

13/03/2025

Phase-1
CODE-A



Aakash

Medical | IIT-JEE | Foundations

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FINAL TEST SERIES for NEET-2025

MM : 720

Test - 2

Time : 180 Mins.

Answers

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

Hints and Solutions

PHYSICS

(1) Answer : (1)

Solution:

Two identical masses having equal speed, can have different velocities, so have different linear momenta.

(2) Answer : (4)

Solution:

Particle is in equilibrium when force acts on it, is zero.

Slope of momentum-time graph = force

Hence, force = 0, when slope of momentum-time graph is zero.

(3) Answer : (1)

Solution:For perfectly elastic collision $e = 1$.

(4) Answer : (4)

Solution:

When two particles of equal masses perform head on elastic collision, then after collision their velocities get exchanged.

$$v_A = 0$$

$$v_B = 10 \text{ m/s}$$

(5) Answer : (4)

Solution:Hint & sol.: $\Delta U = -W_C$

(6) Answer : (1)

Solution:

$$W = \vec{F} \cdot \vec{S} = F s \cos \theta, \text{ work done will be negative when } \theta \text{ is obtuse.}$$

(7) Answer : (3)

Solution:

MOI depends on the choice of axis of rotation also.

(8) Answer : (4)

Solution:

$$\Delta L = 0 \text{ and } \Delta L = \int \tau \cdot dt$$

$$\int \tau \cdot dt = \Delta L$$

$$\Rightarrow \text{Area under } \tau \text{ v/s } t \text{ graph} = \Delta L$$

 \therefore For $\Delta L = 0$, area under τ v/s t graph should be zero.

(9) Answer : (4)

Solution:

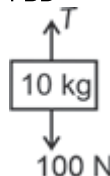
$$2FR = \frac{1}{2}MR^2\alpha$$

$$\alpha = \frac{4F}{MR}$$

(10) Answer : (4)

Solution:

FBD



$$\Rightarrow T - 100 \text{ N} = 0$$

$$\Rightarrow T = 100 \text{ N}$$

(11) Answer : (1)

Solution:

$$\mu = \tan \theta$$

$$\mu = \tan 37^\circ$$

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

(12) Answer : (3)**Solution:**

$$v_s = \sqrt{\mu r g} = \sqrt{0.2 \times 12.5 \times 10} = 5 \text{ m s}^{-1}$$

$$= 5 \times \frac{18}{5}$$

$$= 18 \text{ km/h}$$

(13) Answer : (1)**Solution:**

$$I = 5 \times 10^{-3} \text{ kg m}^2, n = 20 \text{ rev/s}$$

$$\omega = \omega_0 + \alpha t$$

$$0 = 2\pi \times 20 - \alpha \times 10$$

$$\alpha = 4\pi \text{ rad/s}^2$$

$$\tau = I\alpha = 5 \times 10^{-3} \times 4\pi$$

$$\alpha = 2\pi \times 10^{-2} \text{ N m}$$

(14) Answer : (2)**Solution:**

$$\tau = F \cdot r_{\perp} \quad (\text{where } r_{\perp} = \text{moment arm})$$

$$\tau_{\text{net}} = 2 \times 0 + 10 \times 3 = 30 \text{ N-m}$$

(15) Answer : (1)**Solution:**

$$F_{\text{net}} = m \times a$$

$$\Rightarrow m_1 a_1 = m_2 a_2$$

$$\Rightarrow m_1 \times 3 = m_2 \times 1$$

$$\Rightarrow \frac{m_1}{m_2} = \frac{1}{3}$$

(16) Answer : (1)**Solution:**Assuming, $m_1 > m_2$

$$a = \frac{m_1 g - m_2 g}{m_1 + m_2}$$

$$\Rightarrow \frac{g}{8} = g \cdot \frac{m_1 - m_2}{m_1 + m_2} \Rightarrow m_1 + m_2 = 8m_1 - 8m_2$$

$$\Rightarrow 9m_2 = 7m_1 \Rightarrow \frac{m_1}{m_2} = \frac{9}{7}$$

(17) Answer : (2)**Solution:**

For, 2 kg block

$$\Rightarrow 10 - F_S = 2 \times 2 \Rightarrow F_S = 6 \text{ N}$$

For 3 kg block

$$\Rightarrow 6 = 3 \times a \Rightarrow a = 2 \text{ m/s}^2$$

(18) Answer : (2)**Solution:**

We know that, $K = \frac{p^2}{2m}$

As the momentum remains conserved

$$\Rightarrow K \propto \frac{1}{m} \Rightarrow K \times m = C$$

$$\Rightarrow K_1 \times m_b = K_2 \times M_G \text{ as } M_G > m_b \Rightarrow K_1 > K_2$$

(19) Answer : (2)**Solution:**

$$\vec{W} = \vec{F} \cdot \vec{S} = \hat{i} \cdot \hat{i} + 2\hat{j} \cdot \hat{j} + 3\hat{k} \cdot \hat{k} = 8 \text{ J}$$

(20) Answer : (1)**Solution:**

$$W_{mg} + W_N = \Delta K.E.$$

$$\Delta K.E. = \frac{1}{2} \times m \times 2 \times \frac{g}{3} \times h = \frac{mgh}{3}$$

$$\Rightarrow mgh + W_N = \Delta K.E. \Rightarrow W_N = \frac{-2mgh}{3}$$

(21) Answer : (1)**Solution:**

Use conservation of energy

$$\frac{1}{2} \times K \times x^2 = \frac{1}{2} m V^2 \text{ and } x = \frac{F}{K}$$

$$\frac{1}{2} \times K \times \frac{F^2}{K^2} = \frac{m v^2}{2} \Rightarrow V = \frac{F}{\sqrt{mK}}$$

(22) Answer : (2)

Solution:

Apply momentum conservation

$$mV = [M + m]v' \Rightarrow v' = \frac{mV}{M+m}$$

$$K_i = \frac{1}{2} m V^2, K_F = \frac{1}{2} \times (M + m) \times \frac{m^2 V^2}{(M+m)^2}$$

$$= \frac{m^2 V^2}{2(M+m)}$$

$$\Rightarrow \frac{K_F}{K_i} = \frac{m^2 V^2 \times 2}{2(M+m) \times m V^2} = \frac{m}{M+m}$$

(23) Answer : (2)

Solution:

$$F_{\text{cons}} = -\frac{dv}{dx} \Rightarrow \text{i.e. negative slope of the curve would lead to positive value of force.}$$

(24) Answer : (4)

Solution:

Since the point masses are placed symmetrically, hence centre of mass would remain at its original position.

(25) Answer : (2)

Solution:

$$\vec{a}_{\text{com}} = \frac{m_1 \vec{a}_1 + m_2 \vec{a}_2}{m_1 + m_2} \Rightarrow \vec{a}_{\text{com}} = \frac{2 \times g \hat{i} - \hat{j} + 4g \hat{i} - \hat{j}}{6}$$

$$\Rightarrow \vec{a}_{\text{com}} = -g \hat{j}$$

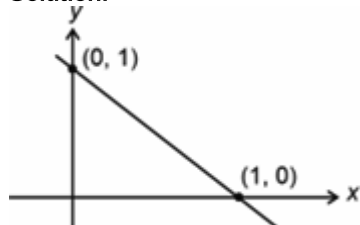
(26) Answer : (4)

Solution:

$$I = MR^2 + MR^2 = 2MR^2$$

(27) Answer : (2)

Solution:



$\vec{L} = \vec{r} \times \vec{p}$, as the point (1, 0) lies on the line of action of linear momentum hence angular momentum about that point would be zero.

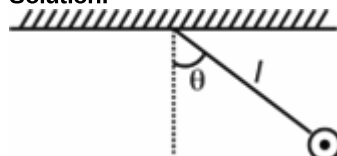
(28) Answer : (1)

Solution:

The analogue of moment of inertia in translational motion is mass.

(29) Answer : (3)

Solution:



Using the conservation of energy,

$$U_i + K_i = U_F + K_F$$

$$mg[l - l \cos \theta] + 0 = 0 + \frac{1}{2} m v^2$$

$$\Rightarrow v^2 = 2gl(1 - \cos \theta)$$

$$\Rightarrow v = \sqrt{2gl(1 - \cos \theta)}$$

(30) Answer : (2)

Solution:

$$\theta_1 = \frac{1}{2} \times \alpha \times 4$$

$$\theta' = \frac{1}{2} \times \alpha \times (4)^2 = \frac{16\alpha}{2} = 8\alpha$$

$$\theta_1 = 2\alpha$$

$$\Rightarrow \theta_2 = \theta' - \theta_1 = 6\alpha$$

$$\Rightarrow \frac{\theta_2}{\theta_1} = \frac{6\alpha}{2\alpha} = \frac{3}{1}$$

(31) Answer : (1)

Solution:

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & 1 \\ 1 & 1 & -1 \end{vmatrix}$$

$$= \hat{i} \cdot -2 - 1 \cdot -\hat{j} - 1 \cdot -1 + \hat{k} \cdot 1 - 2 \cdot$$

$$= -3\hat{i} + 2\hat{j} - \hat{k}$$

$\lambda \cdot \vec{A} \times \vec{B}$ will be perpendicular to \vec{A} and \vec{B} .

(32) Answer : (2)

Solution:

$$P = FV = 20 \times 5 = 100 \text{ W}$$

(33) Answer : (3)

Hint:

$$P = \vec{\tau} \cdot \vec{\omega}$$

Solution:

$$\vec{\tau} = \hat{i} - 3\hat{j} + 2\hat{k} \text{ Nm}$$

$$\vec{\omega} = 4\hat{i} + 2\hat{j} + 5\hat{k} \text{ rad/s}$$

$$P = \hat{i} - 3\hat{j} + 2\hat{k} \cdot 4\hat{i} + 2\hat{j} + 5\hat{k}$$

$$P = 4 - 6 + 10$$

$$P = 8 \text{ W}$$

(34) Answer : (4)

Solution:

Since, the minimum velocity that must be given to body at lowest position is $\sqrt{5gr}$ hence tension at topmost point is zero.

(35) Answer : (4)

Solution:

$$1 \text{ J} = 10^7 \text{ erg}$$

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$

$$1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$$

$$1 \text{ H.P} = 746 \text{ watt}$$

(36) Answer : (2)

Solution:

$$a = \frac{(60-15-10-15)}{2+3} = 4 \text{ m/s}^2$$

$$60 - T - 15 = 3 \times 4$$

$$\therefore T = 33 \text{ N}$$

(37) Answer : (2)

Solution:

$$\text{Impulse} = \Delta \vec{p} \text{ (change in momentum)}$$

$$\text{Velocity of body just before } t = 2 \text{ s is } v_i = \frac{10}{2} = 5 \text{ m/s}$$

$$\text{Velocity just after the } t = 2 \text{ s is } v_f = 0$$

$$\Delta \vec{p} = m \cdot \vec{v}_f - \vec{v}_i$$

$$= 1(0 - 5)$$

$$= -5 \text{ kg m s}^{-1}$$

(38) Answer : (3)

Solution:

$$Mg\frac{L}{2} = I\alpha$$

$$\Rightarrow \frac{ML^2}{3}\alpha = Mg\frac{L}{2}$$

$$\Rightarrow \alpha = \frac{3}{2}\frac{g}{L} = \frac{3}{2} \times \frac{10}{1} = 15 \text{ rad/s}^2$$

(39) Answer : (3)

Solution:

• From conservation of angular momentum $I\omega = \text{constant}$
When I decreases, ω will increase.

• Kinetic energy $K = \frac{L^2}{2I}$

When I decreases, K will increase

(40) Answer : (4)

Solution:

When the spring was not cut, $30 = F_A + F_B$

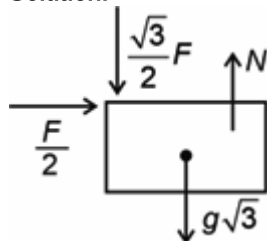
$$\Rightarrow F_A = F_B = 15N$$

When spring A is cut, $F_{\text{net}} = 30 - 15 = 15 = 3a$

$$\Rightarrow a = 5 \text{ m/s}^2$$

(41) Answer : (4)

Solution:



$$\text{From, FBD} \Rightarrow N = \sqrt{3}g + \frac{\sqrt{3}F}{2}$$

$$f_{\text{max}} = \mu N = \frac{g}{2} + \frac{F}{4}$$

$$\text{If block doesn't move} \Rightarrow \frac{F}{2} \leq \frac{g}{2} + \frac{F}{4}$$

$$\Rightarrow \frac{F}{4} \leq \frac{g}{2} \Rightarrow F \leq 2g \Rightarrow F \leq 20N$$

(42) Answer : (1)

Solution:

Since work done by all the forces equal change in K.E.

\Rightarrow Positive work increases K.E. and vice versa.

(43) Answer : (3)

Solution:

Since the gravitational force is a conservative force hence speed of object on reaching ground will be 1 : 1.

(44) Answer : (1)

Solution:

$$X_{\text{com}} = \frac{m_1x_1 + m_2x_2 + \dots}{m_1 + m_2}$$

$$\Rightarrow X_{\text{com}} = \frac{M \times D + M \times D}{5M}$$

$$\Rightarrow X_{\text{com}} = \frac{2D}{5}$$

(45) Answer : (2)

Solution:

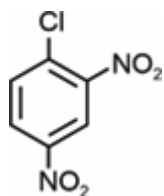
Angular velocity is same for all points on rigid rotating body.

Moment of inertia is independent of angular velocity.

CHEMISTRY

(46) Answer : (3)

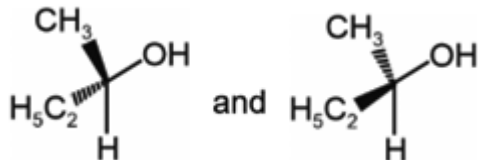
Solution:



More e^- deficient center for Nucleophilic substitution due to $-M$ of $-\text{NO}_2$ groups.

(47) Answer : (1)

Solution:



are non-superimposable mirror image of each other. Hence, they are enantiomers.

(48) Answer : (2)

Hint:

CH_3OH , Methanol is also known as "wood spirit".

Solution:

The commercial alcohol is made unfit for drinking by mixing in it some copper sulphate (to give it a colour) and pyridine (a foul smelling liquid). It is known as denaturation of alcohol.

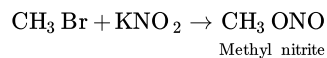
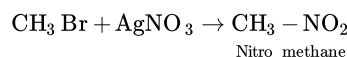
(49) Answer : (3)

Solution:

The compounds in which halogen atom is bonded to a sp^3 hybridised carbon atom attached to an aromatic ring.

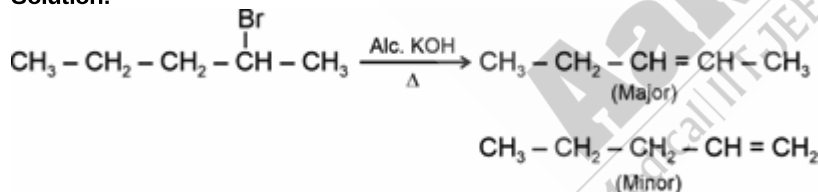
(50) Answer : (1)

Solution:



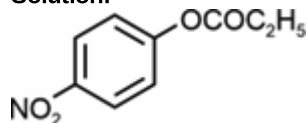
(51) Answer : (1)

Solution:



(52) Answer : (4)

Solution:



$-\text{NO}_2$ is most electron withdrawing and hence more electrophilic position (ester); more readily will be hydrolysis.

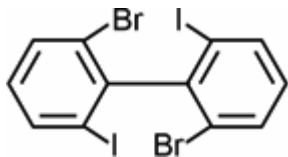
(53) Answer : (3)

Solution:

| Bond | Dipole moment/Debye |
|------------------------|---------------------|
| CH_3F | 1.847 |
| CH_3Cl | 1.860 |
| CH_3Br | 1.830 |
| CH_3I | 1.636 |

(54) Answer : (3)

Solution:



does not have plane of symmetry and centre of symmetry.
Hence, optically active

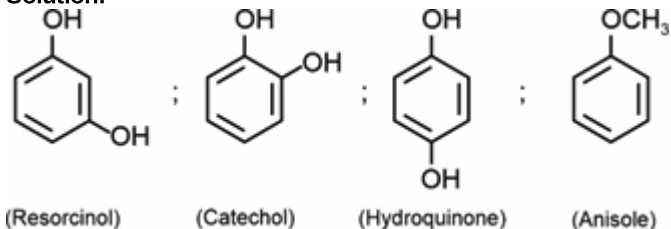
(55) Answer : (1)

Solution:

Ethanol forms intermolecular hydrogen bonding with H_2O so it soluble in water.

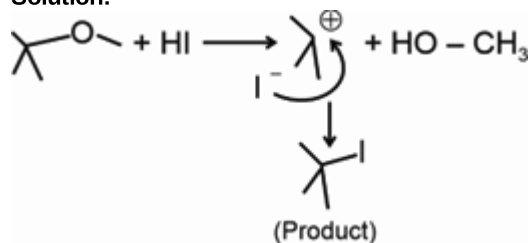
(56) Answer : (3)

Solution:



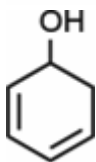
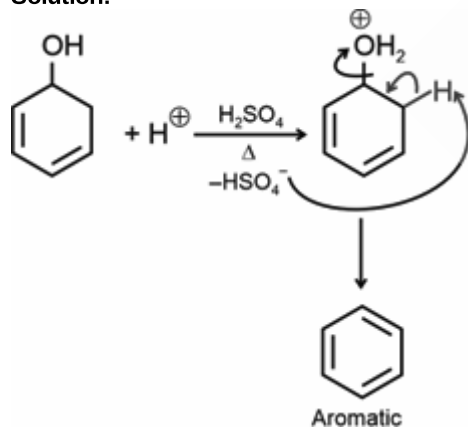
(57) Answer : (2)

Solution:



(58) Answer : (2)

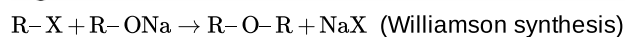
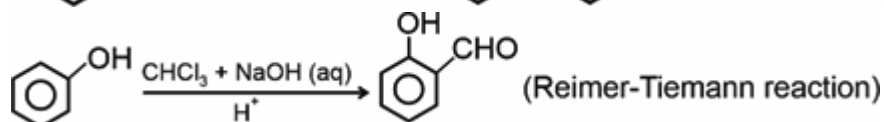
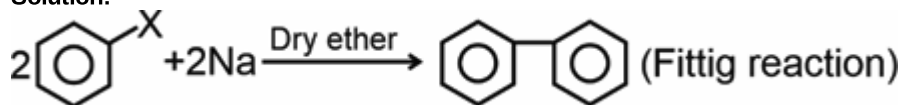
Solution:

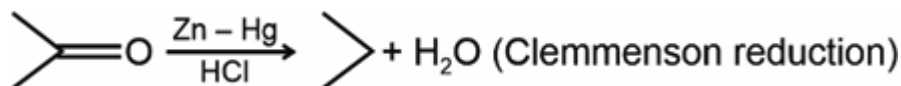


is most readily dehydrated in acidic condition as it yield stable aromatic benzene.

(59) Answer : (3)

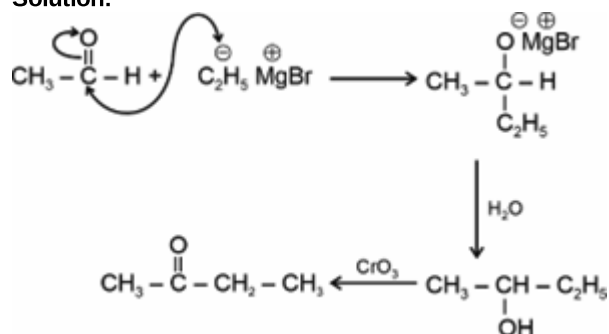
Solution:





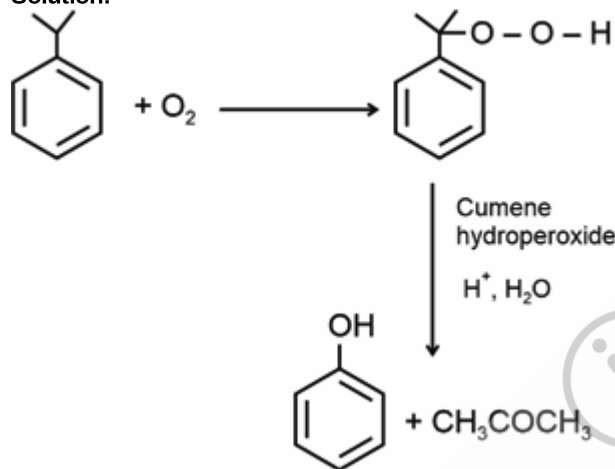
(60) Answer : (2)

Solution:



(61) Answer : (4)

Solution:



(62) Answer : (2)

Solution:

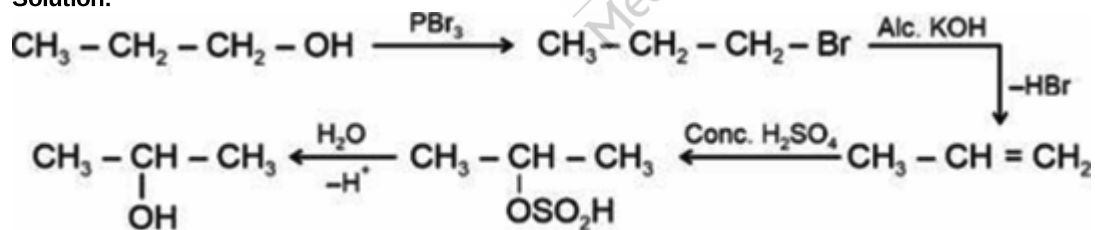
NaBH₄ can reduce aldehyde and ketones but not able to reduce ester.

(63) Answer : (4)

Hint:

Alc. KOH leads to elimination reaction when treated with an alkyl halide.

Solution:

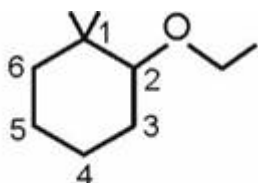


(64) Answer : (1)

Hint:

Numbering should be started from more substituted carbon of the ring

Solution:



2-Ethoxy-1,1-dimethylcyclohexane

(65) Answer : (2)

Hint:

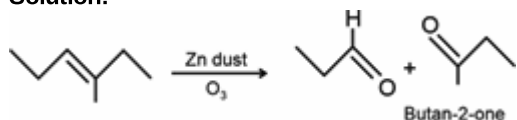
-OCH₃ is +R causing group.

Solution:

BH_3 is an electron deficient molecule and acts as an electrophile. So any electron releasing group by +I/+R will facilitate its attack.

(66) Answer : (2)

Solution:



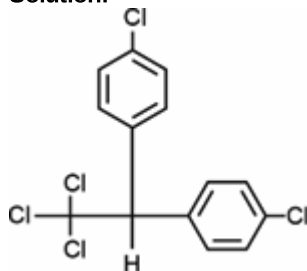
(67) Answer : (1)

Solution:

Ortho and para nitrophenols can be separated by steam distillation as orthonitrophenol forms intramolecular hydrogen bonding yielding lesser boiling point than p-nitrophenol which show intermolecular hydrogen bonding.

(68) Answer : (3)

Solution:



(69) Answer : (2)

Solution:

Hydrogenation of acid chloride in presence of Pd/BaSO_4 to yield aldehyde is a Rosenmund reaction.

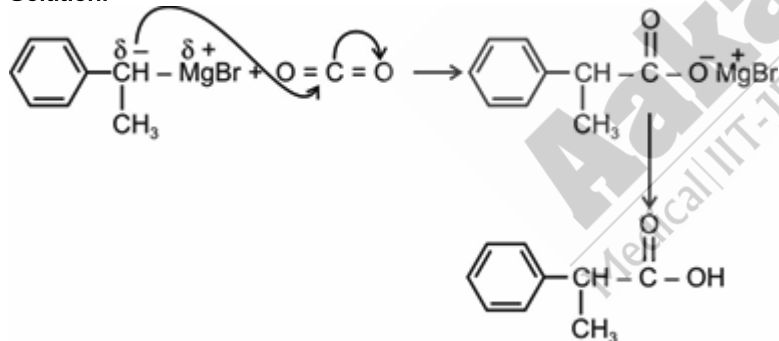
(70) Answer : (1)

Solution:

Due to intermolecular hydrogen bonding in alcohols, their boiling point is higher.

(71) Answer : (2)

Solution:

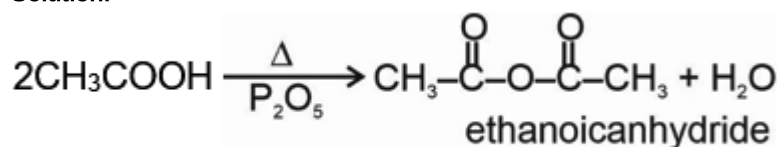


(72) Answer : (2)

Hint:

P_2O_5 is acting as strong dehydrating agent.

Solution:



(73) Answer : (3)

Solution:

LiAlH_4 reduces both carbonyl group and ester group.

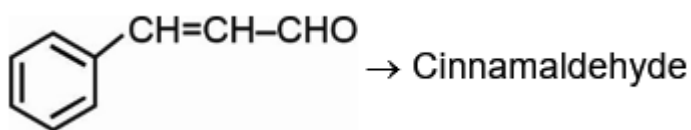
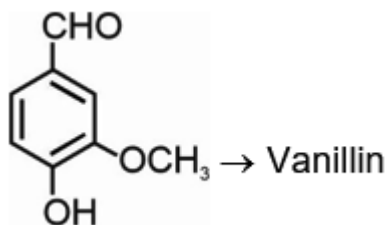
(74) Answer : (3)

Hint:

$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$ is called valeraldehyde

Solution:

$\text{CH}_2 = \text{CH} - \text{CHO} \rightarrow \text{Acrolein}$



(75) Answer : (4)

Solution:

Aldehydes react faster than ketone towards nucleophilic addition reaction.

(76) Answer : (4)

Solution:Order of S_N2 is $\text{CH}_3\text{Cl} > \text{CH}_3\text{CH}_2\text{Cl} > (\text{CH}_3)_2\text{CHCl} > (\text{CH}_3)_3\text{CCl}$

(77) Answer : (3)

Solution:

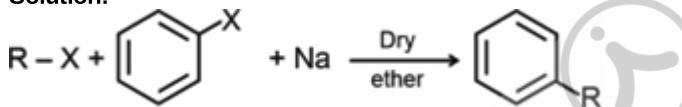
Secondary alcohol with Cu at 573 K give ketones.

(78) Answer : (4)

Solution:

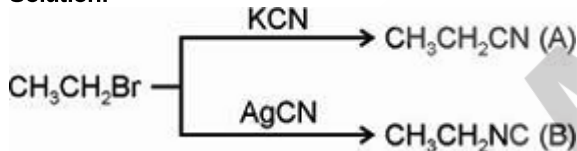
Acetone forms H-bond with water.

(79) Answer : (1)

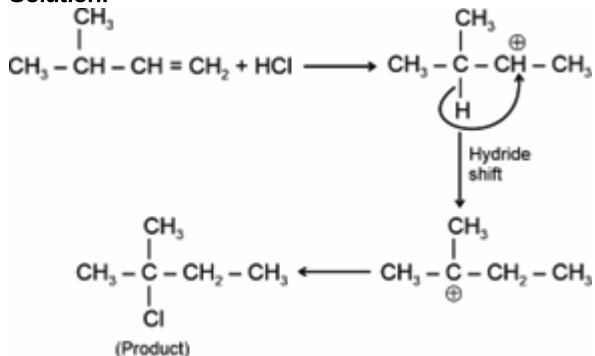
Solution:

This reaction is known as Wurtz-Fittig reactions.

(80) Answer : (2)

Solution:

(81) Answer : (3)

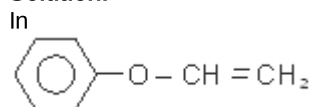
Solution:

(82) Answer : (4)

Solution:

Greater the stability of carbocation, greater will be its ease of formation from alkyl halide and faster will be the rate of reaction.

(83) Answer : (3)

Solution:

, both the C – O bonds have double bond characters so cannot be synthesised by Williamson's method.

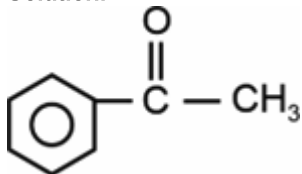
(84) Answer : (4)

Solution:

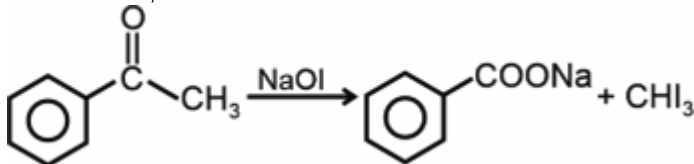
Acid which is stronger than carbonic acid will evolve CO_2 on reaction with NaHCO_3 . Picric acid is stronger acid than carbonic acid but phenol is weaker than carbonic acid.

(85) Answer : (2)

Solution:



reacts with 2, 4 DNP.



(86) Answer : (3)

Hint:

Electron withdrawing groups increase the acidity and decrease the pK_a values of the acids.

Solution:

–I effect order :

$-\text{CN} > -\text{F} > -\text{C}_6\text{H}_5$

• Acidic strength order:

(iv) > (i) > (ii) > (iii)

• pK_a value order:

(iii) > (ii) > (i) > (iv)

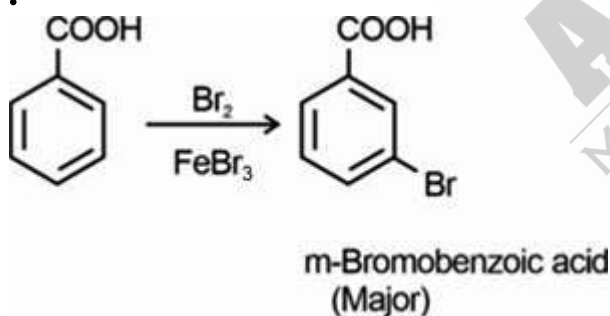
(87) Answer : (3)

Hint:

Carboxyl group is deactivating in nature.

Solution:

• Benzoic acid does not undergo Friedel-Crafts reaction because the carboxyl group is deactivating and the catalyst AlCl_3 [Lewis acid] gets bonded to the carboxyl group.

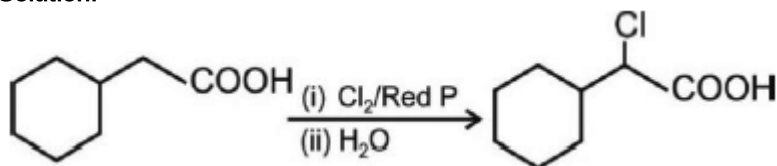


(88) Answer : (4)

Hint:

The given reaction is known as Hell Volhard Zelinsky reaction.

Solution:

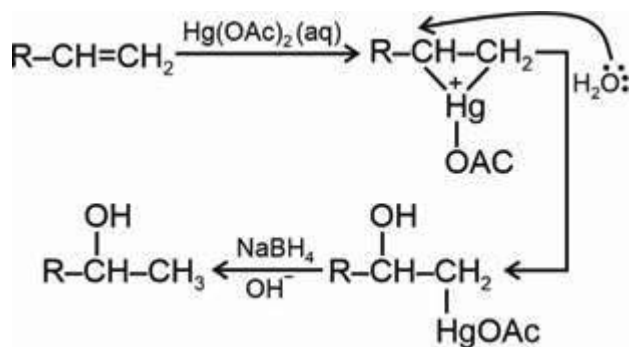


(89) Answer : (4)

Hint:

Oxymercuration – demercuration reaction converts alkene into alcohol in accordance with Markovnikov's rule but without rearrangement.

Solution:



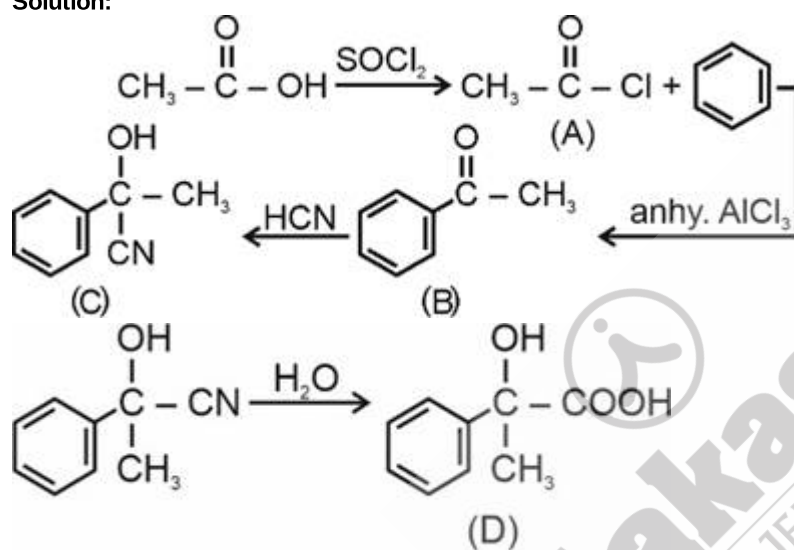
When R is Ph – CH₂ group

(90) Answer : (2)

Hint:

SOCl₂ is a chlorinating agent which converts $\text{--}\overset{\text{O}}{\parallel}\text{C--OH}$ group to $\text{--}\overset{\text{O}}{\parallel}\text{C--Cl}$ group.

Solution:



BOTANY

(91) Answer : (3)

Solution:

Whisky, brandy, rum and vodka are alcoholic beverages produced by distillation of fermented broth.

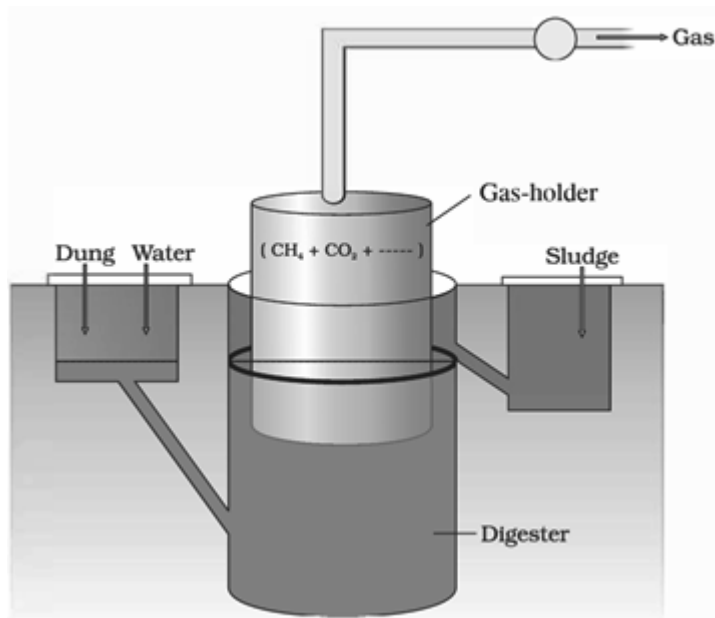
(92) Answer : (3)

Solution:

Lipases are used in detergent formulations and are helpful in removing oily stains from laundry. Lipases are obtained from *Candida lipolytica*.

(93) Answer : (3)

Solution:



A → Cattle dung is fed here with water which is rich in anaerobic bacteria like *Methanobacterium*.

B → Spent slurry is removed through this outlet.

C → Biogas is collected from gas outlet.

(94) Answer : (3)

Solution:

The concept of ecological niche was given by J. Grinnel. Niche represents the functional role of an organism.

(95) Answer : (4)

Solution:

Soil factors are also known as edaphic factors.

(96) Answer : (4)

Solution:

Some organisms like all birds and mammals and a very few lower vertebrate and invertebrate species are able to maintain homeostasis by physiological and behavioural means.

(97) Answer : (1)

Solution:

Statins are blood-cholesterol lowering agents, produced by the yeast - *Monascus purpureus*.

(98) Answer : (2)

Solution:

Antibiotic, penicillin was discovered while working on *Staphylococci* bacteria. Antibiotics are known to retard the growth of disease causing microbes.

(99) Answer : (4)

Solution:

Trichoderma species are free-living fungi, which are effective against various kinds of plant pathogens.

Bacillus thuringiensis is effective against butterfly caterpillars.

(100) Answer : (2)

Solution:

Ladybird beetles are useful in the control of aphids.

(101) Answer : (3)

Solution:

Immigration is known to be the most significant factor, contributing to population growth in a newly colonized habitat.

(102) Answer : (4)

Solution:

Xerophytes have sunkun stomata and thick cuticle on their leaf surface. Mammals from colder climate have shorter ears and limbs. Kangaroo rat is capable of meeting all its water requirement through internal fat oxidation.

(103) Answer : (2)

Solution:

A bell shaped age pyramid is shown by a stable or mature human population.

(104) Answer : (3)

Solution:

Parasites do not possess a digestive system as they directly derive nutrients from the host.

(105) Answer : (4)**Solution:**

Flocs are masses of bacteria associated with fungal filaments to form mesh like structure.

(106) Answer : (4)**Solution:**

Citric acid is commercially produced by *Aspergillus niger*.

(107) Answer : (1)**Solution:**

(i) Swiss Cheese – *Propionibacterium sharmanii*

(ii) Toddy – *Caryota urens*

(iii) Wine – *Saccharomyces*

(iv) Pectinases – *Aspergillus*

(108) Answer : (1)**Solution:**

| | Name of interaction | Species A | Species B |
|-----|---------------------|-----------|-----------|
| (a) | Amensalism | – | 0 |
| (b) | Parasitism | + | – |
| (c) | Commensalism | + | 0 |
| (d) | Competition | – | – |

(109) Answer : (2)**Solution:**

Diapause is a stage of suspended development found in many zooplankton species in lakes and ponds under unfavorable condition.

(110) Answer : (3)**Solution:**

During altitude sickness, body does not get enough oxygen. To compensate for low oxygen availability, body increases R.B.C. production, decreases binding affinity of haemoglobin to oxygen and increases breathing rate.

(111) Answer : (1)**Solution:**

Primary treatment of waste water includes sequential filtration and sedimentation.

All solids that settle during primary treatment of waste water form the primary sludge and the supernatant forms the primary effluent.

(112) Answer : (3)**Hint:**

Secondary treatment of sewage is a biological treatment.

Solution:

Removal of toxic substances and pathogens is done after secondary treatment of sewage by the physico-chemical process.

(113) Answer : (1)**Solution:**

'C' represents partial regulators that behave as regulators only upto certain range, thereafter they are conformers.

(114) Answer : (1)**Solution:**

Removal of small and large particles and floating debris from sewage is done under primary treatment by filtration and sedimentation.

(115) Answer : (2)**Solution:**

Value of r is an important parameter to assess the impact of environmental resistance on population growth.

(116) Answer : (4)**Solution:**

Penicillin was discovered by Alexander Fleming while working on bacteria *Staphylococci*.

(117) Answer : (1)**Solution:**

Mean annual temperature in grassland ecosystem is more than that of arctic and alpine tundra.

(118) Answer : (2)**Hint:**

In population 'X' number of pre reproductive individuals is less than reproductive individuals which shows negative growth.

Solution:

Such population, is unstable and will decline with time and is represented by Urn-shaped age pyramid.

(119) Answer : (2)**Solution:**

1. Microbes play a major role in treating millions of gallons of waste water everyday across the globe.
2. This methodology has been practiced for more than a century now, in almost all parts of the world.

(120) Answer : (2)**Hint:**

Biogas plants are more often built in rural areas.

Solution:

The Ministry of Environment and Forests has initiated Ganga Action Plan and Yamuna Action Plan to save these major rivers of our country from pollution. The technology of biogas production was developed in India mainly due to the efforts of IARI and KVIC.

(121) Answer : (3)**Solution:**

Baculoviruses are excellent candidates for species - specific narrow spectrum insecticidal application.

(122) Answer : (2)**Solution:**

An efficient predator is prudent which does not allow prey to become extinct, rather keep its population in check.

(123) Answer : (3)**Hint:**

Based upon thermal tolerance, organisms are classified into stenothermal and eurythermal.

Solution:Stenothermal organisms cannot tolerate large temperature variation e.g., polar bears, lizards, *Abies*.

Eurythermal organisms can tolerate large changes in temperature e.g., most of the mammals and birds.

(124) Answer : (3)**Solution:**

Calotropis growing in abandoned fields produces highly poisonous cardiac glycosides and that is why you never see any cattle or goats browsing on this plant.

(125) Answer : (3)**Hint:**

Desert lizards lack physiological ability to cope with extreme temperature. They manage body temperature by behavioural means.

Solution:

Ozone layer of stratosphere absorbs UV-C and half of the UV-B radiations.

Vegetation in any area is determined by soil composition and topography.

In a biome, regional and local variations help in formation of wide variety of habitats.

(126) Answer : (2)**Solution:**

The formula to calculate the total population density is :

$$N_{(t+1)} = N_t + [(B+I) - (D+E)]$$

Initial tiger population = 30

New Births = 14

Deaths = 12

Emigration = 0

Immigration = 10

Total tigers = 42**(127) Answer : (4)****Solution:**

(i) Grass population cannot be determined by absolute counts.

(ii) Percentage cover is a relative method of determining population size.

(128) Answer : (2)**Hint:**

Biofertilisers are organisms that enrich the nutrient quality of soil.

Solution:*Anabaena*, *Azotobacter* and *Azospirillum* are employed as biofertiliser.*Bacillus thuringiensis* is a microbial biocontrol agent that can be introduced to control butterfly caterpillars.**(129) Answer : (3)****Solution:**

Methanogens are found in anaerobic sludge during sewage treatment.

(130) Answer : (4)**Solution:**

Biocontrol agents are non toxic, do not kill useful organisms and help in keeping pests at manageable levels.

(131) Answer : (1)

Solution:

Major component of biogas is methane (50-70%) which is highly inflammable, other gases are carbon dioxide (30-40%) and mixture of other gases H_2 , H_2S etc. (10%).

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

Mean annual rainfall is highest in tropical rain forest.

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

In the South American lakes, visiting flamingoes and resident fishes compete for the same food *i.e.*, Zooplanktons.

(134) Answer : (1)**Hint:**

Herbivores are predators on plants.

Solution:

Competition is '–,–' relationship and is exemplified by *Balanus* and *Chathamalus*. Clown fish and sea anemone show commensalism. Sea anemone and hermit crab show protocooperation.

(135) Answer : (4)**Solution:**

(i) In interference competition, the feeding of one species is affected due to the inhibitory presence of the other.

(ii) Resources may not be limiting for competition to occur.

ZOOLOGY

(136) Answer : (3)**Solution:**

Collagen is a protein which is made up of different amino acids and is the most abundant protein in the animal world. RuBisCO is the most abundant protein in whole of the biosphere. Trypsin is an enzyme whereas insulin is a hormone.

(137) Answer : (2)**Solution:**

A heterocyclic ring has one or more atoms other than the carbon in its structure. Adenylic acid, ribose and uracil have heterocyclic ring(s) in their structure but cholesterol has only homocyclic rings in its structure.

(138) Answer : (3)**Solution:**

Proteins, lipids, nucleic acids and polysaccharides are found in the acid-insoluble fraction whereas amino acids, nucleosides, nucleotides, nitrogenous bases and monosaccharides are found in the acid-soluble fraction obtained upon chemical analysis of a living tissue. Inorganic compounds like sulphate, phosphate, etc., are also seen in the acid-soluble fraction.

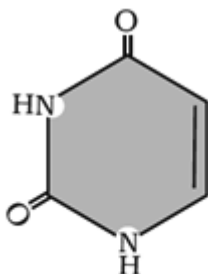
Nucleoside – Uridine

Polysaccharide – Chitin

Lipid – Palmitic acid

Monosaccharide – Glucose

Amino acid – Glutamic acid

(139) Answer : (3)**Solution:**

Uracil (Pyrimidine)

Uracil is a substituted pyrimidine. It is present in the RNA but not in the DNA.

Adenine and guanine are substituted purines. Purines are double ringed structures.

Cytosine and thymine are also substituted pyrimidines.

(140) Answer : (2)**Solution:**

Micromolecules have molecular weights ranging from 18 to around 800 Da approximately.

Molecular weight of lipids do not exceed 800 Da. They come under acid-insoluble fraction *i.e*, macromolecular fraction. They are not strictly macromolecules. They are arranged into structures like cell membrane and other membranes. When cell membranes of a living tissue break into pieces, they arrange themselves as vesicles. Vesicles are water-insoluble and therefore, are present in the retentate portion obtained upon chemical analysis of a living tissue.

(141) Answer : (1)

Solution:

| | |
|----------------------|--|
| Pigments | Carotenoids, Anthocyanins, <i>etc.</i> |
| Alkaloids | Morphine, Codeine, <i>etc.</i> |
| Terpenoides | Monoterpenes, Diterpenes <i>etc.</i> |
| Essential oils | Lemon grass oil, <i>etc.</i> |
| Toxins | Abrin, Ricin |
| Lectins | Concanavalin A |
| Drugs | Vinblastin, curcumin, <i>etc.</i> |
| Polymeric substances | Rubber, gums, cellulose |

(142) Answer : (4)

Solution:

Glycogen is a homopolymer of glucose and is a storage homopolysaccharide in animals. Inulin is a homopolymer of fructose and starch is a storage homopolysaccharide in plants. Cellulose is a structural polysaccharide in plants.

(143) Answer : (4)

Solution:

Frog mouth is wide anterior most opening leading to a spacious buccal cavity that leads to the oesophagus through pharynx. Food is captured by single, bilobed tongue.

(144) Answer : (3)

Hint:

Arachidic acid has 20 carbons

Solution:

Arachidonic acid has 20 carbon atoms including the carboxyl carbon. Stearic acid has 18 carbon atoms and Palmitic acid has 16 carbon atoms.

(145) Answer : (4)

Solution:

In neural tissues of humans, excitable cells called neurons are present. More than 50% of the neural tissue is formed by neuroglia. Neurons are the structural and functional units of neural tissue. Neural tissue exerts the greatest control over the body's responsiveness to changing conditions. Neurons can respond to stimulus but they do not produce them.

(146) Answer : (3)

Solution:

Compound epithelium is made up of more than one layer of cells and thus has a limited role in secretion and absorption. Its main function is to provide protection against chemical and mechanical stresses. It covers the dry surface of the skin, the moist surface of buccal cavity and pharynx.

Simple squamous epithelium is involved in the formation of diffusion boundary in blood vessels.

(147) Answer : (4)

Solution:

Spiracles are 10 pairs that are present on the lateral side of the body of cockroach.

(148) Answer : (3)

Solution:

Smooth muscles, cardiac muscles and epithelial tissue, they all have the presence of cell junctions in them.

Three types of cell junctions are found in epithelial and other tissues.

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

Cell junctions fuse the plasma membrane of cardiac muscle cells and make them stick together.

(149) Answer : (2)

Solution:

Not all the involuntary muscle fibres are unstriated. *Eg.* Cardiac muscle fibres.

Not all striated muscle fibres are voluntary. *E.g.* Cardiac muscle fibres.

Skeletal muscle fibres – Striated, voluntary

Smooth muscle fibres – Unstriated, involuntary

Cardiac muscle fibres – Striated, involuntary

(150) Answer : (3)

Solution:

The bone marrow of long bones in humans is the site of production of blood cells.

If bone marrow of a person got damaged then, bone marrow transplantation would be the best option.

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

When two molecules of deoxyribose (sugar present in our DNA) combine together, one water molecule is released. Molecular formula of 2-deoxyribose is $C_5H_{10}O_4$. Hence, $C_{15}H_{30}O_{12} - 2(H_2O)$ gives $C_{15}H_{26}O_{10}$.

(152) Answer : (2)**Hint:**

It helps in holding the female frog during copulation.

Solution:

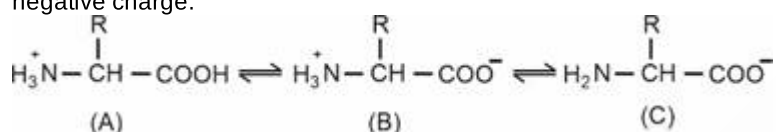
Webbed digits are found in both male and female frogs. Male frogs can be distinguished by the presence of sound producing vocal sacs and also a copulatory pad on the first digit of the fore limbs which are absent in female frogs.

(153) Answer : (3)**Solution:**

Blood vascular system of cockroach is open type. Blood vessels are poorly developed and open into space (haemocoel). Visceral organs located in the haemocoel are bathed in blood (haemolymph). The haemolymph is composed of colourless plasma and haemocytes without respiratory pigments.

(154) Answer : (4)**Solution:**

A particular property of amino acids is the ionizable nature of $-NH_2$ and $-COOH$ groups. Hence, in solutions of different pH, the structure of amino acids changes. These fully ionized species known as zwitterions have both a positive and a negative charge.



(B) is called zwitterionic form.

(155) Answer : (1)**Hint:**

Enzyme is half saturated.

Solution:

K_m value is the concentration of the substrate at which half of the active sites of the enzymes are occupied by the substrate.

K_m is the concentration of substrate at which half of the V_{max} is attained.

(156) Answer : (4)**Solution:**

Proteins which contain single polypeptide subunit/chain show primary, secondary and tertiary structure. Quaternary structure is the feature of only those proteins which have more than one polypeptide or subunits.

(157) Answer : (3)**Solution:**

On an average, a female cockroach produces 9-10 oothecae, each containing 14-16 eggs.

(158) Answer : (4)**Solution:**

Serine is an alcoholic amino acid.

$-SH \Rightarrow$ Cysteine

$-H \Rightarrow$ Glycine

$-CH_3 \Rightarrow$ Alanine

(159) Answer : (4)**Solution:**

A nucleic acid containing 2-deoxyribose is called deoxyribonucleic acid (DNA) while that which contains ribose is called ribonucleic acid (RNA). Hexose sugars are not found in nucleic acids.

(160) Answer : (3)**Solution:**

When a neuron is suitably stimulated, an electrical disturbance is generated which swiftly travels along its plasma membrane. Impulse travels away from dendrites, towards axon.

(161) Answer : (2)**Solution:**

The cloaca is a small, median chamber that is used to pass faecal matter, urine and sperms to the exterior in male frogs.

(162) Answer : (1)**Solution:****Hint:** A = T

Sol.: In a DNA molecule, A and G of one strand compulsorily base pair with T and C respectively, on the other strand. There are two hydrogen bonds between A and T and three hydrogen bonds between G and C.

(163) Answer : (1)**Solution:**

Each adipocyte contains a large droplet of fat that almost fills it. Macrophages are phagocytic cells, mast cells are involved in inflammation and fibroblasts secrete fibres.

(164) Answer : (1)**Solution:**

A competitive inhibitor increases the apparent K_m for a given substrate which means that in presence of a competitive inhibitor more substrate is needed to achieve $\frac{1}{2} V_{max}$.

(165) Answer : (2)**Solution:**

Tendons attach skeletal muscles to bones, whereas ligaments attach one bone to another.

Tendons are classified as dense regular connective tissue in which the fibres and fibroblasts are compactly packed and the collagen fibres are present in rows between many parallel bundles of fibres.

Loose connective tissue has cells and fibres loosely arranged in a semi-fluid ground substance.

(166) Answer : (4)**Solution:**

The lymphatic system of frogs consists of lymph, lymph node and lymph channels.

(167) Answer : (4)**Hint:**

Glycosidic bond is present in between sugar and nitrogen base in the structure of DNA

Solution:

Cellulose is a carbohydrate. It is a linear polymer of glucose molecules which are joined to each other *via* glycosidic bonds.

In a nucleotide (cytidylic acid), glycosidic bond is formed between C1 of pentose sugar and N9 of purines or N1 of pyrimidines.

(168) Answer : (4)**Solution:**

An enzyme like any other protein molecule has primary, secondary and tertiary structure. At a tertiary structure, the backbone of the protein chain folds upon itself, the chain criss-crosses itself and hence, many crevices or pockets are made. One such pocket is the active site. An enzyme through its active site catalyses chemical reactions at high rate.

(169) Answer : (3)**Solution:**

A general rule of thumb is that rate doubles or decreases by half for every 10°C change in either direction from optimum temperature.

Hence, upon lowering of temperature from 40°C to 30°C , change in the rate of reaction would be from Y to $Y/2$.

(170) Answer : (1)**Solution:**

Given graph represents the chemical reaction which is an exothermic reaction. If product is at a lower level than substrate in terms of energy, the reaction is an exothermic reaction.

Enzymes eventually bring down the activation energy barrier making the transition of 'S' to 'P' more easily.

Stability and energy status of a molecule are inversely proportional to each other. Transition state is a high energy state with low stability.

(171) Answer : (3)**Hint:**

Malpighian tubules

Solution:

A ring of 6-8 blind tubules called hepatic or gastric caeca is present at the junction of foregut and midgut, which secrete digestive juice.

At the junction of midgut and hindgut is present 100-150 yellow coloured thin filamentous structures called Malpighian tubules.

(172) Answer : (2)**Solution:**

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

Class I – Oxidoreductases/dehydrogenases

Class II – Transferases

Class III – Hydrolases

Class IV – Lyases

Class V – Isomerases

Class VI – Ligases

(173) Answer : (3)**Hint:**

Ootheca

Solution:

Malpighian tubules, urecose glands, nephrocytes and fat body are associated with excretion in cockroach. Collateral glands are associated with female reproductive system in cockroach.

(174) Answer : (1)

Solution:

With the increase in substrate concentration, the velocity of the enzymatic reaction rises at first. The reaction ultimately reaches a V_{\max} which is not exceeded by any further rise in the concentration of the substrate. This is because, all the enzyme molecules are fully saturated with substrate.

(175) Answer : (4)

Solution:

Connective tissues are the most abundant and widely distributed tissues in the body of complex animals.

They are named connective tissue because of their special function of linking and supporting other tissues/organs of the body.

In all connective tissues except blood, the cells secrete fibres of structural proteins called collagen or elastin. These fibres provide strength, elasticity and flexibility to the tissues; they are not excitable.

(176) Answer : (4)

Solution:

Bones have a hard and non-pliable ground substance rich in calcium salts and collagen fibres which give bone its strength. The bone cells (osteocytes) are present in the spaces called lacunae. Limb bones, such as the long bones of the legs, serve weight-bearing functions. The bone marrow in some bones is the site of production of blood cells. The matrix of bones occurs in the form of concentric lamellae.

(177) Answer : (1)

Solution:

Smooth muscle fibres – Walls of internal organs like blood vessels, stomach and intestine

Skeletal muscle fibres – Biceps

Cardiac muscle fibres – Heart

(178) Answer : (3)

Solution:

Primary metabolites take part in normal physiological processes.

(179) Answer : (3)

Solution:

In all connective tissues except blood, the cells secrete fibres of structural proteins called collagen or elastin. These cells also secrete modified polysaccharides, which accumulate between cells and fibres and act as ground substance. Fibroblasts are the cells which secrete fibres.

Mast cells release histamine and serotonin in allergic conditions. Macrophages are phagocytes and leucocytes are WBCs.

(180) Answer : (1)

Solution:

Genital pouch in male cockroach is bounded dorsally by 9th and 10th terga and ventrally by 9th sternum.