\theta \Rightarrow \omega^2 = 40\pi^2 \simeq 400$$

$$\omega = 20 \Rightarrow v = r\omega = 40 \text{ m/s}$$

(21) Answer : (4)

**Solution:**

$$\tau_{\text{avg}} = \frac{\Delta L}{\Delta t} = \frac{12-8}{2} = \frac{4}{2} = 2 \text{ N m}$$

(22) Answer : (4)

**Solution:**

$$\vec{a} = (3\hat{i} - 4\hat{j} + 2\hat{k}) \quad \text{and} \quad \vec{b} = (-\hat{i} + 2\hat{j} - \hat{k})$$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & -4 & 2 \\ -1 & +2 & -1 \end{vmatrix}$$

$$\hat{i} [4 - 4] - \hat{j} [-3 + 2] + \hat{k} [6 - 4]$$

$$\hat{j} + 2\hat{k}$$

(23) Answer : (2)

**Solution:**

$W = \int F dx$  = Area enclosed by force vs displacement graph

$$W = 3 \times 3 + \frac{1}{2} \times 3 \times 3$$

$$= 9 + \frac{9}{2} = 13.5 \text{ J}$$

(24) Answer : (4)

**Solution:**

$$v_{\text{cm}} = \frac{mv + 2mv}{3m} = v$$

(25) Answer : (4)

**Solution:**

$$F = (m + 4m) a_{\text{com}}$$

$$a_{\text{com}} = \left( \frac{F}{5M} \right)$$

w.r.t. COM, on block

$$F_{\text{pseudo}} = m a_{\text{com}}$$

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

$$W_{pseudo} = \frac{1}{2}Kx^2$$

$$\frac{F}{5}x = \frac{1}{2}Kx^2$$

$$x = \frac{2F}{5K}$$

(26) Answer : (4)

Solution:

The angle between  $\vec{B} \times \vec{A}$  and  $\vec{A}$  is equal to  $90^\circ$ .

(27) Answer : (3)

Solution:

$$T = mg \pm ma$$

For uniform velocity  $a = 0$

Friction force always oppose relative motion between the contact.

(28) Answer : (1)

Solution:



a. Work done by lifting force ( $W$ ) =  $F\cos\theta$

$\theta < 90^\circ$  so  $W = +ve$  ( $\theta = 0^\circ$ )

b. Work done by gravity ( $W$ ) =  $F_g\cos\theta$

$\theta > 90^\circ$  so  $W_g = -ve$  ( $\theta = 180^\circ$ )

c. Total work done will be zero as kinetic energy is constant.

(29) Answer : (1)

Solution:

$$a = g \sin \theta - g\mu \cos \theta$$

$V$  will be maximum when  $a = 0$

$$x = 1$$

$$a = g \sin \theta - g \sin \theta x$$

$$v \frac{dv}{dx} = g \sin \theta (1 - x)$$

$$\frac{v^2}{2} = g \sin \theta \left( x - \frac{x^2}{2} \right)$$

$$V_{\max} = \sqrt{g \sin \theta}$$

(30) Answer : (3)

Solution:

Take man and platform as system,

$$4T = 900$$

$$T = 225 \text{ N}$$

(31) Answer : (3)

Solution:

In uniform circular motion, the direction of motion changes, therefore velocity changes.

As  $P = mv$  therefore momentum of a body also changes in uniform circular motion.

(32) Answer : (4)

Solution:

$$\frac{1}{2}Kx_m^2 = 2mgx_m$$

$$x_m = \left( \frac{4mg}{K} \right)$$

$$\frac{x_m}{2} = \left( \frac{2mg}{K} \right)$$

By conservation of energy at  $\frac{x_m}{2}$

$$\frac{1}{2}K\left(\frac{x_m}{2}\right)^2 + \frac{1}{2}2mv^2 + \frac{1}{2}mv^2 = 2mg\frac{x_m}{2}$$

$$\frac{1}{2}K\left(\frac{2mg}{K}\right)^2 + \frac{3mv^2}{2} = \frac{4m^2g^2}{K}$$

$$\frac{2m^2g^2}{K} + \frac{3}{2}mv^2 = \frac{4m^2g^2}{K}$$

$$v = 2g\sqrt{\frac{m}{3K}}$$

**(33) Answer :** (4)**Solution:**At point  $B$ 

$$\left(\frac{mv^2}{R}\right)^2 + (mg)^2 = 10mg^2$$

$$\left(\frac{mv^2}{R}\right)^2 = 9m^2g^2$$

$$\frac{mv^2}{R} = 3mg$$

$$mv^2 = 3mgR$$

By conservation of energy

$$mgh = mgR + \frac{1}{2}mv^2$$

$$mgh = \frac{5mgR}{2} \Rightarrow h = 2.5R$$

**(34) Answer :** (3)**Solution:**

$$P_{int} = \vec{F} \cdot \vec{v}$$

**(35) Answer :** (1)**Solution:**

$$F = -\frac{dU}{dx}$$

$$F = -6x^2 + 8x - 1$$

$$\int dW = \int F dx$$

$$W = \int_0^2 (-6x^2 + 8x - 1) dx$$

$$= [-2x^3 + 4x^2 - x]_0^2$$

$$= [-16 + 16 - 2]$$

$$= -2 \text{ J}$$

OR

$$W_c = -U_c$$

$$= -16 + 16 - 2$$

$$= -2 \text{ J}$$

**(36) Answer :** (3)**Solution:**

$$a = \frac{F}{m} = \frac{20}{2} = 10 \text{ m/s}^2$$

$$v = at$$

$$= 10 \times 2 = 20 \text{ m/s}$$

$$P = \vec{F} \cdot \vec{v}$$

$$= 20 \times 20$$

$$= 400 \text{ W}$$

**(37) Answer :** (4)**Solution:**

During the collision, momentum and total mechanical energy will be conserved but kinetic energy will not be conserved.

**(38) Answer :** (3)**Solution:**

$$mgh_1 = \frac{3}{4}mgh$$

$$h_1 = \frac{3}{4}h$$

$$e^2h = \frac{3}{4}h$$

$$e = \left(\frac{\sqrt{3}}{2}\right)$$

**(39) Answer :** (2)**Solution:**

Moment of inertia of hollow sphere is  $\frac{2}{3}mR^2$ .

(40) Answer : (4)

Solution:

$$m_1x_1 + m_2x_2 = 0$$

(41) Answer : (2)

Solution:

$$\vec{L} = mv_0 2R(-\hat{k}) + \frac{2}{3}MR^2\omega\hat{k}$$

$$\vec{L} = 2mv_0R(-\hat{k}) + \frac{2}{3}mR^2\frac{v_0}{2R}\hat{k}$$

$$= \frac{6mv_0R(-\hat{k}) + mv_0R\hat{k}}{3}$$

$$= -\frac{5}{3}mv_0R(\hat{k})$$

(42) Answer : (1)

Solution:

$$M \cdot I = \frac{Ml^2 \sin^2 60^\circ}{3}$$

$$= \frac{Ml^2}{3} \times \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{Ml^2}{4}$$

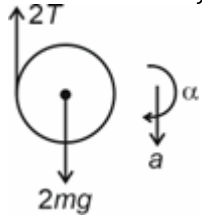
$$MK^2 = \frac{Ml^2}{4}$$

$$K = \left(\frac{l}{2}\right)$$

(43) Answer : (1)

Solution:

Side view of the cylinder :



$$2mg - 2T = 2ma$$

$$2T \times R = I\alpha$$

$$2TR = \frac{2mR^2}{2} \frac{a}{R}$$

$$2T = \frac{2ma}{2}$$

$$4T = 2ma$$

$$2mg - 2T = 4T$$

$$T = \left(\frac{mg}{3}\right)$$

(44) Answer : (4)

Solution:

$$I\vec{\omega} = \text{constant}$$

$I$  will decrease

$\omega$  will increase

(45) Answer : (3)

Solution:

By conservation linear momentum

$$mV_o = 3mV_{cm}$$

$$V_{cm} = \frac{V_o}{3}$$

By conservation of angular momentum

$$\left[ m \left( \frac{l}{3} \right)^2 + \frac{2ml^2}{12} + 2m \left( \frac{l}{6} \right)^2 \right] \omega = \frac{mV_0 l}{3}$$

$$\left( \frac{ml^2}{9} + \frac{ml^2}{6} + \frac{ml^2}{18} \right) \omega = \frac{mV_0 l}{3}$$

$$\left( \frac{2ml^2 + 3ml^2 + ml^2}{18} \right) \omega = \frac{mV_0 l}{3}$$

$$\frac{l}{3} \omega = \frac{V_0}{3}$$

$$\omega = \left( \frac{V_0}{l} \right)$$

## CHEMISTRY

(46) Answer : (2)

**Hint:**Dipole moment ( $\mu$ ) =  $q \times d$ where  $q$  is charge and  $d$  is distance between the atoms.**Solution:**

Dipole moment/ Debye

CH<sub>3</sub>F 1.847CH<sub>3</sub>Cl 1.860CH<sub>3</sub>Br 1.830CH<sub>3</sub>I 1.636

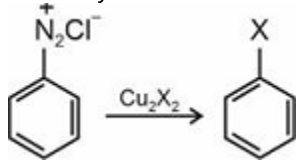
(47) Answer : (3)

**Hint:**

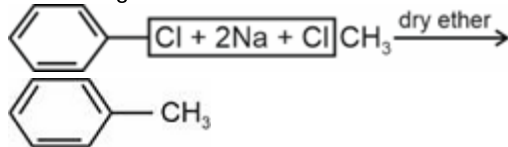
Swarts and Finkelstein reactions are halogen exchange reactions.

**Solution:**

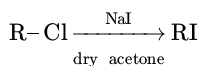
Sandmeyer reaction



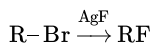
Wurtz Fittig reaction



Finkelstein reaction



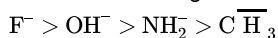
Swarts reaction.



(48) Answer : (2)

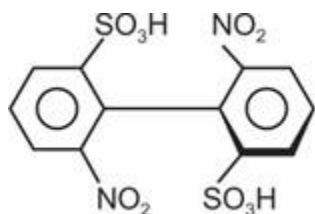
**Solution:**

Weak bases are good leaving groups. Order of leaving group tendency is



(49) Answer : (4)

**Solution:****Hint:** Sterically hindered ortho substituted biphenyls having different groups are optically active as one ring becomes perpendicular to other which lacks plane of symmetry.**Sol.:**



This molecule does not contain plane of symmetry. Hence, it is chiral and optically active.

(50) Answer : (2)

**Hint:**

Electron withdrawing group stabilises the carbanion formed by the attack of nucleophile.

**Solution:**

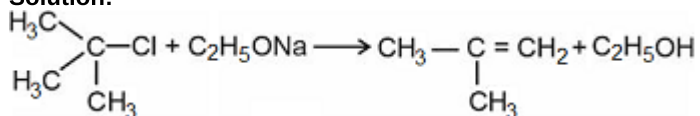
More is the number of electron withdrawing group at o/p positions to the haloarene faster will be the nucleophilic substitution reaction.

(51) Answer : (1)

**Hint:**

Tertiary halide reacts with a strong base then elimination takes place.

**Solution:**



(52) Answer : (1)

**Solution:**

Resorcinol	
m-cresol	
Catechol	
Quinol	

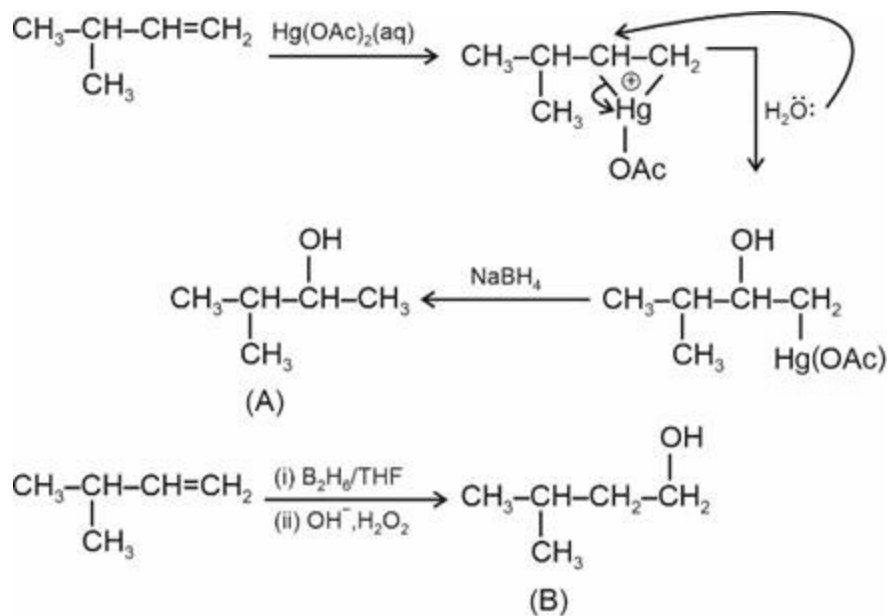
(53) Answer : (4)

**Hint:**

In hydroboration oxidation reaction, anti-Markovnikov addition product is the major product for unsymmetrical alkenes.

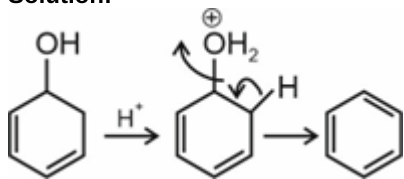
**Solution:**

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(54) Answer : (2)

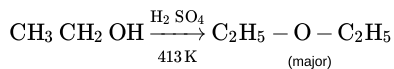
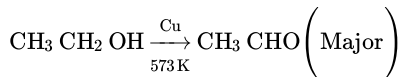
Solution:



It is most readily dehydrated as it will form a more stable aromatic compound i.e. benzene.

(55) Answer : (1)

Solution:

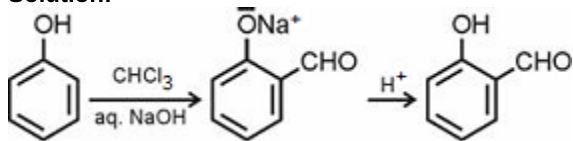


(56) Answer : (2)

Hint:

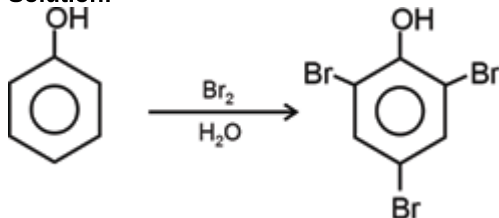
Electrophile involved in Reimer-Tiemann reaction is a carbene.

Solution:

Electrophile is  $:\text{CCl}_2$ 

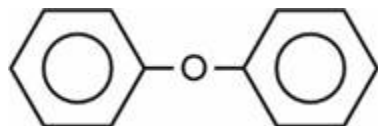
(57) Answer : (1)

Solution:



(58) Answer : (4)

Solution:



is most difficult to cleave on heating with HBr due to partial double bond character.

(59) Answer : (3)

**Solution:**

For cyclic ethers O should be in ring \* carbon here is chiral

(1)



2(d, l pair)

(2)



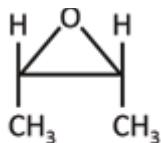
1

(3)



1

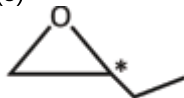
(4)



(1)

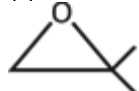
Meso compound

(5)



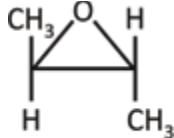
2(d, l pair)

(6)



1

(7)

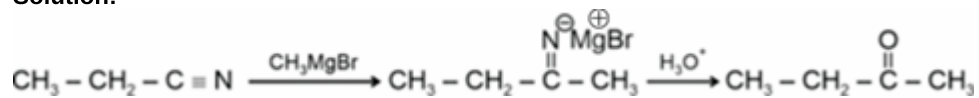


2(d, l pair)

Total number of isomers = 2 + 1 + 1 + 1 + 2 + 1 + 2 = 10

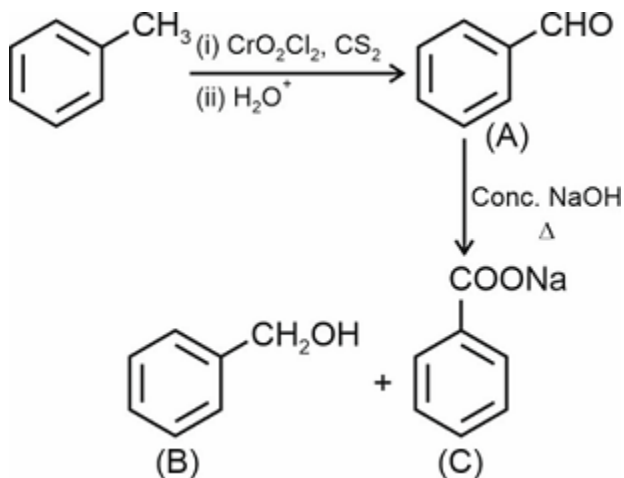
(60) Answer : (2)

**Solution:**



(61) Answer : (3)

**Solution:**



(62) Answer : (2)

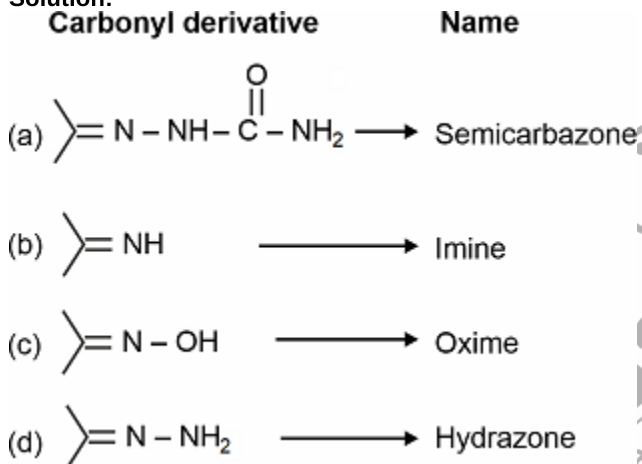
**Hint:**

Boiling point of propanone (acetone) is more than propanal.

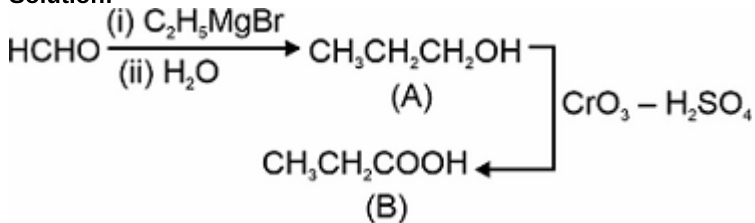
**Solution:**

Methanal, ethanal and propanone are miscible with water in all proportions because they form hydrogen bond with water.

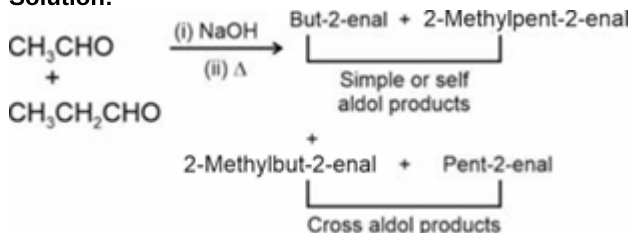
(63) Answer : (4)

**Solution:**

(64) Answer : (2)

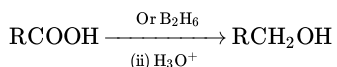
**Solution:**

(65) Answer : (4)

**Solution:**

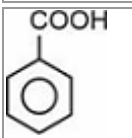
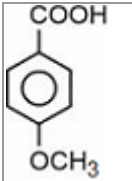
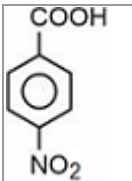
(66) Answer : (2)

**Solution:**

(i)  $\text{LiAlH}_4/\text{ether}$ 

Sodium borohydride does not reduce the carboxylic acid.

**(67) Answer :** (4)**Hint:**Lesser the  $\text{pK}_a$  value more will be the acidic strength.**Solution:**

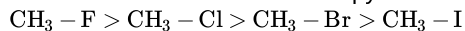
Compound	$\text{pK}_a$
	4.19
	4.46
	3.41
HCOOH	3.75

**(68) Answer :** (2)**Hint:**Boiling point order for isomeric amines is  $1^\circ > 2^\circ > 3^\circ$  amines.**Solution:**

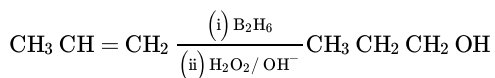
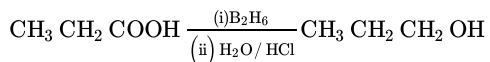
Compound	Boiling point (K)
$n\text{-C}_4\text{H}_9\text{NH}_2$	350.8
$(\text{C}_2\text{H}_5)_2\text{NH}$	329.3
$\text{C}_2\text{H}_5\text{N}(\text{CH}_3)_2$	310.5

**(69) Answer :** (4)**Solution:**

The correct order of bond enthalpy is



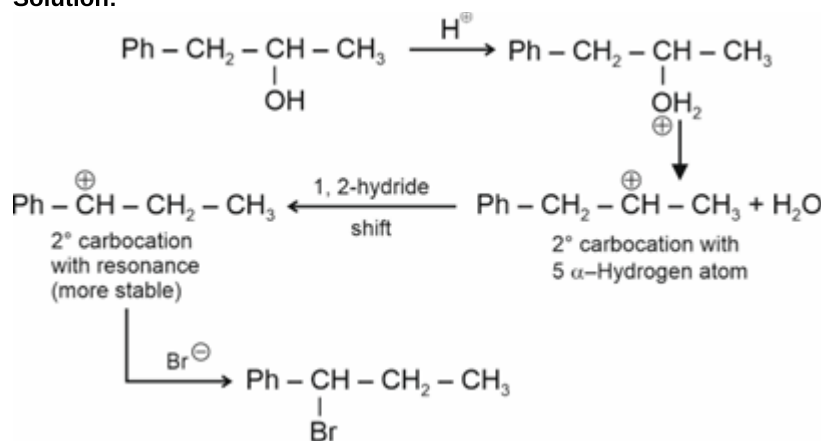
$$\text{Bond enthalpy} \propto \frac{1}{\text{Bond length}}$$

**(70) Answer :** (2)**Solution:****(71) Answer :** (1)**Solution:**

Enantiomers are non-superimposable mirror images of each other. Enantiomers possess identical physical properties namely, melting point, boiling point, refractive index etc, they only differ with respect to the rotation of plane polarised light. If one of the enantiomers is dextrorotatory, then other will be laevorotatory.

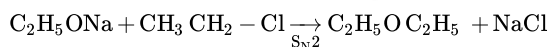
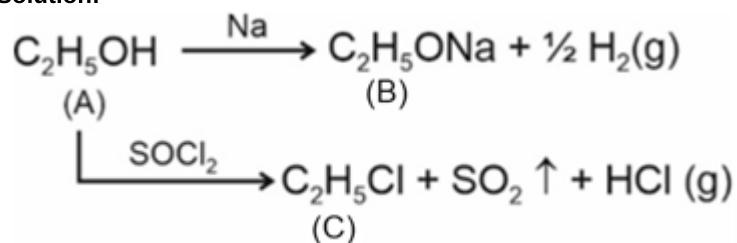
**(72) Answer :** (3)

Solution:



(73) Answer : (4)

Solution:



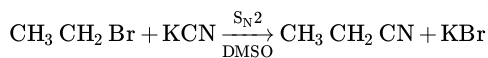
(74) Answer : (1)

Solution:

2° alcohol and 3° alcohol can be distinguished by Lucas reagent.  
Isopropyl alcohol will give iodoform test but tert-butyl alcohol will not give iodoform test.

(75) Answer : (2)

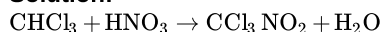
Solution:



Polar aprotic solvent favours S<sub>N</sub>2 reaction.

(76) Answer : (1)

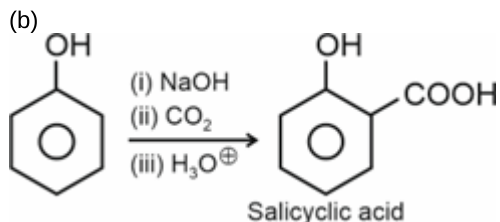
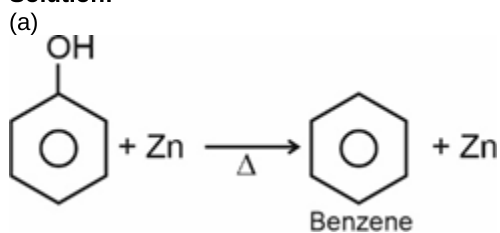
Solution:



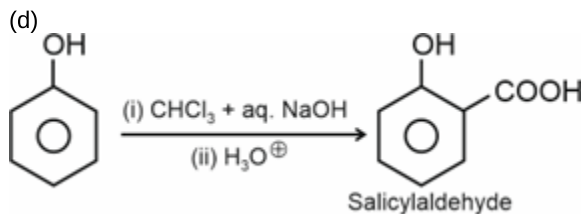
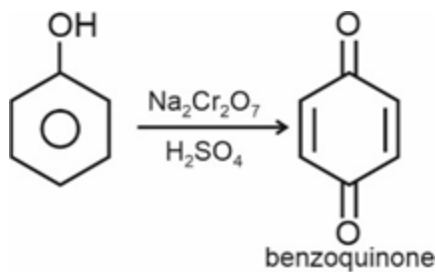
In an S<sub>N</sub>1 reaction on chiral centres, there is inversion more than retention leading to partial racemization.

(77) Answer : (1)

Solution:

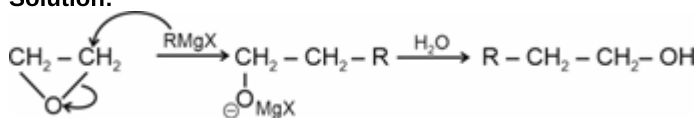


(c)



(78) Answer : (1)

Solution:



(79) Answer : (4)

Solution:



(80) Answer : (3)

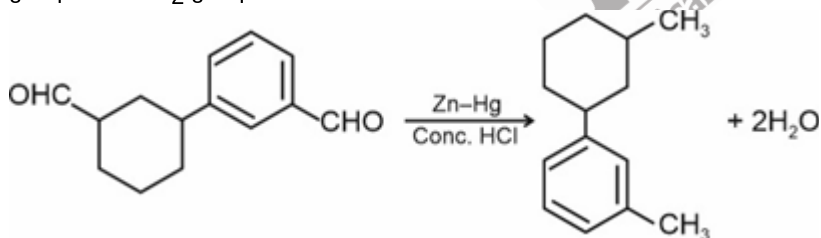
Solution:

Fehling's solution 'B' is alkaline solution of sodium potassium tartrate (Rochelle salt).

(81) Answer : (3)

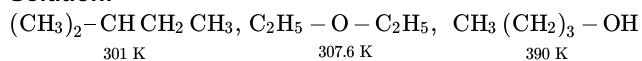
Solution:

Zinc-amalgam and concentrated hydrochloric acid is known as Clemmensen reagent it converts,

group into  $>CH_2$  group.

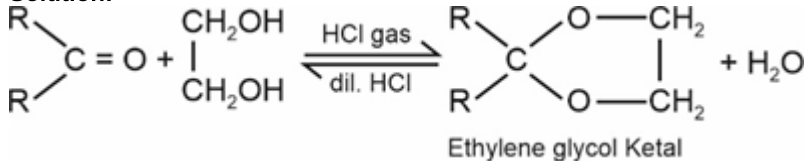
(82) Answer : (1)

Solution:



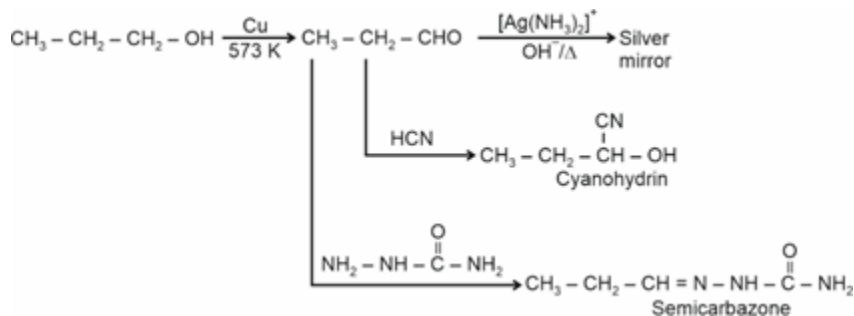
(83) Answer : (3)

Solution:



(84) Answer : (2)

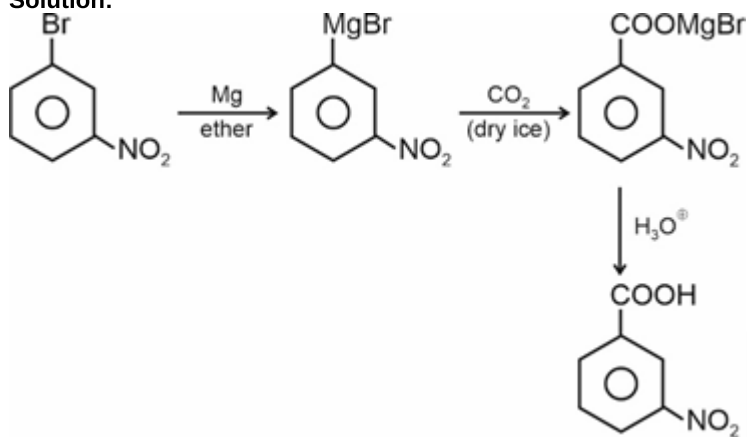
Solution:



It contains aldehyde and alcohol functional groups.

(85) Answer : (1)

Solution:



(86) Answer : (4)

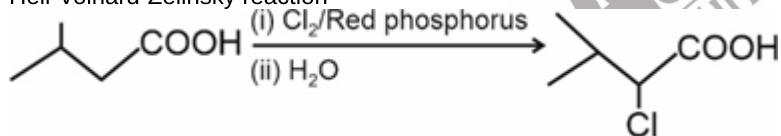
Solution:

Carboxylic acids are higher boiling liquids than aldehydes, Ketones and alcohols of comparable molecular masses. This is due to more extensive association of carboxylic acid molecules through intermolecular hydrogen bonding.

(87) Answer : (2)

Solution:

Hell-Volhard-Zelinsky reaction



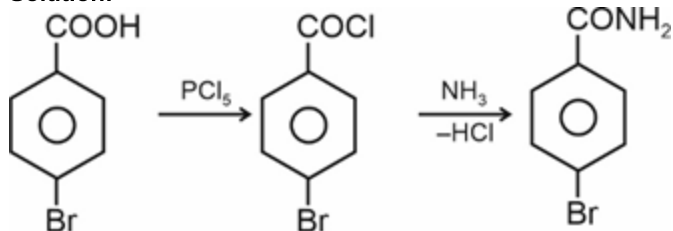
(88) Answer : (4)

Solution:

Sodium benzoate is used as a food preservative Benzoic acid does not undergo Friedel-Crafts reaction.

(89) Answer : (1)

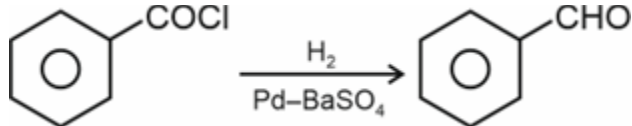
Solution:



(90) Answer : (4)

Solution:

Rosenmund reaction



## BOTANY

- (91) **Answer :** (1)  
**Solution:**  
An association between two species in which one is benefited while other is not affected at all is known as commensalism.
- (92) **Answer :** (1)  
**Solution:**  
Floc includes useful aerobic heterotrophic microbes in aeration tank.  
It is mass of bacteria associated with fungal filaments.
- (93) **Answer :** (2)  
**Solution:**  
Dragonflies are useful to get rid of mosquitoes.
- (94) **Answer :** (3)  
**Solution:**  
When BOD is reduced significantly, effluent is passed into the secondary settling tank to sediment the flocs.
- (95) **Answer :** (2)  
**Hint:**  
Carnivores are less adversely affected due to competition.  
**Solution:**  
In general, herbivores and plants appear to be more adversely affected by competition than carnivores.
- (96) **Answer :** (4)  
**Hint:**  
Viruses, bacteria, fungi, protozoans, viroids and prions are included in microbes.  
**Solution:**  
Bacterial colonies can be seen with naked eyes. Production of beverages on an industrial scale, requires fermentors. Viruses are obligate parasites.
- (97) **Answer :** (3)  
**Solution:**  
Bt toxin is produced by *Bacillus thuringiensis*.
- (98) **Answer :** (1)  
**Solution:**  
Acetic acid is used in preparation of vinegar  
Citric acid is used in dyeing, flavouring and preservation of food etc.  
Lactic acid is used in preparation of curd  
Gluconic acid are used as a source of calcium to infants, cow and lactating mothers.
- (99) **Answer :** (2)  
**Solution:**  
Predation, parasitism and commensalism share a common characteristics *i.e.*, the interacting species live closely together.
- (100) **Answer :** (2)  
**Hint:**  
The main sources of biofertilizers are bacteria, fungi and cyanobacteria.  
**Solution:**  
*Aulosira* is a non-symbiotic nitrogen fixer in the rice fields in India. Blue green algae adds organic matter to the soil and increase its fertility.
- (101) **Answer :** (3)  
**Solution:**  
Rapidly increasing population – Triangular shape  
Stable population – Bell shape  
Declining population – Urn shape
- (102) **Answer :** (4)  
**Solution:**  
Biotic potential of organisms represents their intrinsic rate of natural increase.
- (103) **Answer :** (2)  
**Solution:**  
Soyabean is a leguminous plant. *Rhizobium* is used as a biofertiliser in leguminous plants.

Organic farming uses naturally produced compost.  
Anaerobic sludge digesters produce biogas due to anaerobic digestion of organic material.

(104) Answer : (4)

**Solution:**

Roquefort cheese, bread and beer are fungal fermented products.  
Swiss cheese is ripened with the help of a bacterium.

(105) Answer : (4)

**Solution:**

*Calotropis* growing in abandoned field, produces highly poisonous cardiac glycosides as a defence against grazing herbivores.

(106) Answer : (1)

**Solution:**

The major component of biogas or gobar gas is methane (CH<sub>4</sub>)

(107) Answer : (1)

**Hint:**

Darwin found that fourteen species of finches co-existed in Galapagos island due to the development of different feeding habits.

**Solution:**

The principle of competitive exclusion was stated by Gause.

(108) Answer : (1)

**Hint:**

Goats are better browsers than tortoise.

**Solution:**

Competitive exclusion states that two closely related species competing for the same resources cannot co-exist indefinitely and the competitively inferior one will be eventually eliminated.

(109) Answer : (1)

**Hint:**

Dosa and idli are the fermented preparations of rice and black gram, prepared by using bacteria.

**Solution:**

Microbes used in such preparations are – *Leuconostoc* and *Streptococcus* species of bacteria.

(110) Answer : (2)

**Hint:**

Logistic growth is described by the equation,  $\frac{dN}{dt} = rN \left( \frac{K-N}{K} \right)$

**Solution:**

N = 400

K = 500

r = 0.01

So,  $\frac{dN}{dt} = 0.01 \times 400 \left( \frac{500-400}{500} \right)$

$= 4 \times \frac{1}{5} = 0.8$

$\frac{dN}{dt} = 0.8$

(111) Answer : (1)

**Solution:**

Conformer's body temperature changes with the ambient temperature.

(112) Answer : (4)

**Solution:**

Tiger census in National parks of India is usually based on pugmarks and fecal pellets.

(113) Answer : (2)

**Solution:**

Increased Dissolved Oxygen supports phytoplankton, which consequently increases the population of zooplankton (prey for fishes).

(114) Answer : (1)

**Solution:**

Anaerobic bacteria digest the sludge and form biogas.

Biogas formation occur during secondary treatment in anaerobic sludge digester.

(115) Answer : (3)

**Solution:**

Chain and Florey established the full potential of Penicillin as an effective antibiotic.

(116) Answer : (3)

**Solution:**

During curd formation, LAB produces acids that coagulate milk and partially digest the milk proteins.

(117) Answer : (4)

**Solution:**

Statins are produced by the yeast, *Monascus purpureus* which is a member of Ascomycetes.

(118) Answer : (2)

**Solution:**

Antibiotics are chemical substances which are against life with reference to pathogens.

(119) Answer : (3)

**Solution:**

Pectinases are used for clearing bottled juices. Toddy is prepared from palm sap.

(120) Answer : (4)

**Solution:**

Bacteria can perform all of the given functions.

(121) Answer : (1)

**Solution:**

Different varieties of cheese have different flavours and textures due to the action of different microbes in their fermentation process.

(122) Answer : (3)

**Solution:**

Streptokinase produced by *Streptococcus* is used as a blood-clot buster.

(123) Answer : (2)

**Solution:**

Ladybird controls the population of aphids.

(124) Answer : (3)

**Solution:**

Integral form of the exponential growth equation is,  $N_t = N_0 e^{rt}$

(125) Answer : (1)

**Solution:**

*Convolvulus arvensis* inhibits the growth of wheat. This exemplifies amensalism.

(126) Answer : (4)

**Solution:**

*Balanus* and *Chathamalus* show competition.

(127) Answer : (1)

**Solution:**

The given figure represents a cyanobacteria, *Nostoc*. It is a non-symbiotic  $N_2$  fixing organism.

(128) Answer : (2)

**Solution:**

Produces a large number of small-sized offsprings – pelagic fish

Breeds only once in a life-time – Pacific salmon fish

(129) Answer : (4)

**Solution:**

Exponential growth can be observed in a natural ecosystem for short period because short periods of resource abundance can allow populations to grow. Predators keeps the prey population under control but does not make them extinct.

(130) Answer : (2)

**Solution:**

Since, all the populations start at the same  $N/K$  ratio, the population with higher 'r' value will reach the asymptote faster.

(131) Answer : (2)

**Solution:**

Mycorrhizal associations are not responsible for nitrogen fixation.

**(132) Answer :** (4)**Solution:**

The fungal symbiont in mycorrhizal associations absorbs phosphorus from soil and passes it to the plant. Plants having such associations show other benefits also, such as resistance to root-borne pathogens, tolerance to salinity and drought, and an overall increase in plant growth and development.

**(133) Answer :** (2)**Solution:**

Cyclosporin A is used as an immunosuppressive agent.

**(134) Answer :** (3)**Solution:**

Wine and beer have the least alcohol concentration as they are the non-distilled beverages.

**(135) Answer :** (2)**Solution:**

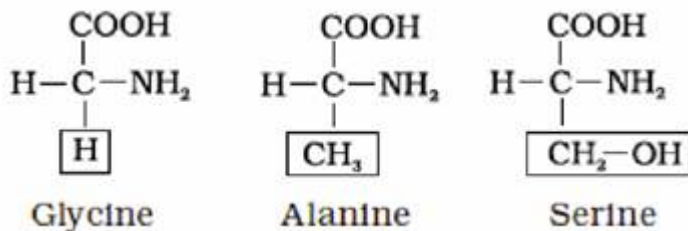
In 1981, the  $r$  value for human population in India was 0.0205.

Connell's experiment showed competitive exclusion.

ZOOLOGY

**(136) Answer :** (1)**Hint:**

Serine is an alcoholic amino acid.

**Solution:****(137) Answer :** (1)**Solution:**

Ciliated columnar epithelium lines the inner surface of hollow organs like bronchioles and fallopian tubes.

**(138) Answer :** (2)**Hint:**

Cardiac muscle fibres

**Solution:**

Gap junctions facilitate the cells to communicate with each other by connecting the cytoplasm of adjoining cells, for rapid transfer of ions, small molecules and sometimes big molecules.

Cardiac muscle fibres show densely stained cross-bands called intercalated discs having communication junctions at intervals.

Cell junctions hold smooth muscle fibres together and they are bundled together in a connective tissue sheath.

**(139) Answer :** (4)**Solution:**

Cardiac muscle cells contract as a unit due to the presence of communication junctions at some fusion points. Most of the cartilages in vertebrate embryos are replaced by bones in adults.

**(140) Answer :** (4)**Solution:**

Cnidarians exhibit tissue level of body organisation whereas poriferans have cellular level of organisation. Platyhelminths have organ and echinoderms have organ-system level of body organisation.

**(141) Answer :** (2)**Solution:**

Primary structure of a protein gives positional information of amino acids. Peptide bonds are present in between adjacent amino acid residues in primary structure of protein.

Ester bonds are present in the lipids and nucleic acid.

Hydrogen bonds are present in secondary, tertiary and quaternary structures of protein.

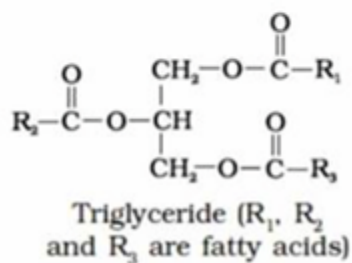
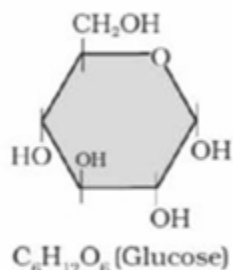
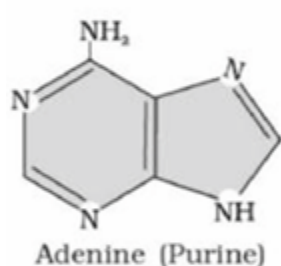
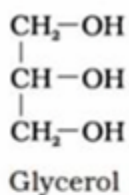
Disulphide bond is present in proteins exhibiting tertiary structure.

(142) Answer : (4)

**Hint:**

Number of hydroxyl groups in glycerol = 3

**Solution:**



(143) Answer : (1)

**Solution:**

A Closer examination reveals that the relative abundance of carbon, hydrogen and oxygen, with respect to other elements is higher in any living organism than in Earth's crust.

(144) Answer : (3)

**Solution:**

A general rule of thumb is that rate doubles or decreases by half for every  $10^\circ\text{C}$  change in temperature in either direction. In the mentioned case, temperature is decreased by  $10^\circ\text{C}$ , therefore, the rate of reaction decreases by half (2X becomes X).

(145) Answer : (2)

**Solution:**

As in a DNA molecule, the amount of adenine equals to that of thymine and the amount of guanine is always equal to that of cytosine *i.e.*,

$$A = T \text{ and } G = C$$

$$[C + G] = 60\% \text{ So,}$$

$$[A + T] = 40\%$$

$$\therefore [A] = 20\% \text{ and } [T] = 20\%$$

(146) Answer : (1)

**Hint:**

Equal to the number of OH groups in glycerol.

**Solution:**

The monomeric units of proteins (carboxypeptidase, antibody and collagen) and carbohydrates (glycogen, cellulose) are joined to each other by peptide and glycosidic bonds, respectively. These bonds are formed by dehydration synthesis.

Adenine is attached to ribose sugar to form adenosine by dehydration reaction.

Guanine (Nitrogenous base), glycine (Amino acid) and fructose (Monosaccharide) are monomers.

(147) Answer : (2)

**Solution:**

A = Water, B = Proteins, C = Nucleic acids

D = Carbohydrates, E = Lipids, F = Ions

Component	% of the total cellular mass
Water	70-90
Proteins	10-15
Carbohydrates	3
Lipids	2
Nucleic acids	5-7
Ions	1

**(148) Answer :** (1)**Hint:**

Nucleotide minus a phosphate group is nucleoside

**Solution:**

- Arachidonic acid has 20 carbon atoms including the carboxyl carbon.
- Some tissues, especially the neural tissues, have lipids with more complex structures.
- Adenosine is a nucleoside and thymidylic acid is a nucleotide.

**(149) Answer :** (3)**Hint:**Dehydration reaction includes removal of a H<sub>2</sub>O molecule.**Solution:**Molecular formula of glucose – C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>2 molecules of glucose form 'X' after dehydration reaction which involves removal of a H<sub>2</sub>O molecule.So, C<sub>12</sub>H<sub>24</sub>O<sub>12</sub> – H<sub>2</sub>O = C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>Therefore, molecular formula for 'X' is C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>.**(150) Answer :** (4)**Solution:**

The teeth help in grinding of food.

**(151) Answer :** (2)**Solution:**

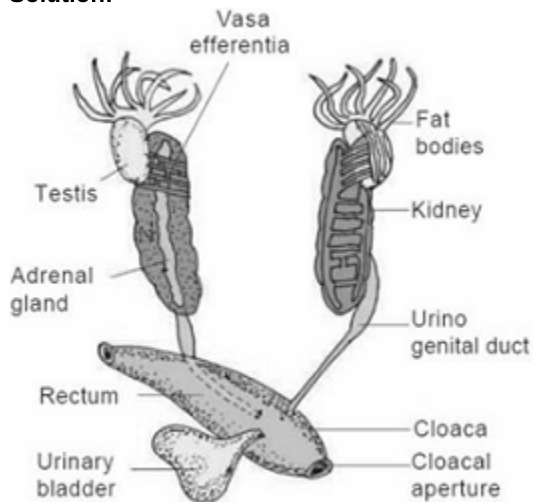
Frogs show indirect development. In frogs, air enters through the nostrils into the buccal cavity and then to the lungs.

**(152) Answer :** (4)**Solution:**

Frogs differ from humans in possessing nucleated red blood cells which are biconvex in shape, while humans have enucleated RBCs which are biconcave in shape.

**(153) Answer :** (3)**Hint:**

Vasa efferentia open into Bidder's canal.

**Solution:**

(154) Answer : (4)

**Solution:**

In nervous system of cockroach, segmentally arranged ganglia are joined by paired longitudinal connectives on the ventral side. The brain is represented in head region by supra-oesophageal ganglion. One pair of compound eyes are situated on dorsal side of the head. Each eye consists of about 2000 hexagonal units called ommatidia.

(155) Answer : (2)

**Solution:**

The cuboidal epithelium is composed of a single layer of cube-like cells. This is commonly found in ducts of glands and tubular parts of nephrons in kidneys and its main functions are secretion and absorption.

(156) Answer : (3)

**Solution:**

Exocrine glands secrete mucus, saliva, earwax, oil, milk, digestive enzymes and other cell products. Insulin is an endocrine secretion.

(157) Answer : (4)

**Solution:**

Simple squamous epithelium consists of a single layer of flat cells that resembles a tiled floor when viewed from the apical surface. The nucleus of each cell is a flattened oval or sphere and is centrally located.

(158) Answer : (4)

**Solution:**

Blood is a fluid connective tissue. Neuroglial cells do not exhibit excitability. Cartilage has no blood supply and tendons have scanty blood supply.

The fibres produced by fibroblasts provide strength, elasticity and flexibility to the tissues.

(159) Answer : (3)

**Solution:**

The matrix (ground substance) of cartilage is solid and pliable and resists compression.

Most of the bones forming skeleton of the adult are cartilaginous in the early embryonic stage.

(160) Answer : (2)

**Solution:**

Skeletal muscles are involved in maintaining posture and heat production. Skeletal muscle fibres are long, cylindrical, striated with peripherally located nuclei.

(161) Answer : (2)

**Solution:**

Neuroglial cells make up more than one-half the volume of neural tissue in our body. These cells protect and support the neurons.

(162) Answer : (1)

**Solution:**

Smooth muscle tissue is present in the iris of the eyes. Smooth muscle fibres are spindle-shaped, uninucleated and involuntary.

Both smooth and skeletal muscle fibres do not have intercalated discs.

(163) Answer : (1)

**Solution:**

Exoskeleton of arthropods have complex polysaccharide called chitin.

(164) Answer : (3)

**Solution:**

Macrophage – Ingests cell debris, bacteria and foreign matter.

Adipocyte – Fat – storing cell

Mast cell – Produces heparin and serotonin

Fibroblast – Produces matrix and fibres

(165) Answer : (1)

**Solution:**

Enzymes are divided into 6 classes each with 4-13 sub-classes and named accordingly by a four digit number.

(166) Answer : (2)

**Solution:**

Haem is the prosthetic group and it is a part of the active site of peroxidase and catalase.

Zinc is a co-factor for the proteolytic enzyme carboxypeptidase.

(167) Answer : (3)

**Solution:**

Co-enzyme NADP contains vitamin niacin. Haem is the prosthetic group in peroxidase and catalase.

(168) Answer : (3)

**Solution:**

Inulin is a polymer of fructose. It is a storage polysaccharide found in roots and tubers of dahlia and related plants. Inulin is readily filtered through the kidney.

(169) Answer : (4)

**Solution:**

Palmitic acid is an example of saturated fatty acid while arachidonic acid is an example of unsaturated fatty acid.

(170) Answer : (3)

**Solution:**

Glycogen is present as a store house of energy in animal tissues. It is made up of about 30,000 glucose residues. It has branched structure having  $\alpha$ -1, 4 linkages at unbranched part and the branching points have  $\alpha$ -1, 6 linkages. It gives red colour with iodine.

(171) Answer : (2)

**Solution:**

Transferases include enzymes that catalyse a transfer of a group (other than hydrogen) between a pair of substrates.

(172) Answer : (3)

**Solution:**

Almost all enzymes are proteins. There are some nucleic acids that behave like enzymes. These are called ribozymes.

(173) Answer : (4)

**Solution:**

Nucleic acids constitute 5-7% of the total cellular mass. Nucleic acids like DNA and RNA contain two main types of bonds *i.e.*, phosphodiester bond and hydrogen bond. A third type, glycosidic bond connects the nitrogenous base to the sugar molecule within each nucleotide.

(174) Answer : (1)

**Solution:**

Adult human haemoglobin consists of 4 subunits. This represents quaternary structure of a protein.

(175) Answer : (3)

**Solution:**

Starch is a homopolymer of glucose while insulin, RuBisCO and glucagon are proteins.

(176) Answer : (1)

**Solution:**

Adenine and guanine are substituted purines while thymine, cytosine and uracil are substituted pyrimidines.

(177) Answer : (1)

**Solution:**

Enzymes are composed of one or several polypeptide chains. However, there are a number of cases in which non-protein constituents called co-factors are bound to the enzyme to make the enzyme catalytically active.

(178) Answer : (1)

**Hint:**

Largest phallomere of male cockroach.

**Solution:**

Pseudopenis and titillator are parts of left phallomere which is considered as the largest phallomere of male cockroach.

(179) Answer : (3)

**Hint:**

Sperms are glued together within this structure.

**Solution:**

In cockroach, sperms are stored within seminal vesicles and are glued together in the form of bundles called spermatophores which are discharged during copulation. Long tubules are present in mushroom-shaped gland found in male cockroach.

(180) Answer : (4)

**Solution:**

In frogs, fertilization and development is external and indirect, respectively. Development takes place through a larval stage and its larva is called tadpole.