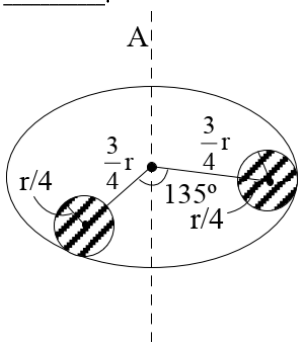
Jupiter Academy

Subjects : Physics , Chemistry , Biology | Full mock test 01 (Solutions) | Date : 24-03-2026 | Hours : 3 Hours

Total Marks : 720

Physics

1. Suppose there is a uniform circular disc of mass M kg and radius r m shown in figure. The shaded regions are cut out from the disc. The moment of inertia of the remainder about the axis A of the disc is given by $\frac{x}{256}Mr^2$. The value of x is _____.



A) 100 **B)** 109 **C)** 128 **D)** 156

Solution : (Correct Answer: B)

$M = \sigma\pi R^2$

$\sigma\pi R^2 = 16m$

$m = \frac{\sigma\pi R^2}{16}$

$I_{\text{system}} = \frac{MR^2}{2} - 2\left(\frac{mR^2}{2\times16} + \frac{9mR^2}{16}\right)$

$= \frac{MR^2}{2} - 2\times\frac{19mR^2}{32}$

$= \frac{MR^2}{2} - \frac{19}{16}mR^2$

$= \frac{MR^2}{2} - \frac{19}{256}MR^2$ becoz $m = \frac{M}{16}$

$= \frac{(128-19)(MR^2)}{256}$

$= \frac{109MR^2}{256}$

2. In a hydrogen like ion, the energy difference between the 2^{nd} excitation energy state and ground is 108.8 eV. The atomic number of the ion is

A) 4 **B)** 2 **C)** 1 **D)** 3

Solution : (Correct Answer: D)

$\Delta E = 13.6z^2\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$(13.6)z^2\left[\frac{1}{1} - \frac{1}{9}\right] = 108.8$

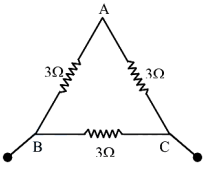
$\frac{(13.6)(8)}{9}(z^2) = 108.8$

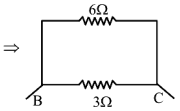
$z = 3$

3. A wire of resistance 9Ω is bent to form an equilateral triangle. Then the equivalent resistance across any two vertices will be ____ ohm.

A) 4 **B)** 6 **C)** 8 **D)** 2

Solution : (Correct Answer: D)





9Ω is the resistance of whole wire

$\therefore$ resistance of each wire $= 3\Omega$.

$\therefore$ Equivalent resistance $= 2\Omega$

4. In a transistor $(\beta = 50)$, the voltage across $5\ k\Omega$ load resistance in collector circuit is $5\ V$. The base current is ..... mA

A) 0.02 **B)** 0.03 **C)** 0.08 **D)** 0.09

Solution : (Correct Answer: A)

(a)

$\beta = \frac{I_C}{I_B}, I_C = \frac{5}{50\times10^3}$

$I_B = \frac{I_C}{\beta}$

5. The activity of a radioactive sample is $1.6\ curie$ and its half-life is $2.5\ days$. Its activity after $10\ days$ will be ..... $curie$

A) 0.8 **B)** 0.4 **C)** 0.1 **D)** 0.16

Solution : (Correct Answer: C)

(c) Number of half lives $n = \frac{10}{2.5} = 4$

==> $\frac{A}{A_0} = \frac{N}{N_0} = \left(\frac{1}{2}\right)^n$

$\Rightarrow A = 1.6\times\left(\frac{1}{2}\right)^4 = 0.1\ curie$

6. The photoelectric work function for a metal surface is $4.125\ eV$. The cut-off wavelength for this surface is ..... $\mathring{A}$

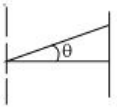
A) 4125 **B)** 2062.5 **C)** 3000 **D)** 6000

Solution : (Correct Answer: C)

(c) $W.(eV) = \frac{12375}{\lambda_0(\mathring{A})}$

$\Rightarrow \lambda_0 = \frac{12375}{4.125} = 3000\mathring{A}$

7. Two slits are separated by $0.3\ mm$. A beam of $500\ nm$ light strikes the slits producing an interference pattern. The number of maxima observed in the angular range $-30^o < \theta < 30^o$.



A) 300 **B)** 150 **C)** 599 **D)** 149

Solution : (Correct Answer: C)

Given info: The two slits are separated by a distance of 0.3mm and the

wavelength of beam is 500nm.

The diagram is shown as

Consider there are n fringes (bright and dark) of width x on one side of the central bright.

The formula to calculate the interference is as,

$d\sin\theta = n\lambda(1)$

Here,

n is the order.

λ is the wavelength.

d is the separation between the slits.

Rearrange the above formula to find n

$d\sin\theta = n\lambda$

$n = \frac{d\sin\theta}{\lambda}$

Substitute 0.3nm for $d, 30^\circ$ for $\theta, 500\text{nm}$ for λ in the above formula as,

$n = \frac{d\sin\theta}{\lambda}$

$= \frac{\left(0.3\text{nm}\times\frac{10^{-3}\text{m}}{1\text{mm}}\right)\sin 30^\circ}{\left(500\text{nm}\times\frac{10^{-9}\text{m}}{1\text{mm}}\right)}$

$= \frac{\left(0.30\text{nm}\times\frac{10^{-3}\text{m}}{1\text{mm}}\right)}{2\left(500\text{nm}\times\frac{10^{-9}\text{m}}{1\text{nm}}\right)}$

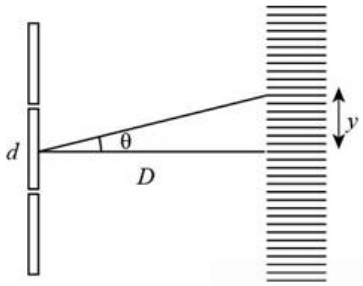
$= 299.5$

The approximate value of n is 299.5.

The maxima are used for bright fringe and minima for dark fringe. Thus, the total number of fringes (bright and dark) in the angular separation from -30° to 30° is 2×299.5 that is 599 .

Conclusion:

Therefore, the number of maxima observed in the angular range $-30.0^\circ < \theta < 30.0^\circ$ is 599



8. The radii of curvature of the faces of a double convex lens are $10\ cm$ and $15\ cm$. Its focal length is $12\ cm$. What is the refractive index of glass

A) 1.33 **B)** 1.5 **C)** 1.4 **D)** 2

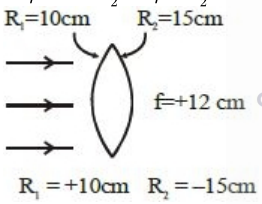
Solution : (Correct Answer: B)

$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

$\frac{1}{12} = (\mu - 1)\left[\frac{1}{+10} - \frac{1}{-15}\right]$

$\Rightarrow \frac{1}{12} = (\mu - 1)\left(\frac{3+2}{30}\right) \Rightarrow \frac{1}{2} = (\mu - 1)\left(\frac{5}{5}\right)$

$\Rightarrow \mu - 1 = \frac{1}{2} \Rightarrow \mu = \frac{3}{2} = 1.5$



9. Electromagnetic wave consists of periodically oscillating electric and magnetic vectors

A) in mutually perpendicular planes but vibrating with a phase difference of π

B) in mutually perpendicular planes but vibrating with a phase difference of $\frac{\pi}{2}$

C) in randomly oriented planes but vibrating in phase

D) in mutually perpendicular planes but vibrating in phase

Solution : (Correct Answer: D)

Electromagnetic wave consists of periodically oscillating electric and magnetic vectors in mutually perpendicular planes but vibrating in phase.

10. In a ac circuit of capacitance the current from potential is

A) Forward

B) Backward

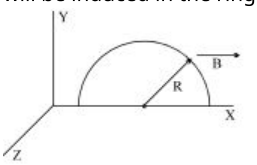
C) Both are in the same phase

D) None of these

Solution : (Correct Answer: A)

(a)

11. A semicircle conducting ring of radius R is placed in the xy plane, as shown in the figure. A uniform magnetic field is set up along the x -axis. No emf, will be induced in the ring. if



A) it moves along the x -axis

B) it moves along the y -axis

C) it moves along the z -axis

D) All of the above

Solution : (Correct Answer: D)

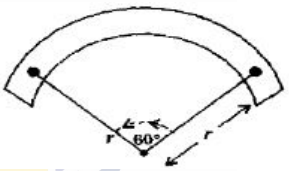
emf induced (by lenz's law)

$E = \frac{-d\phi}{dt}$

$E = \frac{-d}{dt}(BA) = -B\frac{d}{dt}(A) - A\frac{d}{dt}(B)$

either magnetic field or area must be changed w.r.t. time to generate emf, and here the magnetic field and plane of ring are parallel thus no emf induced in either situation.

12. A bar magnet of length $'l'$ and magnetic dipole moment $'M'$ is bent in the form of an arc as shown in figure. The new magnetic dipole moment will be



A) M **B)** $\frac{3}{\pi}M$ **C)** $\frac{2}{\pi}M$ **D)** $\frac{M}{2}$

Solution : (Correct Answer: B)

Let m be strength of each pole of bar magnet of length l. Then

$M = m \times l$.....(i)

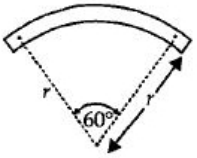
When the bar magnet is bent in the form of an arc as shown in figure Then

$l = \frac{\pi}{3} \times r = \frac{\pi r}{3}$

or $r = \frac{3l}{\pi}$

New magnetic dipole moment $M' = m \times 2r\sin 30^\circ$

$= m \times 2 \times \frac{3l}{\pi} \times \frac{1}{2} = \frac{3ml}{\pi} = \frac{3M}{\pi}$ (Using (i))



13. Which of the following particle will experience maximum acceleration when projected with same speed in transverse magnetic field

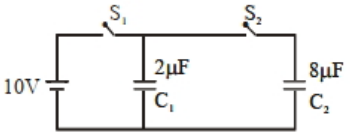
A) He^{+2} **B)** H^+

C) Be^{+2} **D)** Li^+

Solution : (Correct Answer: B)

$a = \frac{F_m}{m} = q\frac{v}{m}B\sin 90^o \Rightarrow a \propto \frac{q}{m}$

14. A $2\ \mu F$ capacitor C_1 is first charged to a potential difference of $10\ V$ using a battery.Then the battery is removed and the capacitor is connected to an uncharged capacitor C_2 of $8\ \mu F$. The charge in C_2 on equilibrium condition is ... μC. (Round off to the Nearest Integer)



A) 9 **B)** 25 **C)** 20 **D)** 16

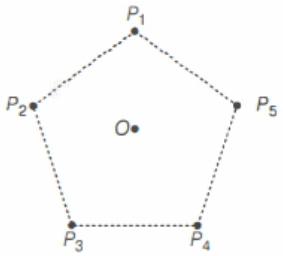
Solution : (Correct Answer: D)

$20 = (C_1 + C_2)\,V \Rightarrow V = 2\,volt$

$Q_2 = C_2 V = 16\,\mu C$

$= 16$

15. 5 charges each of magnitude $10^{-5}\ C$ and mass $1\ kg$ are placed (fixed) symmetrically about a movable central charge of magnitude $5 \times 10^{-5}\ C$ and mass $0.5\ kg$ as shown in the figure given below. The charge at P_1 is removed. The acceleration of the central charge is [Given, $OP_1 = OP_2 = OP_3 = OP_4 = OP_5 = 1m, \frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$]



A) $9\,ms^{-2}$ upwards
B) $9\,ms^{-2}$ downwards
C) $4.5\,ms^{-2}$ upwards
D) $4.5\,ms^{-2}$ downwards

Solution : (Correct Answer: C)

Forces on charge at point O initially balances each other as it is given that acceleration occurs when charge at point P_1 is removed. This means resultant of force due to charges at points P_2, P_3, P_4 and P_5 is equal and opposite to force due to at point P_1.

Hence, acceleration of charge at point O is directed along OP_1.

Acceleration $= \frac{F}{m}$

$= \frac{(\frac{Kq_1q_2}{r^2})}{m}$

$= \frac{9\times10^9\times10^{-5}\times5\times10^{-5}}{(1)^2\times1}$

$= 4.5\,ms^{-2}$

16. A whistle sends out 256 waves in a second. If the whistle approaches the observer with velocity $\frac{1}{3}$ of the velocity of sound in air, the number of waves per second the observer will receive

A) 384 **B)** 192 **C)** 300 **D)** 200

Solution : (Correct Answer: A)

(a) Wave number = $\frac{1}{\lambda}$ but $\frac{1}{\lambda'} = \frac{1}{\lambda}\left(\frac{v}{v-v_s}\right)$ and $v_s = \frac{v}{3}$

$\therefore (W.N.)' = (W.N.)\left(\frac{v}{v-v/3}\right) = 256 \times \frac{v}{2v/3}$

$= \frac{3}{2} \times 256 = 384$

17. Two particles A and B of equal masses are suspended from two massless springs of spring constants K_1 and K_2 respectively.If the maximum velocities during oscillations are equal, the ratio of the amplitude of A and B is

A) $\frac{K_2}{K_1}$ **B)** $\frac{K_1}{K_2}$
C) $\sqrt{\frac{K_1}{K_2}}$ **D)** $\sqrt{\frac{K_2}{K_1}}$

Solution : (Correct Answer: D)

$A_1\omega_1 = A_2\omega_2$

$A_1\sqrt{\frac{k_1}{m}} = A_2\sqrt{\frac{k_2}{m}}$

$\frac{A_1}{A_2} = \sqrt{\frac{k_2}{k_1}}$

18. A triatomic, diatomic and monatomic gas is supplied same amount of heat at constant pressure, then

A) Fractional energy used to change internal energy is maximum in monatomic gas
B) Fractional energy used to change internal energy is maximum in diatomic gas
C) Fractional energy used to change internal energy is maximum in triatomic gases
D) Fractional energy used to change internal energy is same in all the three gases

Solution : (Correct Answer: C)

(c)

$\frac{\Delta U}{\Delta Q} = \frac{nC_V\Delta T}{nC_P\Delta T} = \frac{C_V}{C_P} = \frac{1}{\gamma}$

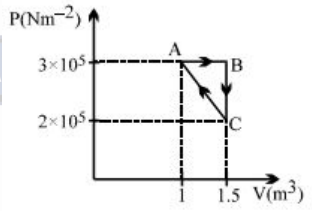
$\left(\frac{\Delta U}{\Delta Q}\right)_{\text{mono}} = \frac{1}{\gamma_{\text{mono}}} = \frac{3}{5}$

$\left(\frac{\Delta U}{\Delta Q}\right)_{\text{dia}} = \frac{1}{\gamma_{\text{dia}}} = \frac{5}{7}$

$\left(\frac{\Delta U}{\Delta Q}\right)_{\text{tria}} = \frac{1}{\gamma_{\text{tria}}} = \frac{3}{4}$

Fractional energy used to change internal energy is maximum in Triatomic gas.

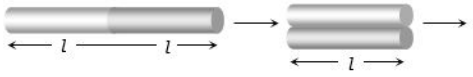
19. Considere the thermodynamics cycle shown on PV diagram. The process $A \to B$ is isobaric, $B \to C$ is isochoric and $C \to A$ is a straight line process. The following internal energy and heat are given : $\Delta U_{A\to B} = +400\ kJ$ and $Q_{B\to C} = -500\ kJ$ The heat flow in the process $Q_{C\to A}$ is ..... kJ



A) -20 **B)** $+25$
C) -25 **D)** Data are insufficient

Solution : (Correct Answer: C)

20. Two rods of same length and material transfer a given amount of heat in 12 seconds, when they are joined end to end. But when they are joined lengthwise, then they will transfer same heat in same conditions in ..... sec



A) 24 **B)** 3 **C)** 1.5 **D)** 48

Solution : (Correct Answer: D)

Let the heat transferred be Q .

When rods are joined end to end. Heat transferred by each rod $= Q = \frac{K2A\Delta\theta}{l} \times 12$ .....(i)

When rods are joined lengthwise, $Q = \frac{KA\Delta\theta}{2l}t$ ....(ii)

From equation (i) and (ii) we get $t = 48\ s$

21. If $1\ g$ of steam is mixed with $1\ g$ of ice, then the resultant temperature of the mixture is ..... ^oC

A) 100 **B)** 50 **C)** 230 **D)** 270

Solution : (Correct Answer: A)

ice $1\text{gm}0^{\circ}\text{C}$

Heat gain $= 1 \times 80 + 1 \times 1 \times (100 - 0)$

$= 180\text{cal}$

Heat loss $= 1 \times 540 = 540\text{cal}$

(means complete steam won't convert to water at 100°C)

22. A glass flask is filled up to a mark with $50\ cc$ of mercury at $18\ ^{\circ}C$. If the flask and contents are heated to $38^{\circ}C$. ..... cc mercury will be above the mark ? (α for glass is $9 \times 10^{-6^{\circ}}C^{-1}$ and coefficient of real expansion of mercury is $180 \times 10^{-6^{\circ}}C^{-1}$)

A) 0.85 **B)** 0.46 **C)** 0.15 **D)** 0.05

Solution : (Correct Answer: C)

(c) Due to volume expansion of both mercury and flask, the change in volume of mercury relative to flask is given by

$\Delta V = V_0[\gamma_L - \gamma_g]\Delta\theta = V[\gamma_m - 3\alpha_g]\Delta\theta$

$= 50\,[180 \times 10^{-6} - 3 \times 9 \times 10^{-6}]\,(38 - 18) = 0.153\,cc$

23. In a capillary tube, water rises by $1.2\ mm$. The height of water that will rise in another capillary tube having half the radius of the first, is ..... mm

A) 1.2 **B)** 2.4 **C)** 0.6 **D)** 0.4

Solution : (Correct Answer: B)

(b) $h \propto \frac{1}{r}$

$r_1h_1 = r_2h_2 \Rightarrow h_2 = \frac{r_1h_1}{r_2} = 2.4\ mm$

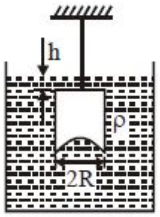
24. If the surface tension of a liquid is T, the gain in surface energy for an increase in liquid surface by A is

A) AT^{-1} **B)** AT
C) A^2T **D)** A^2T^2

Solution : (Correct Answer: B)

(b) Surface energy = surface tension $\times$ increment in area = $T \times A$

25. A hemispherical portion of radius R is removed from the bottom of a cylinder of radius R. The volume of the remaining cylinder is V and mass M. It is suspended by a string in a liquid of density ρ, where it stays vertical. The upper surface of cylinder is at a depth h below the liquid surface. The force on the bottom of the cylinder by the liquid is



A) $\rho g(V + \pi R^2)$ **B)** Mg
C) $Mg - V\rho g$ **D)** $\rho g(V + \pi R^2 h)$

Solution : (Correct Answer: D)

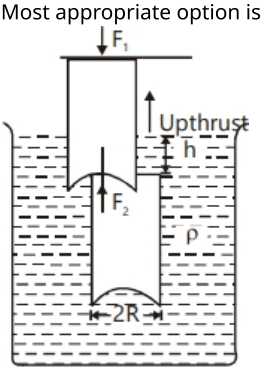
$\text{F}_2 - \text{F}_1 = \text{upthrust}$

$\therefore \text{F}_2 = \text{F}_1 + \text{upthrust}$

$\text{F}_2 = (\text{p}_0 + \rho\text{gh})\,\pi\text{R}^2 + v\rho g$

$= \text{p}_0\pi\text{R}^2 + \rho\text{g}\,(\pi\text{R}^2\text{h} + \text{V})$

Most appropriate option is (D).



26. A tank $5\ m$ high is half-filled with water and then is filled to the top with oil of density $0.85\ g/cm^3$. The pressure at the bottom of the tank, due to these liquids is ..... $g\ dyne/cm^2$

A) 1.85 **B)** 89.25 **C)** 462.5 **D)** 500

Solution : (Correct Answer: C)

Pressure at the bottom $\text{P} = (\text{h}_1\text{d}_1 + \text{h}_2\text{d}_2)\,\frac{\text{g}}{\text{cm}^2}$

$= [250 \times 1 + 250 \times 0.85] = 250[1.85]g$

$= 462.5\text{g}\ dyne/cm^2$

27. Given below are two statements: one is labelled as Assertion(A) and the other is labelled as Reason (R).

Assertion (A) : In Vernier calliper if positive zero error exists, then while taking measurements, the reading taken will be more than the actual reading.

Reason (R) : The zero error in Vernier Calliper might have happened due to manufacturing defect or due to rough handling.

In the light of the above statements, choose the correct answer from the options given below :

A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
C) (A) is true but (R) is false
D) (A) is false but (R) is true

Solution : (Correct Answer: B)

Assertion Reason both are correct Theory

28. Two exactly similar wires of steel and copper are stretched by equal forces. If the difference in their elongations is 0.5 cm, the elongation (l) of each wire is $Y_s(\text{steel}) = 2.0 \times 10^{11}\ N/m^2 Y_c(\text{copper}) = 1.2 \times 10^{11}\ N/m^2$

A) $l_s = 0.75\,cm,\ l_c = 1.25\,cm$
B) $l_s = 1.25\,cm,\ l_c = 0.75\,cm$
C) $l_s = 0.25\,cm,\ l_c = 0.75\,cm$
D) $l_s = 0.75\,cm,\ l_c = 0.25\,cm$

Solution : (Correct Answer: A)

(a) $l \propto \frac{1}{Y} \Rightarrow \frac{Y_s}{Y_c} = \frac{l_c}{l_s} \Rightarrow \frac{l_c}{l_s} = \frac{2\times10^{11}}{1.2\times10^{11}} = \frac{5}{3}$...(i)

Also $l_c - l_s = 0.5$...(ii)

On solving (i) and (ii) $l_c = 1.25\ cm$ and $l_s = 0.75\ cm$.

29. Consider a planet in some solar system which has a mass double the mass of earth and density equal to the average density of earth. If the weight of an object on earth is W, then weight of the same object on that planet will be

A) $\sqrt{2}\,W$ **B)** $2\,W$
C) W **D)** $2^{\frac{1}{3}}\,W$

Solution : (Correct Answer: D)

Since the density of planet is same as that of earth.

$\rho_p = \rho_e$

$\Rightarrow \frac{M_p}{\frac{4}{3}}\pi R_p^3 = \frac{M_e}{\frac{4}{3}}$

πR_e^3

$\Rightarrow \frac{R_p}{R_e} = \left(\frac{M_p}{M_e}\right)^{1/3}$

The value of gravitational acceleration $= g = \frac{GM}{R^2}$

$\Rightarrow \frac{W_p}{W_e} = \frac{mg_p}{mg_e}$

$\Rightarrow \frac{g_p}{g_e} = \frac{M_p}{M_e}\frac{R_e^2}{R_p^2}$

$= \frac{M_p}{M_e}\left(\frac{M_e}{M_p}\right)^{2/3} = \left(\frac{M_p}{M_e}\right)^{1/3} = 2^{1/3}$

$\Rightarrow W_p = 2^{1/3}\, W$

30. Two identical satellites are at R and $7R$ away from earth surface, the wrong statement is (R = Radius of earth)

A) Ratio of total energy will be 4
B) Ratio of kinetic energies will be 4
C) Ratio of potential energies will be 4
D) Ratio of total energy will be 4 but ratio of potential and kinetic energies will be 2

Solution : (Correct Answer: D)

(d)Orbital radius of satellites $r_1 = R + R = 2R$

$r_2 = R + 7R = 8R$

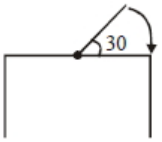
$U_1 = \frac{-GMm}{r_1}$ and $U_2 = \frac{-GMm}{r_2}$

$K_1 = \frac{GMm}{2r_1}$ and $K_2 = \frac{GMm}{2r_2}$

$E_1 = \frac{GMm}{2r_1}$ and $E_2 = \frac{GMm}{2r_2}$

$\frac{U_1}{U_2} = \frac{K_1}{K_2} = \frac{E_1}{E_2} = 4$

31. One end of a straight uniform 1 m long bar is pivoted on horizontal table. It is released from rest when it makes an angle 30° from the horizontal (see figure). Its angular speed when it hits the table is given as $\sqrt{\mathrm{n}}$ s^{-1}, where n is an integer. The value of n is



A) 10 **B)** 13 **C)** 15 **D)** 18

Solution : (Correct Answer: C)

From mechanical energy conservation,

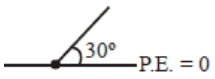
$\mathrm{U_i} + \mathrm{K_i} = \mathrm{U_f} + \mathrm{K_r}$

$\Rightarrow \mathrm{mg}\frac{\ell}{2}\sin 30^\circ + 0 = 0 + \frac{1}{2}\mathrm{I}\omega^2$

$\Rightarrow \mathrm{mg} \times \frac{1}{2} \times \frac{1}{2} + 0 = 0 + \frac{1}{2} \times \frac{\mathrm{m}(1)^2}{3}\omega^2$

$\Rightarrow \omega^2 = \frac{3\mathrm{g}}{2} \Rightarrow \omega = \sqrt{15}$

$\therefore n = 15$



32. A body of mass $5\ kg$ strikes another body of mass $2.5\ kg$ initially at rest. The bodies after collision coalesce and begin to move as a whole with a kinetic energy of $5\ J$. The kinetic energy of the first body before collision is ..... J

A) 7.5 **B)** 5 **C)** 2.5 **D)** 10

Solution : (Correct Answer: A)

$5u + 0 = (5 + 2.5)v$

$\mathrm{v} = \frac{2}{3}\mathrm{u}$

$\mathrm{K} = \frac{1}{2} \times (5 + 2.5)\mathrm{v}^2 = 5 \Rightarrow \mathrm{u} = \sqrt{3}\mathrm{m/s}$

$\mathrm{K_i} = \frac{1}{2} \times 5 \times 3 = 7.5\mathrm{J}$

33. A particle of mass m is moving in a horizontal circle of radius r under a centripetal force equal to $-K/r^2$, where K is a constant. The total energy of the particle is

A) $\frac{K}{2r}$ **B)** $-\frac{K}{2r}$
C) $-\frac{K}{r}$ **D)** $\frac{K}{r}$

Solution : (Correct Answer: B)

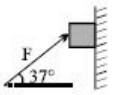
(b)Here $\frac{mv^2}{r} = \frac{K}{r^2}$

K.E.$= \frac{1}{2}mv^2 = \frac{K}{2r}$

$U = -\int_\infty^r F.dr = -\int_\infty^r \left(-\frac{K}{r^2}\right) dr = -\frac{K}{r}$

Total energy $E = \mathrm{K.E.} + \mathrm{P.E.} = \frac{K}{2r} - \frac{K}{r} = -\frac{K}{2r}$

34. A $1\ kg$ block is being pushed against a wall by a force $F = 75\ N$ as shown in the Figure. The coefficient of friction is 0.25. The magnitude of acceleration of the block is ..... m/s^2



A) 10 **B)** 20 **C)** 5 **D)** none

Solution : (Correct Answer: B)

$\mathrm{F}\sin 37^\circ - \mathrm{mg} - \mu\mathrm{F}\cos 37^\circ = \mathrm{ma}$

$\Rightarrow \mathrm{a} = 20\mathrm{m/s}^2$

35. A car turns a corner on a slippery road at a constant speed of $10\ m/s$. If the coefficient of friction is 0.5, the minimum radius of the arc in meter in which the car turns is

A) 20 **B)** 10 **C)** 5 **D)** 4

Solution : (Correct Answer: A)

(a)$v = \sqrt{\mu\, g\, r} \Rightarrow r = \frac{v^2}{\mu g} = \frac{100}{0.5 \times 10} = 20$

36. In a tug-of-war contest, two men pull on a horizontal rope from opposite sides. The winner will be the man who

A) exerts greater force on the rope
B) exerts greater force on the ground
C) exerts a force on the rope which is greater than the tension in the rope
D) makes a smaller angle with the vertical

Solution : (Correct Answer: B)

For the 'two men plus rope' system, the external forces are those exerted by the ground on the men, which, by the third law of motion, are equal to the forces they exert on the ground. The system will move in the direction of the greater external force.

37. An object with a mass $10\ kg$ moves at a constant velocity of $10\, m/sec$. A constant force then acts for $4\ second$ on the object and gives it a speed of $2\ m/sec$ in opposite direction, the force acting on the object is ..... N

A) 30 **B)** -30 **C)** 3 **D)** -3

Solution : (Correct Answer: B)

(b)$F = ma = 10 \times (-3) = -30\ N$

38. Two bodies are thrown up at angles of 45^o and 60^o, respectively, with the horizontal. If both bodies attain same vertical height, then the ratio of velocities with which these are thrown is

A) $\sqrt{\frac{2}{3}}$ **B)** $\frac{2}{\sqrt{3}}$
C) $\sqrt{\frac{3}{2}}$ **D)** $\frac{\sqrt{3}}{2}$

Solution : (Correct Answer: C)

$\mathrm{H_{max}} = \frac{\mathrm{u}^2\sin^2\theta}{2\mathrm{g}}$

According to problem

$\frac{\mathrm{u_1}^2\sin^2 45^\circ}{2\mathrm{g}} = \frac{\mathrm{u_2}^2\sin^2 60^\circ}{2\mathrm{g}}$

$\Rightarrow \frac{\mathrm{u_1}^2}{\mathrm{u_2}^2} = \frac{\sin^2 60^\circ}{\sin^2 45^\circ} \Rightarrow \frac{\mathrm{u_1}}{\mathrm{u_2}} = \frac{\sqrt{3}/2}{1/\sqrt{2}} = \sqrt{\frac{3}{2}}$

39. A horizontal curve on a racing track is banked at a 45^o angle. When a vehicle goes around this curve at the curve's safe speed (no friction needed to stay on the track), what is its centripetal acceleration?

A) g **B)** $2g$ **C)** $0.5g$ **D)** none

Solution : (Correct Answer: A)

40. If two vectors $\vec{P} = \hat{i} + 2m\hat{j} + m\hat{k}$ and $\vec{Q} = 4\hat{i} - 2\hat{j} + mk$ are perpendicular to each other. Then, the value of m will be :

A) 1 **B)** -1 **C)** -3 **D)** 2

Solution : (Correct Answer: D)

$\vec{P} \cdot \vec{Q} = 0$

$(\hat{i} + 2m\hat{j} + m\hat{k}) \cdot (4\hat{i} - 2\hat{j} + m\hat{k}) = 0$

$\Rightarrow 4 - 4m + m^2 = 0$

$\Rightarrow (m-2)^2 = 0 \Rightarrow m = 2$

41. Which of the following is independent of the choice of co-ordinate system

A) $\vec{P} + \vec{Q} + \vec{R}$ **B)** $(P_x + Q_x + R_x)\hat{i}$

C) $P_x\hat{i} + Q_y\hat{j} + R_z\hat{k}$ **D)** None of these

Solution : (Correct Answer: A)

as a vector, its magnitude, and the angle between two vectors do not depend on the choice of the orientation of the coordinates axes.

42. A particle is projected with velocity v_0 along $x-$ axis. A damping force is acting on the particle which is proportional to the square of the distance from the origin i.e., $ma = -\alpha x^2$. The distance at which the particle stops:

A) $\left(\frac{3v_0^2}{2\alpha}\right)^{\frac{1}{2}}$ **B)** $\left(\frac{2v_0}{3\alpha}\right)^{\frac{1}{2}}$

C) $\left(\frac{2v_0^2}{3\alpha}\right)^{\frac{1}{2}}$ **D)** $\left(\frac{3v_0^2}{2\alpha}\right)^{\frac{1}{3}}$

Solution : (Correct Answer: D)

$F = -\alpha x^2$

$ma = -\alpha x^2$

$a = \frac{-\alpha x^2}{m}$

$\frac{vdv}{dx} = -\frac{\alpha}{m}x^2$

$\int_{v_0}^{0} vdv = \int_0^x -\frac{\alpha}{m}x^2 dx$

$\left(\frac{v^2}{2}\right)^0 = -\frac{\alpha}{m}\left(\frac{x^3}{3}\right)_0^x$

$\frac{-v_0^2}{2} = -\frac{\alpha}{m}\frac{x^3}{3}$

$x = \left(\frac{3mv_0^2}{2\alpha}\right)^{\frac{1}{3}}$

43. A ball is dropped downwards. After 1 second another ball is dropped downwards from the same point. What is the distance between them after $3\,seconds$.....m

A) 25 **B)** 20 **C)** 50 **D)** 9.8

Solution : (Correct Answer: A)

(a) Distance between the balls = Distance travelled by first ball in 3 seconds -Distance travelled by second ball in 2 seconds $= \frac{1}{2}g\,(3)^2 - \frac{1}{2}g\,(2)^2 = 45 - 20 = 25\ m$

44. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : Product of Pressure (P) and time (t) has the same dimension as that of coefficient of viscosity.

Reason R : Coefficient of viscosity $= \frac{\text{Force}}{\text{Velocity gradient}}$

Question : Choose the correct answer from the options given below

A) Both A and R true, and R is correct explanation of A

B) Both A and R are true but R is NOT the correct explanation of A.

C) A is true but R is false.

D) A is false but R is true.

Solution : (Correct Answer: C)

Pressure and time

$P : \frac{N}{m^2},\ \text{Time} : \text{Sec}$

$Pt = \frac{Nsec}{m^2}$

$\eta = \frac{F}{6\pi rv} : \frac{N}{m{\cdot}m/sec} : \frac{Nsec}{m^2}$

45. The maximum percentage errors in the measurement of mass (M), radius (R) and angular velocity (ω) of a ring are $2\%, 1\%$ and 1% respectively, then find the maximum percenta? error in the measurement of its moment of inertia $(I = \frac{1}{2}MR^2)$ about its geometric axis.

A) 4 **B)** 5 **C)** 6 **D)** 7

Solution : (Correct Answer: A)

Moment of inertia $(\mathrm{I}) = \mathrm{MR}^2$

$\therefore \frac{\Delta I}{I} \times 100 = \frac{\Delta M}{M} \times 100 + 2\frac{\Delta R}{R} \times 100$

$= 2\% + (2 \times 1\%) = 4\%$

the maximum percenta $= 4\%$

Chemistry

46. For a reaction, $\mathrm{N_2O_{5(g)}} \rightarrow 2\mathrm{NO_{2(g)}} + \frac{1}{2}\mathrm{O_{2(g)}}$ in a constant volume container, no products were present initially. The final pressure of the system when 50% of reaction gets completed is _____.

A) 5 times of initial pressure

B) $5/2$ times of initial pressure

C) $7/2$ times of initial pressure

D) $7/4$ times of initial pressure

Solution : (Correct Answer: D)

$$\mathrm{N_2O_{5\,(g)}} \longrightarrow 2\mathrm{NO_{2(g)}} + \frac{1}{2}\mathrm{O_{2(g)}}$$

t = 0	P_0	–	–
t = t	P_0–x	2x	$\frac{x}{2}$

$$x = \frac{P_0}{2}$$

$$P_{\text{total}} = P_0 - \frac{P_0}{2} + P_0 + \frac{P_0}{4} = \frac{7}{4}P_0$$

47. Dehydrated phosphorus trichloride in water gives

A) HPO_3 **B)** H_3PO_4

C) H_3PO_2 **D)** H_3PO_3

Solution : (Correct Answer: D)

(d) $3H_2O + PCl_3 \rightarrow H_3PO_3 + 3HCl$

48. The calorific values of fats, carbohydrates and proteins vary in the order

A) Fats > Carbohydrates > Proteins

B) Fats > Proteins > Carbohydrates

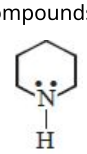
C) Carbohydrates > Proteins > Fats

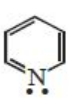
D) Proteins > Carbohydrates > Fats

Solution : (Correct Answer: A)

It's obvious.

49. Identify the strongest base from the given compounds

A) 

B) 

C)  D) All have same basic strength

Solution : (Correct Answer: A)

50. The product obtained when acetic acid is treated with phosphorus trichloride is

A) $CH_3COOPCl_3$ B) CH_3COOCl
C) CH_3COCl D) $ClCH_2COOH$

Solution : (Correct Answer: C)

(c) $3CH_3COOH + PCl_3 \rightarrow H_3PO_3 + 3CH_3COCl$

51. When acetone is heated with hydroxylamine, the compound formed is

A) Cyanohydrin B) Oxime
C) Semicarbazone D) Hydrazone

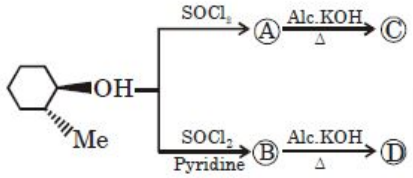
Solution : (Correct Answer: B)

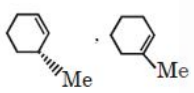
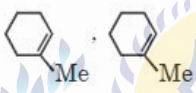
(b)

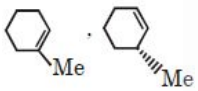
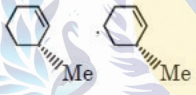
$$\begin{matrix}CH_3\\CH_3\end{matrix}\!\!>C=O + NH_2OH \rightarrow \begin{matrix}CH_3\\CH_3\end{matrix}\!\!>C=N-OH + H_2O$$

Acetoxime

52. Major product (C) and (D) will be respectively

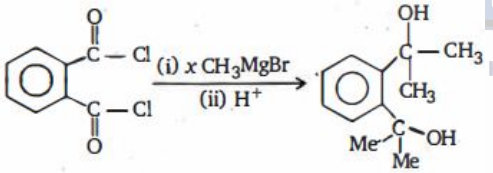


A)  B) 

C)  D) 

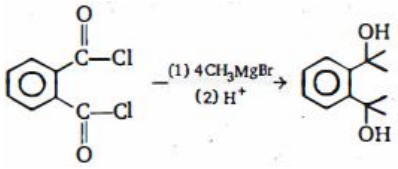
Solution : (Correct Answer: A)

53. Number of moles of CH_3MgBr consumed in above reaction is



A) 2 B) 4 C) 6 D) 8

Solution : (Correct Answer: B)



54. $26.7\ Qgm$ of a compound of formula $PtCl_2Br_2.6H_2O$ is taken for analysis, this compound shows stereoisomerism and total 3 stereoisomers exist. Then find the loss in the mass (in gm) when the given amount of the compound is treated with the $conc.H_2SO_4$
(molar mass : $PtCl_2Br_2.6H_2O = 534\ g\,mol^{-1}$)

A) 1.80 B) 2.70 C) 4.47 D) 2.31

Solution : (Correct Answer: B)

Compound could be

$[\mathrm{Pt}\,(\mathrm{H_2O})_3\,\mathrm{Cl_2Br}]\,\mathrm{Br}.3\mathrm{H_2O}$ or

$[\mathrm{Pt}(\mathrm{H_2O})_3\mathrm{Br_2Cl}]\,\mathrm{Cl}.\,3\mathrm{H_2O}$

moles $= 0.05$

So moles of crystallised water $= 0.15$

mass $= 2.7\,\mathrm{gm}$

Cone $\mathrm{H_2SO_4}$ absorb water molecules

55. Which of the following is not expected to be a ligand ?

A) NO B) NH_4^+ C) en D) CO

Solution : (Correct Answer: B)

Complexes are formed when ligands donate a pair of electrons to metals. In ammonia, N atom has one lone pair of electrons. Nitrogen donates this lone pair of electrons to proton to form ammonium ion. $SoNH_4^+$ion does not have a lone pair of electrons which it can donate to central metal ion. Hence it cannot behave as a ligand.

56. The aqueous solution of $CuCrO_4$ is green because it contains

A) green Cu^{2+} ions
B) green CrO_4^{2-} ions
C) blue Cu^{2+} ions and green CrO_4^{2-} ions
D) blue Cu^{2+} ions and yellow CrO_4^{2-} ions

Solution : (Correct Answer: D)

57. Equivalent weight of $KMnO_4$ acting as an oxidant in acidic medium is

A) The same as its molecular weight
B) Half of its molecular weight
C) One-third of its molecular weight
D) One-fifth of its molecular weight

Solution : (Correct Answer: D)

(d)

$$\overset{+7}{2KMnO_4} + 3H_2SO_4 \rightarrow K_2SO_4 + \overset{+2}{2MnSO_4} + 3H_2O + 5[O]$$

Change by 5

$$\text{Eq. wt.} = \frac{\text{Mol.wt.}}{5}$$

58. Consider the kinetic data given in the following table for the reaction $A + B + C \rightarrow$ Product.

Experiment No.	$[A]$ $(moldm^{-3})$	$[B]$ $(moldm^{-3})$	$[C]$ $(moldm^{-3})$	Rate of reaction $(moldm^{-3}s^{-1})$
1	0.2	0.1	0.1	6.0×10^{-5}
2	0.2	0.2	0.1	6.0×10^{-5}
3	0.2	0.1	0.2	1.2×10^{-4}
4	0.3	0.1	0.1	9.0×10^{-5}

The rate of the reaction for $[A] = 0.15moldm^{-3}$, $[B] = 0.25moldm^{-3}$ and $[C] = 0.15moldm^{-3}$ is found to be $Y \times 10^{-5}moldmd^{-3}s^{-1}$. The value of Y i. . . . . .

A) 6.75 B) 6.80 C) 6.85 D) 6.90

Solution : (Correct Answer: A)

$r = K[A]^{n_1}[B]^{n_2}[C]^{n_3}$

From table

$n_1 = 1$

$n_2 = 0$

$n_3 = 1$

$r = K[A][C]$

From Exp-1

$6 \times 10^{-5} = K \times 0.2 \times 0.1$

$K = 3 \times 10^{-3}$

$r = \left(3 \times 10^{-3}\right) \times 0.15 \times 0.15$

$= 6.75 \times 10^{-5}$

$= Y \times 10^{-5}$

$Y = 6.75$

59. In a first order reaction, the concentration of the reactant, decreases from $0.8\ M$ to $0.4\ M$ in 15 minutes. The time taken for the concentration to change from $0.1\ M$ to $0.025\ M$ is ..... min.

A) 7.5 **B)** 15 **C)** 30 **D)** 60

Solution : (Correct Answer: C)

(c)The concentration of the reactants decrease from 0.8 to 0.4 in $15\ min$ i.e., $T_{1/2} = 15\ min$, concentration from $0.1\ m$ to 0.025 will fall in 2 half lives so total time taken $= 2 \times T_{1/2} = 2 \times 15 = 30\ min$.

60. $Co|\ Co^{+2}\ (C_2)\ ||\ Co^{+2}(C_1)|\ Co$ for this cell, ΔG is negative if

A) $C_2 > C_1$ **B)** $C_1 > C_2$

C) $C_1 = C_2$ **D)** Unpredictable

Solution : (Correct Answer: B)

For $\Delta G\ -\ ve$

$E_{cell}\ = +ve$

$E_{cell} = E^{\circ}_{cell} - \frac{0.0591}{2} \log \frac{C_2}{C_1}$

$C_1 > C_2$ then $E_{cell}\ = +ve$

61. On passing electric current through molten aluminium chloride, 11.2 litre of Cl_2 is liberated at NTP at anode. The quantity of aluminium deposited at cathode is ..... g (at. wt. of $Al = 27$)

A) 9 **B)** 18 **C)** 27 **D)** 36

Solution : (Correct Answer: A)

11.21 of Cl_2 at NTP $\Rightarrow 0.5$ mole of Cl_2

Cl_2 gives $2\ moles$ of electer $2Cl^- + 2e^- \rightarrow Cl_2$

$\therefore$ moles of $e^- = 0.5 \times 2 = 1 Al^{3+} + 3e^- \rightarrow AC$

$\therefore 1\ mole$ of Ac requires $3\ moles$ of e

$\therefore 1\ mole\ e^-$ reduces $\frac{1}{3}$ moles of AC

mole of $AC = \frac{1}{3} \times 27 = 9\ g$

62. The van't Hoff factor 'i' for a compound which undergoes dissociation in one solvent and association in other solvent is respectively

A) Less than one and greater than one

B) Less than one and less than one

C) Greater than one and less than one

D) Greater than one and greater than one

Solution : (Correct Answer: C)

In case of association of solute particles in solution, the observed molecular weight of solute being more than the normal, the value of factor 'i' is less than unity (i.e. $i < 1$), while for dissociation the value of i is greater than unity (i.e. $i > 1$), because the observed molecular weight has lesser value than normal molecular weight.

63. $3.65\ gms$ of HCl is dissolved in $16.2\ gms$ of water. The mole fraction of HCl in the resulting solution is

A) 0.4 **B)** 0.3 **C)** 0.2 **D)** 0.1

Solution : (Correct Answer: D)

(d) $X = \frac{n}{n+N}$

$n = \frac{w}{m} = \frac{3.65}{36.5} = 0.1, \quad N = \frac{W}{M} = \frac{16.2}{18} = 0.9$

$X = \frac{0.1}{0.1+0.9} = 0.1.$

64. Consider the oxides of group 14 elements $SiO_2, GeO_2, SnO_2, PbO_2, CO$ and GeO. The amphoteric oxides are _____.

A) GeO, GeO_2 **B)** SiO_2, GeO_2

C) SnO_2, PbO_2 **D)** SnO_2, CO

Solution : (Correct Answer: C)

SnO_2 and PbO_2 are amphoteric.

65. $H_3BO_3 \xrightarrow{T_1} X \xrightarrow{T_2} Y \xrightarrow{Red\ hot} B_2O_3$

if $T_1 < T_2$ then X and Y respectively are

A) $X =$ Metaboric Acid, $Y =$ Tetraboric acid

B) $X =$ Tetraboric Acid, $Y =$ Metaboric acid

C) $X =$ Borax, $Y =$ Metaboric acid

D) $X =$ Tetraboric Acid, $Y =$ Borax

Solution : (Correct Answer: A)

$H_3BO_3 \xrightarrow{100^{\circ}C} HBO_2 \xrightarrow{160^{\circ}C} H_2B_4O_7 \xrightarrow{\text{red hot}} B_2O_3$

X is HBO_2 which is metaboric acid and Y is $H_2B_4O_7$ which is tetraboric acid.

66. Which of the following oil is obtained from benzene after fractional distillation of coal tar

A) Light oil **B)** Heavy oil

C) Middle oil **D)** Anthracene oil

Solution : (Correct Answer: A)

(a)Benzene on fractional distillation gives light oil [It is lighter than water and hence called as light oil]

67. Ethylene reacts with ozone to give

A) Formaldehyde **B)** Ethyl alcohol

C) Ozonide **D)** Acetaldehyde

Solution : (Correct Answer: A)

(a) $CH_2 = CH_2 \xrightarrow[2)\ Zn/H_2O]{1)\ O_3} \underset{\text{Formaldehyde}}{HCHO} + HCHO$

68. The correct order of acidic strength is

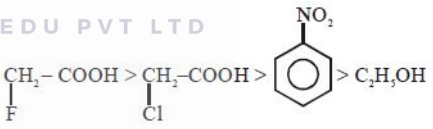
A) Chloroacetic acid > Fluoroacetic acid > Phenol > Ethanol

B) Ethanol > Phenol > Chloroacetic acid > Fluoroacetic acid

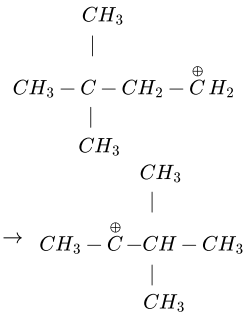
C) Fluoroacetic acid > Chloroacetic acid > phenol > Ethanol

D) Fluoroacetic acid > Chloroacetic acid > Ethanol > Phenol

Solution : (Correct Answer: C)



69.



How many $H^{\ominus}$ shifts are involved in above rearrangement :

A) 4 **B)** 3 **C)** 2 **D)** 1

Solution : (Correct Answer: D)

70. The transformation occurring in Duma's method is given below :

$C_2H_7\ N + (2x + \frac{y}{2})\ CuO \rightarrow x\ CO_2 + \frac{y}{2} H_2O + \frac{z}{2}\ N_2 + (2x + \frac{y}{2})\ Cu$

The value of y is ..... .(Integer answer)

A) 2 **B)** 7 **C)** 1 **D)** 15

Solution : (Correct Answer: B)

$C_2H_7\ N + (2x + \frac{y}{2})\ CuO \rightarrow xCO_2 + \frac{y}{2} H_2O + \frac{z}{2}\ N_2 + (2x + \frac{y}{2})\ Cu$

On balancing

$C_2H_7\ N + \frac{15}{2}CuO \rightarrow 2CO_2 + \frac{7}{2}H_2O + \frac{1}{2}\ N_2 + \frac{15}{2}Cu$

On comparing

$y = 7$

71. In Carius method $0.099\ g$ organic compound gave $0.287\ g\ AgCl$. The percentage of chlorine in the compound will be

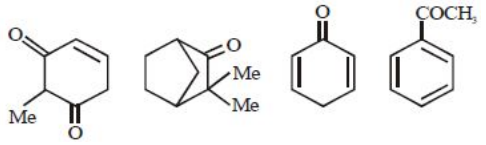
A) 28.6 **B)** 71.7 **C)** 35.4 **D)** 64.2

Solution : (Correct Answer: B)

(b) % of chlorine = $\frac{35.5}{143.5} \times \frac{\text{Mass of } AgCl}{\text{Mass of substance}} \times 100$

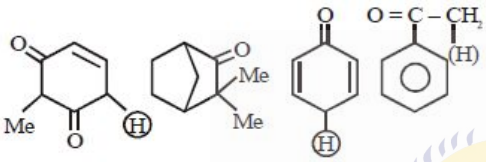
= $\frac{35.5}{143.5} \times \frac{0.287}{0.099} \times 100 = 71.71\%$.

72. How many of given compounds show Tautomerism



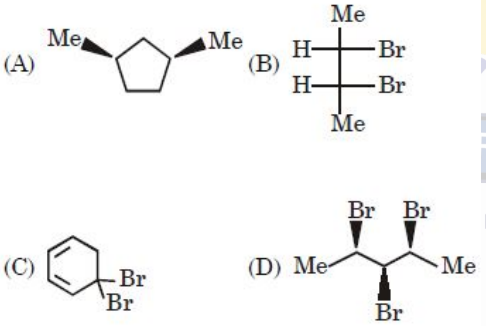
A) 2 **B)** 3 **C)** 4 **D)** 1

Solution : (Correct Answer: B)



H in circle can take part in tautomerism

73. Which of the following are meso compound?



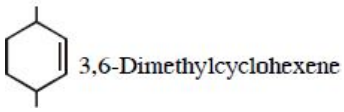
A) A, B, C, D **B)** B, C, D

C) A, C, D **D)** A, B, D

Solution : (Correct Answer: D)

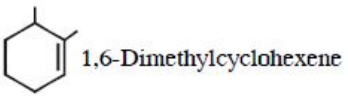
74. Which of the following name is incorrect ?

A)



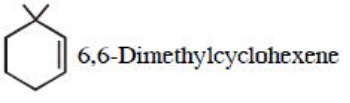
3,6-Dimethylcyclohexene

B)



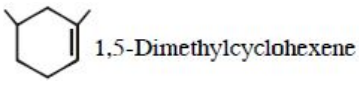
1,6-Dimethylcyclohexene

C)



6,6-Dimethylcyclohexene

D)



1,5-Dimethylcyclohexene

Solution : (Correct Answer: C)

75. The $IUPAC$ name of $CH_3 - \underset{|}{CH}(Cl) - \underset{|}{CH}(Br) - \underset{|}{CH}(OH) - CH_3$ is

A) 3– Bromo –4– chloropentan –2– ol

B) 3– Bromo –2– chloro –4– hydroxypentane

C) 3– Bromo –2– chloropentane –4– ol

D) none of these

Solution : (Correct Answer: A)

No. of carbon in longest carbon keleton $= 5$

Functional group :- alcohol

Side group :- chlorine and bromine in position 4 and 3 respectively.

Name :- 3-Bromo-4-chloropentan-2-ol

76. Iodine is formed when KI reacts with a solution of

A) $CuSO_4$ **B)** $(NH_4)_2SO_4$

C) $ZnSO_4$ **D)** $FeSO_4$

Solution : (Correct Answer: A)

(a)Iodine being a strong reducing agent reduce Cu^{2+} ions to Cu^{+} ions and itself gets oxidised to iodine.

$\underset{\text{Reduced}}{2\overset{+2}{Cu}SO_4} + \underset{\text{Oxidised}}{4\overset{-1}{K}I} \rightarrow \overset{+1}{Cu_2}I_2 + \overset{0}{I_2} + 2K_2SO_4$

77. In which pair of species the oxidation number of chlorine is same

A) $ClO^{-1}, HClO_3$ **B)** $ICl, NaCl$

C) $NaCl, NaClO_3$ **D)** ICl, ClF_3

Solution : (Correct Answer: B)

$\overset{-1}{ICl}$, $\overset{-1}{NaCl}$

$\overset{+1}{ClO^-}$, $+\overset{+5}{HClO_3}$, $\overset{+5}{NaClO_3}$

78. According to the reaction $PbCl_2 = Pb^2 + 2Cl^-$,the solubility coefficient of $PbCl_2$ is

A) $[Pb^{2+}]\,[Cl^-]^2$

B) $[Pb^{2+}]\,[Cl^-]$

C) $[Pb^{2+}]^2\,[Cl^-]$

D) None of these

Solution : (Correct Answer: A)

(a) Solubility coefficient $= [Pb^{2+}]\,[Cl^-]^2$

79. The strongest Lewis base in the following

A) CH_3^- **B)** F^-

C) NH_2^- **D)** OH^-

Solution : (Correct Answer: A)

(a) CH_4 has almost no acidic nature and thus CH_3^- is strongest base.

80. In the reaction $A_{(g)} + B_{(g)} \rightleftharpoons C_{(g)}$, the backward reaction is favoured by

A) Decrease of pressure

B) Increase of pressure

C) Either of the two

D) None of the two

Solution : (Correct Answer: A)

When the pressure of the system is decrease, the backward reaction will be favoured as the forward reaction occurs with a increase in the number of moles.

81. Consider the following reactions:

$(i)\ H^+_{(aq)} + OH^- = H_2O_{(l)},\ \Delta H = -X_1\ kJ\ mol^{-1}$

$(ii)\ H_{2(g)} + \frac{1}{2}O_{2(g)} = H_2O_{(l)},\ \Delta H = -X_2\ kJ\ mol^{-1}$

$(iii)\ CO_{2(g)} + H_{2(g)} = CO_{(g)} + H_2O_{(l)},\ \Delta H = -X_3\ kJ\ mol^{-1}$

$(iv)\ C_2H_{2(g)} + \frac{5}{2}O_{2(g)} = 2CO_{2(g)} + H_2O_{(l)},\ \Delta H = -X_4\ kJ\ mol^{-1}$

Enthalpy of formation of $H_2O_{(l)}$ is

A) $+X_3\ kJ\ mol^{-1}$ **B)** $-X_4\ kJ\ mol^{-1}$

C) $+X_1\ kJ\ mol^{-1}$ **D)** $-X_2\ kJ\ mol^{-1}$

Solution : (Correct Answer: D)

The standard enthalpy change of formation of a compound is the enthalpy change which occurs when one mole of the compound is formed from its elements under standard conditions. The equation showing the standard enthalpy change of formation of water is $H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(1)$

1 mole of water formed.

$\therefore$ Enthalpy of formation is $-X_2 kJ/mol$.

82. An irreversible process occuring isothermally in an isolated system leads to

A) Zero entropy
B) An increase in the total entropy of the system
C) A decrease in the total entropy of the system
D) None of these

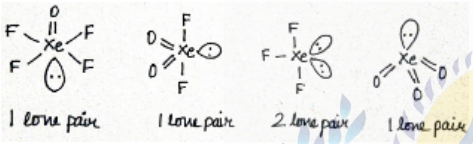
Solution : (Correct Answer: B)

(b)Entropy of the system increases as the process occur irreversibly and isothermally in an isolated system.

83. The molecule exhibiting maximum number of non-bonding electron pairs $(l.p.)$ around the central atom is

A) $XeOF_4$ **B)** XeO_2F_2
C) XeF_3^- **D)** XeO_3

Solution : (Correct Answer: C)



84. Which of the configuration is correct :-

A) $CO : \sigma ls^2 .....\sigma 2pz^2, \pi 2py^2$
B) $CN^- : \sigma 1s^2 .....\sigma 2pz^2, \pi 2px^2$
C) $NO : \sigma 1s^2 .....\pi^* 2px^1, \pi^* 2py^0$
D) $N_2^+ : \sigma 1s^2 .....\sigma 2pz^2, \pi 2py^1$

Solution : (Correct Answer: C)

85. Element having highest $I.P.$ value is

A) Ne **B)** He **C)** Be **D)** N

Solution : (Correct Answer: B)

The electronic configuration of the given element is:

$Ne : [He]2s^2\, 2p^6$

$He : 1s^2$

$Be : 1s^2\, 2s^2$

$N : [He]2s^2\, 2p^3$

Although Ne, He and N all have fully filled stable configuration but the electron is to be removed from a is shell in case of He. $1s$ shell being closest to the nucleus makes quite tough to remove an electron from it. Thus, the element having the highest $I.P.$ value is Helium.

86. The outer most shell electronic configuration of transition element is

A) $ns^2\, nd^{1-10}$
B) $(n-1)\, d^{1-10}\, ns^{1-2}$
C) $(n-1)\, d^2\, ns^{0-2}$
D) $(n-1)\, d^{1-10}\, ns^2$

Solution : (Correct Answer: B)

87. How many spectral line of Balmer series present in visible region :

A) 5 **B)** 4 **C)** 2 **D)** 3

Solution : (Correct Answer: B)

For balmer series,

$n_1 = 2$ and $n_2 = 3, 4, 5, 6, \ldots\ldots$

In balmer series, four spectral lines are available in visible region. These spectral lines have wavelengths greater than $400\, nm$ and smaller than $700\, nm$.

88. When the azimuthal quantum number has a value of $l = 1$, the shape of the orbital is

A) Unsymmetrical **B)** Spherically symmetrical
C) Dumb-bell **D)** Complicated

Solution : (Correct Answer: C)

(c) For $p-$ orbital, $l = 1$ means dumb-bell shape.

89. $25\ g$ of a solute of molar mass $250\ g\ mol^{-1}$ is dissolved in $100\ ml$ of water to obtain a solution whose density is $1.25\ g\ ml^{-1}$. The molarity and molality of the solution are respectively

A) 0.75 and 1 **B)** 0.8 and 1
C) 1 and 0.8 **D)** 1 and 1

Solution : (Correct Answer: D)

No. of moles of solute $= \frac{25}{250} = 0.1$ moles Molarity $= \frac{\text{No. of moles of solute}}{\text{Volume of solvent in litre}} = \frac{0.1}{\frac{100}{1000}} = 1M$

Moles of solute $= \frac{25\text{g}}{250\text{g/mol}} = 0.1\text{mol}$

Density of water $= 1\text{g/ml}$

Mass of solvent (water) $= 100\ ml \times 1\frac{\text{g}}{\text{ml}} = 100\text{g}$ $= 0.1\text{kg}$

Molality $= \frac{\text{Moles of solute}}{\text{Mass of solvent (in kg)}}$

Molality $= \frac{0.1\text{mol}}{0.1\text{kg}} = 1\text{m}$

Molality of solution is 1m

90. What is the weight of oxygen required for the complete combustion of $2.8\ kg$ of ethylene ..... kg

A) 2.8 **B)** 9.6 **C)** 6.4 **D)** 96

Solution : (Correct Answer: B)

(b) $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

$28\, gm\ C_2H_4$ requires $96\, gm$ oxygen

$\therefore 2.8 \times 10^3\ gm\ C_2H_4$ requires $= \frac{96}{28} \times 2.8 \times 10^3\ gm = 9.6 \times 10^3\ gm = 9.6\, kg$.

Biology - (Zoology)

91. Who proposed that the genetic code for amino acids should be made up of three nucleotides?

A) George Gamow **B)** Francis Crick
C) Jacque Monod **D)** Franklin Stahl

Solution : (Correct Answer: A)

George Gamow, a physicist proposed that genetic code for amino acids should be made up of three nucleotides.

92. Given below are two statements :
Statement I : Transfer RNAs and ribosomal RNA do not interact with mRNA.
Statement II : RNA interference (RNAi) takes place in all eukaryotic organisms as a method of cellular defence.
In the light of the above statements, choose the most appropriate answer from the options given below :

A) Both statement I and statement II are correct
B) Both statement I and statement II are incorrect
C) Statement I is correct but statement II is incorrect

D) Statement I is incorrect but statement II is correct

Solution : (Correct Answer: D)

Both transfer RNAs and ribosomal RNA interact with mRNA.

RNA interference (RNAi) takes place in all eukaryotic organisms as a method of cellular defence.

93. Which one of the following equations represents the Verhulst-Pearl Logistic Growth of population?

A) $\frac{dN}{dt} = r\left(\frac{K-N}{K}\right)$
B) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$
C) $\frac{dN}{dt} = rN\left(\frac{N-K}{N}\right)$
D) $\frac{dN}{dt} = N\left(\frac{r-K}{K}\right)$

Solution : (Correct Answer: B)

Logistic growth is described by Verhulst-Pearl logistic growth equation $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$.

94. Given below are two statements :

Statement I : Fig fruit is a non-vegetarian fruit as it has enclosed fig wasps in it.

Statement II : Fig wasp and fig tree exhibit mutual relationship as fig wasp completes its life cycle in fig fruit and fig fruit gets pollinated by fig wasp.

In the light of the above statements, choose the most appropriate answer from the options given below :

A) Both statement I and statement II are correct
B) Both statement I and statement II are incorrect
C) Statement I is correct but statement II is incorrect
D) Statement I is incorrect but statement II is correct

Solution : (Correct Answer: B)

Fig fruit is a vegetarian fruit as it only gets pollinated by wasp. Fig tree and fig wasps shows mutualism in which both species are benefitted. So, statement I is incorrect. Statement II is also not correct as fig inflorescence/flower gets pollinated by fig wasp.

95. Epiphytes that are growing on a mango branch is an example of which of the following?

A) Commensalism B) Mutualism
C) Predation D) Amensalism

Solution : (Correct Answer: A)

Commensalism is the type of interaction in which one-species benefits and another is neither harmed nor benefited. An orchid growing as an epiphyte on a mango branch is an example of commensalism.

96. Silencing of specific mRNA is possible via RNAi because of...

A) Complementary dsRNA
B) Inhibitory ssRNA
C) Complementary tRNA
D) Non-complementary ssRNA

Solution : (Correct Answer: A)

RNAi (RNA interference) takes place in all eukaryotic organisms as a method of cellular defense. This method involves silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA.

97. Which of the following genetically engineered organisms was used by Eli Lilly to prepare human insulin?

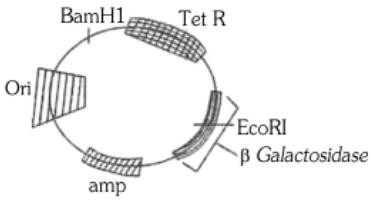
A) Bacterium B) Yeast
C) Virus D) Phage

Solution : (Correct Answer: A)

The correct answer is bacterium.

In 1983, Eli Lilly, an American company, prepared two DNA sequences corresponding to ' A ' and ' B ' chains of human insulin and introduced them in plasmids of E.coli (a gram negative bacterium) to produce insulin chains.

98.



In the above represented plasmid, an alien piece of DNA is inserted at EcoRI site. Which of the following strategies will be chosen to select the recombinant colonies?

A) Using ampicillin & tetracycline containing medium plate.
B) Blue color colonies will be selected.
C) White color colonies will be selected.
D) Blue color colonies grown on ampicillin plates can be selected.

Solution : (Correct Answer: C)

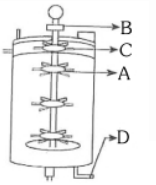
The correct answer is that white-colored colonies will be selected.

Since an alien piece of DNA is being inserted at EcoRI site, the gene β-galactosidase present here will undergo insertional inactivation.

This gene is responsible for producing blue-colored colonies, but since it has been insertionally inactivated, white colored colonies will be produced.

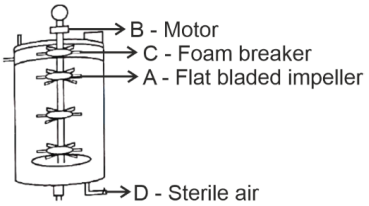
Ampicillin and tetracycline resistance genes present in the given DNA will remain intact. Thus, the given DNA will show amp ^{R} and tet ^{R}.

99. Identify the part of a bio-reactor which is used as a foam braker from the given figure.



A) A B) B C) D D) C

Solution : (Correct Answer: D)



$\therefore$ Part labelled as C is foam breaker.

100. The blue and white selectable markers have been developed which differentiate recombinant colonies from non-recombinant colonies on the basis of their ability to produce colour in the presence of a chromogenic substrate.

Given below are two statements about this method:
Statement I : The blue coloured colonies have DNA insert in the plasmid and they are identified as recombinant colonies.

Statement II : The colonies without blue colour have DNA insert in the plasmid and are identified as recombinant colonies.

In the light of the above statements, choose the most appropriate answer from the options given below:

A) Both Statement I and Statement II are correct
B) Both Statement I and Statement II are incorrect
C) Statement I is correct but Statement II is incorrect
D) Statement I is incorrect but Statement II is correct

Solution : (Correct Answer: D)
Statement I is incorrect but statement II is correct as a recombinant DNA is inserted within the coding sequence of an enzyme, β-galactosidase. This results into inactivation of the gene for synthesis of this enzyme. Thus, presence of insert results into insertional inactivation of the β-galactosidase gene and the colonies do not produce any colour and identified as recombinant colonies. Whereas non-recombinant transformants will produce blue colour in presence of chromogenic substrate.

101. Given below are two statements :
Statement I: The DNA fragments extracted from gel electrophoresis can be used in construction of recombinant DNA.

Statement II : Smaller size DNA fragments are observed near anode while larger fragments are found near the wells in an agarose gel.

In the light of the above statements, choose the most appropriate answer from the options given below :

A) Both statement I and statement II are correct
B) Both statement I and statement II are incorrect
C) Statement I is correct but statement II is incorrect
D) Statement I is incorrect but statement II is correct

Solution : (Correct Answer: A)
The cutting of DNA by restriction endonucleases results in the fragments of DNA. These fragments can be separated by a technique known as gel electrophoresis.

The separated bands of DNA are cut out from the agarose gel and extracted from the gel piece. This step is known as elution. The DNA fragments purified in this way are used in constructing rDNA by joining them with cloning vectors.
- In gel electrophoresis, the DNA fragments separate (resolve) according to their size through sieving effect provided by the agarose gel. Hence, the smaller the fragment size, the farther it moves from cathode towards anode.

102. Polymerase chain reaction (PCR) amplifies DNA following the equation.

A) N^2 **B)** 2^n **C)** $2n+1$ **D)** $2\ N^2$

Solution : (Correct Answer: B)
PCR i.e., polymerase chain reaction amplifies DNA as per the equation 2^n, where ' n ' refers to number of cycles.
Thus, say, if 3 PCR cycles will run, then 2^3 i.e., $2 \times 2 \times 2 \Rightarrow 8$ DNA fragments will be formed.

103. Given below are two statements :

Statement I : In the RNA world, RNA is considered the first genetic material evolved to carry out essential life processes. RNA acts as a genetic material and also as a catalyst for some important biochemical reactions in living systems. Being reactive, RNA is unstable.

Statement II: DNA evolved from RNA and is a more stable genetic material. Its double helical strands being complementary, resist changes by evolving repairing mechanism.

In the light of the above statements, choose the most appropriate answer from the options given below :

A) Both statement I and statement II are correct
B) Both statement I and statement II are incorrect
C) Statement I is correct but statement II is incorrect
D) Statement I is incorrect but statement II is correct

Solution : (Correct Answer: A)
In RNA world, RNA was the first genetic material as there are enough evidences to suggest that essential life processes (such as metabolism, translation, splicing, etc) evolved around RNA. RNA used to act as a genetic material as well as catalyst (there are some important biochemical reaction in living systems that are catalysed by RNA catalysts not by protein enzymes) so, statement I is correct statement II is also correct as DNA being double stranded and having complementary strands further resists changes by evolving a process of repair.

104. Which of the following are the post-transcriptional events in an eukaryotic cell?
A. Transport of pre-mRNA to cytoplasm prior to splicing.
B. Removal of introns and joining of exons.
C. Addition of methyl group at 5' end of hnRNA.
D. Addition of adenine residues at 3 ' end of hnRNA.
E. Base pairing of two complementary RNAs.

Choose the correct answer from the options given below :

A) A, B, C only **B)** B, C, D only
C) B, C, E only **D)** C, D, E only

Solution : (Correct Answer: B)
The process of copying genetic information from one strand of the DNA into RNA is known as transcription. It occurs in the cytoplasm with the help of transcripting enzyme.

Transport of pre-mRNA to cytoplasm prior to

splicing is a part of transcription.
The primary transcript is converted into functional mRNA after post transcriptional processing involves 3 steps as follows-
- Modification of 5' end by capping,
- Tailing,
- Splicing.

Base pairing of two complementary RNA is not on event of post-transcription. Hence, statements B, C, D are post-transcriptional modification events in eukaryotic cell.

105. Match List I with List II:

List - I	List - II
(a) Alfred Hershey and Martha Chase	(i) Streptococcus pneumoniae
(b) Euchromatin	(ii) Densely packed and dark-stained
(c) Frederick Griffith	(iii) Loosely packed and light-stained
(d) Heterochromatin	(iv) DNA as genetic material confirmation

Choose the correct answer from the options given below:

A) A-II, B-IV, C-I, D-III
B) A-IV, B-II, C-I, D-III
C) A-IV, B-III, C-I, D-II
D) A-III, B-II, C-IV, D-I

Solution : (Correct Answer: C)
The unequivocal proof that DNA is the genetic material came from the experiment of Alfred Hershey and Martha Chase.

Euchromatin are lightly stained region with loosely packed chromatin fibre.
Frederick Griffith performed series of experiments by selecting the different strains of Streptococcus pneumoniae.

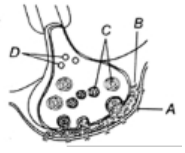
Heterochromatin are darkly stained region with tightly packed chromatin fibre.

106. The canal passing through the midbrain is called

A) Medulla oblongata
B) Cerebral aqueduct
C) Eustachian tube
D) Aqueous chamber

Solution : (Correct Answer: B)
There is no ventricle in the midbrain, instead a passage is present which connects III^{rd} ventricle to the IV^{rth} ventricle and is known as cerebral aqueduct or iter

107. The figure shows an axon terminal and synapse. Select the option giving correct identification of labels $A-D$.



A) A - Action potential, C - Neurotransmitter
B) B - Neurotransmitter, D - Receptor capsules
C) C - Receptor, D - Synaptic vesicles
D) A - Axon terminal, B - Serotonin complex

Solution : (Correct Answer: C)
(c) : A - Action potential

B - Neurotransmitter

C - Receptor

D - Synaptic vesicles

108. Nissl's granules are absent in

A) Axon
B) Cyton
C) Dendron
D) Both $'a'$ and $'b'$

Solution : (Correct Answer: A)
(a)Axon is a single long process of uniform thickness. It contain neurofibrils and neurotubules but lack nissle's granules, golgi complex ribosomes etc.

109. Which is correct about human brain

A) It is covered by two membranes
B) There is no blood brain barrier
C) Largest number of cranial nerves originate from cerebral hemisphere
D) Cerebral cortex is highly developed

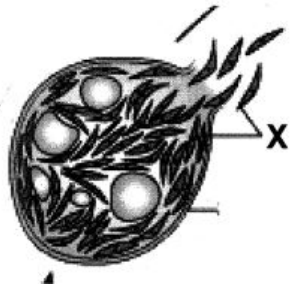
Solution : (Correct Answer: D)
It's Obvious

110. A nerve impulse will travel through a nerve fibre only if the membrane suddenly becomes more permeable to

A) Chloride ions **B)** Potassium ions
C) Sodium ions **D)** Calcium ions

Solution : (Correct Answer: C)
(c) Membrane permeability of the nerve fibre for sodium ions is a state of depolarisation.

111. Identify X from figure



A) Sporozoites **B)** Salivary gland
C) Mosquito host **D)** Human host

Solution : (Correct Answer: A)

112. ...A... released by LAB during growth coagulate and partially digest ...B.... Here A and B refers to

A) $A-$Acid; $B-$milk protein
B) $A-$Base; $B-$harmful bacteria
C) $A-$Enzyme; $B-$milk protein
D) $A-$Bacteria; $B-$other microbes

Solution : (Correct Answer: A)
$A-$Acid; $B-$Milk protein.

Lactic Acid Bacteria (LAB) like Lactobacillus are added to milk. It converts lactose sugar of milk into lactic acid. Lactic acid causes coagulation and partial conversion of milk protein casein to calparacaesinate. Milk is changed into curd, yoghurt and cheese

113. Which of the following are the part or example of symbiotic mutualistic association?
$I.$ Yeast
$II.$ Rhizobium

III. Mycorrhiza
IV. Oscillatoria

A) I and II B) I and III
C) II and III D) III and IV

Solution : (Correct Answer: C)

Mycorrhiza and Rhizobium both are shows symbiotic association.

In the Mycorrhizal association fungi surround the root hairs of plants. This increases the surface area of the root hairs and allows it to better absorb nutrients in the soil. It also provides the plant roots with protection. In exchange the fungi attached to the root hairs gets glucose from the plant

The other type of root symbiosis is Rhizobium symbiosis. This type of symbiosis occurs in legumes. Here, nodules containing the bacteria Rhizobium attach themselves to root hairs of the legume. The Rhizobium absorbs and converts unusable nitrogen in the soil, to biologically usable nitrogen, which is then used by the legume. The root of the legume supplies the Rhizobium with glucose obtained photosynthetic parts of the plant

114. Trichoderma species, free living fungi, are present in root ecosystems are potentially useful as

A) Biopesticides
B) Biofertilisers
C) Methanogens
D) Vectors for genetic engineering

Solution : (Correct Answer: A)

Biopesticides.

Trichoderma is a free living saprophytic fungi that most commonly lives on dead organic matter in the soil and rhizosphere. It acts as a biopesticides for control of many soil borne disease

115. Primary treatment is the

A) Physical removal of large and small particles from sewage
B) Biological removal of large and small particles from sewage
C) Both (a) and (b)
D) Chemical removal of large and small particles from sewage

Solution : (Correct Answer: A)

Primary treatment is the physical removal of large and small particles from sewage

116. Identify bacteria.

A) Trichoderma polysporum
B) Monascus purpureus
C) Streptococcus
D) Penicillium notatum

Solution : (Correct Answer: C)

117. '$ELISA$' test is done for the diagnosis of

A) Anthrax B) HIV C) Hepatitis D) Malaria

Solution : (Correct Answer: B)

It's obvious.

118. Sleep is prevented by

A) Barbiturates B) Benzodiazephines
C) Amphetamines D) Psilocybin

Solution : (Correct Answer: C)

It's obvious.

119. Benign tumour is the one which

A) Shows metastasis
B) Differentiated and capsulated
C) Undifferentiated and noncapsulated
D) Differentiated and noncapsulated

Solution : (Correct Answer: B)

It's obvious.

120. An antigen is

A) Opposite to an antibody
B) Residue of an antibody
C) Stimulus for antibody formation
D) Result of antibody

Solution : (Correct Answer: C)

It's obvious.

121. Organs which have similar origin and developmental plan, but different functions are called

A) Vestigial organs B) Analogous organs
C) Homologous organs D) Physiological organs

Solution : (Correct Answer: C)

Vestigial organs refer to those which are present in an organism but are non-functional. These are just inherited from ancestor

122. Which one of the following factors will not affect the Hardy-Weinberg equilibrium?

A) Genetic drift
B) Gene migration
C) Constant gene pool
D) Genetic recombination

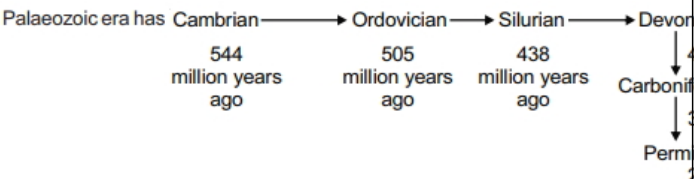
Solution : (Correct Answer: C)

The correct answer is option (3) as a constant gene pool will not disturb the Hardy-Weinberg equilibrium. Option (1), (2) and (4) will affect the equilibrium leading to evolution.

123. The Permian period, during which the first most modern orders of insects appeared, occurred approximately

A) $80\ million$ years ago
B) $150\ million$ years ago
C) $280\ million$ years ago
D) $550\ million$ years ago

Solution : (Correct Answer: C)



124. The organisms of earth are well protected from the layer of a gas which covers the earth. It is known as

A) Nitrogen B) Ozone C) CO_2 D) Dust

Solution : (Correct Answer: B)

It's Obvious

125. What is the correct chronological sequence of human evolution

A) Ramapithecus $\rightarrow$ Australopithecus $\rightarrow$ Homo erectus$\rightarrow$ Neanderthal $\rightarrow$ Homo sapiens

sapiens

B) Ramapithecus $\rightarrow$ Homo habilis $\rightarrow$ Homo sapiens sapiens $\rightarrow$ Homo erectus

C) Australopithecus$\rightarrow$ Ramapithecus$\rightarrow$Homo habilis $\rightarrow$ Homo sapiens sapiens

D) Homo habilis $\rightarrow$ Australopithecus $\rightarrow$ Homo erectus $\rightarrow$ Homo sapiens sapiens

Solution : (Correct Answer: A)

It's Obvious

126. A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple will be colour blind?

A) 0.25 **B)** 0 **C)** 0.5 **D)** 0.75

Solution : (Correct Answer: C)

(c) : It is given that the man had colour blind father, $i.e.$, man's genotype would be XY. Now, the woman had a colourblind mother and normal father, thus her genotype would be X^cX. A cross between them can be represented as below. Therefore, 50% of male children of this couple will be colour blind.

127. Primary source of allelic variation is

A) Independent assortment **B)** Recombination

C) Mutation **D)** Polyploidy

Solution : (Correct Answer: A)

It's Obvious

128. In man sometime during gametogenesis sex chromosomes are not separated themselves on account of which chromosome number becomes $45, 47$ or 48. In this condition which of the following genotype and phenotype is correct

A) 22 pairs $+$ XXY males

B) 22 pairs $+$ XX females

C) 22 pairs $+$ $XXXY$ females

D) $22+$ Y females

Solution : (Correct Answer: A)

(a)22 pairs $+$ XXY genotype is the result of fertilization of an ovum containing $22+$ XX chromosomes which may be formed as a result of non-disjunction of X chromosome during oogenesis.

129. The blood of AB group donor can be transfused to a person with the blood group

A) A **B)** B **C)** AB **D)** O

Solution : (Correct Answer: C)

(c)Blood group 'AB' has both the antigens and no antibodies.

130. In F_2 generation, a phenotypic ratio of $1:1:1:1$ exhibits

A) Back cross **B)** Monohybrid test cross

C) Lethality **D)** Dihybrid test cross

Solution : (Correct Answer: D)

(d) In dihybrid test cross two pairs of contrasting characters are involved and the individual is crossed with recessive parent in F_1 generation.

131. Progestasert and $LNG-20$ are the examples of

A) Non-mediated $IUDs$

B) Copper releasing $IUDs$

C) Hormonal releasing $IUDs$

D) All of the above

Solution : (Correct Answer: C)

Hormonal releasing $IUDs$.

Intra Uterine Devices $(IUDs)$ for contraception

(i) There devices are inserted by the doctors into the uterus through vagina.

(ii) There are three types of $IUDs$

Non-medicated $IUDs$ They increases the phagocytosis of the sperm within the uterus, $e.g.$, Lippes loop

Copper Releasing $IUDs$ Along with phagocytosis of the sperms, the copper ions released, suppresses the sperm motility and the fertilizing capacity of the sperm. $e.g., Cu-T, Cu-7$, multiload-375

Hormone Releasing $IUDs$ They makes the uterus unsuitable for implantation and the cervix hostile to the sperms, $e.g.$ progestasert, $LNG-20$

132. Periodic abstinence is avoiding sex during

A) Luteal phase **B)** Ovulatory phase

C) Menstrual phase **D)** None of these

Solution : (Correct Answer: B)

Avoid sex in ovulatory phase. Probable ova releasing day is $12-14$ day of menstrual phase, and sperm can live for $2-3$ days in female reproductive system. So, $10-17$ $days$ are the most probable days for fertilisation. Draw backs of periodic abstinence The effectiveness of this method is limited because only a few women have regular menstrual cycle and the actual time of ovulation can not be produced as the ovulation in humans occurs about 14 $days$ before the onset of the next menstruation

133. $ICSI$ stands for

A) Isolated Cytoplasmic Semen Injection

B) Intra Cytoplasmic Sperm Injection

C) Inter Cytoplasmic Semen Injection

D) In Cytoplasmic Semen Injection

Solution : (Correct Answer: B)

$ICCl-$Intra Cytoplasmic Sperm/Semen Injection

134. Population of India in early 21st century may be

A) 105 crore **B)** 125 crore

C) 95 crore **D)** 155 crore

Solution : (Correct Answer: A)

It's Obvious

135. Which of the following is not a sexually transmitted disease?

A) Trichomoniasis

B) Encephalitis

C) Syphilis

D) Acquired Immuno Deficiency Syndrome $(AIDS)$

Solution : (Correct Answer: B)

(b)

136. Arrange the events of menstrual cycle as they occur

I. Secretion of FSH

II. Growth of corpus luteum

III. Growth of follicle and oogenesis

IV.Ovulation

V. Sudden increase in level of LH

A) I, III, V, IV, II

B) II, I, III, IV, V

C) III, I, IV, V, II

D) I, IV, III, V, II

Solution : (Correct Answer: A)

137. When male ejaculates sperms during coitus of which for normal fertility at least..... percent sperms must have normal shape and size and at least .....per cent of them must show vigorous motility

A) $40, 60$ **B)** $50, 50$
C) $60, 40$ **D)** $52, 48$

Solution : (Correct Answer: C)

138. The Leydig's cells as found in the human body are the secretory source of

A) progesterone **B)** intestinal mucus
C) glucagon **D)** androgens.

Solution : (Correct Answer: D)

(d) : Interstitial cells or Leydig cells are the cells interspersed between the seminiferous tubules of the testis. They secrete androgens ($e.g.$, testosterone) in response to stimulation by luteinizing hormone from the anterior pituitary gland.

139. Blastocyst is a modified blastula of

A) Placenta mammals **B)** Frog **C)** Fish **D)** Birds

Solution : (Correct Answer: A)

It's Obvious

140. Fallopian tube is the part of

A) Uterus **B)** Ureter **C)** Oviduct **D)** Vas deferens

Solution : (Correct Answer: C)

It's Obvious

141. A : Oxytocin stimulates contraction of uterine muscles during birth and initiates ejection of milk.
R : It is synthesized in the posterior lobe of pituitary.

A) Assertion and Reason both are correct and also correct explanation.
B) Assertion and Reason both are correct but not explanation of assertion.
C) Assertion is correct, but Reason is incorrect.
D) Both Assertion and Reason are incorrect.

Solution : (Correct Answer: C)

Oxytocin stimulates of uterine muscles during birth and initiates ejection of milk.
It is released through axon of neurosecretory cells of hypothalamus into the posterior pituitary.

142. The two glands located in the neck region are

A) Thyroid gland and parathyroid gland
B) Pituitary gland and pineal gland
C) Adrenal gland and thymus
D) Pineal gland and thyroid gland

Solution : (Correct Answer: A)

Thyroid and parathyroid gland	neck region
Pituitary gland and pineal gland	brain gland
Adrenal gland	over kidney
Thymus gland	dorsal surface

143. How does steroid hormone influence the cellular activities?

A) Changing the permeability of the cell membrane.
B) Binding to DNA and forming a gene-hormone complex.
C) Activating cyclic AMP located on the cell membrane
D) Using aquaporin channels as second messenger

Solution : (Correct Answer: B)

144. If a person takes iodine then it will be stored in

A) Thyroid **B)** Liver cells
C) Brain cells **D)** Pancreas

Solution : (Correct Answer: A)

It's Obvious

145. Which one of the following hormone is antiinflamatory

A) Secretin **B)** Epinephrin
C) Glucoprotein **D)** Glucocorticoid

Solution : (Correct Answer: D)

(d) Glucocorticoids include three main hormones : cortisol, corticosterone and cortisone. Cortisone has anti insulin effect.

It also helps in reducing pain cortisol is anti-in flammatory.

146. Relaxation of the muscle takes place due to
$I.$ pumping of Ca^{2+ii} ions in sarcoplasmic reticulum
$II.$ presence of ATP
$III.$ confirmational changes in troponin and masking the actin filament
Option containing correct statement is

A) $I \text{ and } III$
B) $I \text{ and } II$
C) $II \text{ and } III$
D) $I, II \text{ and } III$

Solution : (Correct Answer: D)

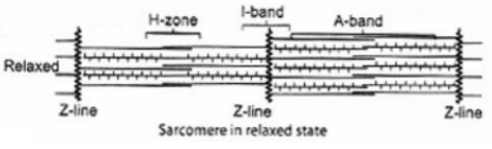
Ca^{2+ii} ions binds to the troponin and unmark the tropomyosin sites for attaching ATP so that, the contraction takes place during the muscle contraction. A band never shortens. It is the light band, which slides over the I-band and causes the shortning $I, H-$ band. In relexed state Ca^{2+ii} are pumped back into sarcoplasmic reticulum and this causes the troponin confirmation changes that load troponin to occupy the active site of actin filament

147. Which of the following statements is true with reference to the structure of a muscle fibre?

A) $H-$zone is present in the middle of $A-$band
B) $A-$band is present in the middle of sarcomere
C) $M-$Line is present in the middle of $H-$zone
D) All of the above

Solution : (Correct Answer: D)

All of the above. The thick filaments lies parallel to one another and thin filaments are present in orderly array between the thick filaments. In the centre of the $I-$band, there is a band of amorphous material called $Z-$Line. In the middle of the $A-$band a comparatively less dark zone called H-zone of band is present. The area between the two $Z-$lines is called sarcomere. M-line is present, in the middle of H-zone



Sarcomere in relaxed state

148. Select the correct option.

A) 8^{th} , 9^{th} and 10^{th} pairs of ribs articulate directly with the sternum.

B) 11^{th} and 12^{th} pairs of ribs are connected to the stemum with the help of hyaline cartilage.
C) Each rib is a flat thin bone and all the ribs are connected dorsally to the thoracic vertebrae and ventrally to the sternum.
D) There are seven pairs of vertebrostemal, three pairs of vertebrochondral and two pairs of vertebral ribs.

Solution : (Correct Answer: D)

149. Which of the following are involved in the formation of coxal bone ?
(1) ilium (2) Pubis Freitag
(3) Ischium (4) Femur

A) 1 and 2 only
B) 2 and 4 only
C) 1, 2 and 3
D) 1, 3 and 4

Solution : (Correct Answer: C)

150. Ball and socket joints can be seen in

A) Wrist B) Fingers
C) Neck D) Shoulders

Solution : (Correct Answer: D)
(d) Shoulder and hip joints are the examples of ball and socket joints.

151. Juxta glomerular apparatus is modification in the

A) Afferent atriole and PCT
B) Afferent atriole and DCT
C) Efferent atriole and DCT
D) Efferent atriole and PCT

Solution : (Correct Answer: B)
Juxta glomerular apparatus is a modification in afferent arteriole and distal convoluted tubule for regulation of osmoregulation in body

152. The characteristic that is shared by urea, uric acid and ammonia is/are
I. They are nitrogenous wastes.
II. They all need very large amount of water for excretion.
III. They are all equally toxic.
IV. They are equally in the kidneys.

A) I and III B) I and IV
C) I, III and IV D) I only

Solution : (Correct Answer: D)
Urea, uric acid and ammonia all are nitrogenous wastes. Ammonia is highly toxic and soluble in water, therefore, requires a large amount of water for excretion. Urea is less toxic and less soluble in water than ammonia. Uric acid crystals are nontoxic and almost insoluble in water.

153. A fall in the GFR rate activates the

A) JG cells to release reni
B) JG cells to release aldosterone
C) JG cells to release epinephrine
D) JG cells to release nor-epinephrine

Solution : (Correct Answer: A)
The kidneys have built in mechanisms for the regulation of glomerular filtration rate. One such efficient mechanism is carried out by juxta glomerular apparatus (JGA), JGA is the special sensitive region formed by cellular modification in the distal convoluted tubule and the afferent arteriole at the location of their contact. A fall in GFR can activate the JG cells to release renin, which can stimulate the glomerular blood flow and there by GFR back to normal

154. Angiotensin-II activates the ....A.... and release ..... B.....
Choose the correct option for A and B to complete the given statement

A) A–adrenal cortex; B–aldosterone
B) A–adrenal medulla; B–aldosterone
C) A–adrenal capsule; B–aldosterone
D) A–adrenal medulla; B–oxytocin

Solution : (Correct Answer: A)
A–adrenal cortex; B–aldosterone

155. Match the excretory functions of section I with the parts of the excretory system in section II. Choose the correct combinations from among the answers given

Section I	Section II
(i) Ultrafiltration	(a) Henle's loop
(ii)Concentration of urine	(b) Ureter
(iii) Transport of urine	(c) Urinary bladder
(iv) Storage of urine	(d) Malpighian corpuscles
	(e) Proximal convoluted tubules

A) $(i)-(d),(ii)-(a),(iii)-(b),(iv)-(c)$
B) $(i)-(d),(ii)-(c),(iii)-(b),(iv)-(a)$
C) $(i)-(e),(ii)-(d),(iii)-(a),(iv)-(c)$
D) $(i)-(e),(ii)-(d),(iii)-(a),(iv)-(b)$

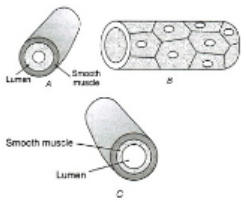
Solution : (Correct Answer: A)
It's obvious.

156. Reabsorption of substances according to the needs of body is called

A) Obligatory reabsorption
B) Facultative reabsorption
C) Glomerular reabsorption
D) None of the above

Solution : (Correct Answer: B)
It's obvious.

157. Identify A, B and C in the given diagram



A) A–Artery, B–Capillary, C–Vein
B) A–Artery, B–Vein, C–Capillary
C) A–Vein, B–Artery, C–Capillary
D) A–Capillary, B–Artery, C–Vein

Solution : (Correct Answer: A)
A–artery, B–capillary,C–vein

158. Grouping of ABO blood is based on the

A) Surface antigens present on $RBCs$
B) Surface lipids present on the cell membrane
C) Nature of all constituents
D) Nature of RBC and WBC

Solution : (Correct Answer: A)
ABO blood grouping is based on the presence or absence of the surface antigens, A and B on $RBCs$

159. Clotting disorders is occurred because

A) Number of platelets become reduce

B) Number of platelets become increase
C) Number of platelets become constant
D) Number of WBC increase

Solution : (Correct Answer: A)

160. Which is correct path for pulmonary circulation ?

A) Left atria (oxygenated blood) $\rightarrow$ lungs (deoxygenated blood) $\rightarrow$ Right atria
B) Left atria (deoxygenated blood) $\rightarrow$ lungs y(oxygenated blood) $\rightarrow$ right atria
C) Left atria (oxygenated blood) $\rightarrow$ lungs(deoxygenated) $\rightarrow$ left atria
D) Right atria (deoxygenated blood) $\rightarrow$ lungs (oxygenated blood) $\rightarrow$ left atria

Solution : (Correct Answer: D)

161. Systole refers to the contraction of

A) SA node
B) AV node
C) Major arteries
D) Atria and ventricles

Solution : (Correct Answer: D)

(d) Systole refers to contraction of atria $(atrial\ systole)$ which propels blood into ventricles and contraction of ventricles $(ventricular\ systole)$ expels blood into aorta and pulmonary artery.

162. Systolic pressure is higher than diastolic pressure because

A) Arteries are contracting during systole
B) Blood is pumped with a pressure in the arteries by the heart during systole but not during diastole.
C) Arteries resist during systole only.
D) Volume of blood is higher in systole than that of diastole in the heart

Solution : (Correct Answer: B)

It's obvious.

163. What is the value of tidal volume in a normal healthy man?

A) Approximately $6000 - 8000$ ml/min
B) $1000 - 1100$ ml/min
C) $2500 - 3000$ ml/min
D) Approximately $8000 - 12000$ ml/min

Solution : (Correct Answer: A)

Minute volume = $TV \times$ Breathing rate
500 ml $\times\ 12 - 16$ /min $\Rightarrow \sim 6000 - 8000$ ml
Minute volume is also known as pulmonary ventilation.

164. Which of the following statements are not correct?
I. Diffusion membrane is made up of 3 layers
II. Solubility of CO_2 in blood is higher than O_2 by 25 times
III. Breathing volumes are estimated by spirometer
IV. High H^+ in blood favours oxygen dissociation
Choose the correct option

A) I and III B) III and IV
C) I and IV D) None of these

Solution : (Correct Answer: D)

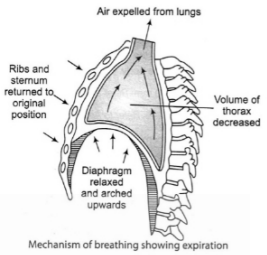
I. Diffusion membrane is made-up of the three layers
II. Solubility of CO_2 in blood is higher than O_2 by 25 times
III. Breathing volumes are estimated by spirometer
IV. High H^{+ii} in blood favours oxygen dissociation

165. Arrange the given steps of expiration in the sequence of event occurring first
I. Relaxation of the diaphragm and sternum
II. Reduction of the pulmonary volume
III. Expulsion of air from the lungs
IV. Increase in intra pulmonary pressure
Choose the correct option

A) $I \rightarrow II \rightarrow III \rightarrow IV$
B) $I \rightarrow II \rightarrow IV \rightarrow III$
C) $IV \rightarrow III \rightarrow II \rightarrow I$
D) $IV \rightarrow II \rightarrow III \rightarrow I$

Solution : (Correct Answer: B)

Relaxation of the diaphragm and intercostal muscles returns the diaphragm and sternum to their normal positions and reduces the thoracic volume and thereby the pulmonary volume. This leads to an increase in intrapulmonary pressure to slightly above the atmospheric pressure, causing the expulsion of air from the lungs, i.e., expiration



Mechanism of breathing showing expiration

166. During swallowing, glottis can be covered by a thin elastic cartilaginous flap called ...A... to prevent the entry of food into laryn x. Trachea is a straight tube extending up to ...B... cavity, which divides at the level of $5th$ thoracic vertebra into right and left primary ...C...
Choose the correct option for A, B and C from the given four options to complete the above statement with reference to NCERT textbook

A) $A-$ epiglottis, $B-$ bronchi, $C-$ bronchioles
B) $A-$ epiglottis, $B-$ mid thoracic, $C-$ bronchi
C) $A-$ epiglottis, $B-$ hind thoracic, $C-$ bronchi
D) $A-$ epiglottis, $B-$ pre thoracic, $C-$ bronchi

Solution : (Correct Answer: B)

167. Carbonic anhydrase is found in

A) RBCs B) Plasma
C) Both (a) and (b) D) None of these

Solution : (Correct Answer: C)

Carbonic anhydrase is found in the blood and the minute quantity of same is in plasma

168. High percentage of CO_2 is transported in dissolved form as compared to O_2. This is because

A) O_2 has high solubility in plasma
B) CO_2 has high solubility in plasma
C) pCO_2 is high in blood than pO_2
D) CO_2 has low solubility in plasma

Solution : (Correct Answer: B)

Ratio of CO_2 and O_2 solubility in plasma is 25 : $1\ (CO_2 : O_2)$.

169. Which of the following type of muscle tissue is being described on the basis of given statements?
(i) These muscle fibres taper at both ends and do not show striations.

(ii) The wall of internal organs such as the blood vessels, stomach and intestine contain this type of muscle tissue.
(iii) They are 'involuntary' as their function cannot be directly controlled.

A) Skeletal muscle **B)** Smooth muscle
C) Cardiac muscle **D)** All of these

Solution : (Correct Answer: B)

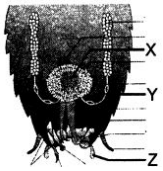
The smooth muscle fibres are involuntary, taper at both ends and do not show striation. The wall of internal organs such as the blood vessels, stomach and intestine contains this type of muscle tissue.

170. Select the incorrect option for compound epithelium?

A) It is made of more than one layer of cells
B) Main function is to provide protection against chemical and mechanical stress
C) Cover the dry surface of skin
D) Cells secrete modified polysaccharides

Solution : (Correct Answer: D)

171. Identify X, Y and Z given figure. $X - Y - Z$



A) Anal cercus - Caudal style - Small tubules
B) Small tubules - Vas deferens - Caudal style
C) Vas deferens - phallic gland - Caudal style
D) Caudal style - small tubules - phallic gland

Solution : (Correct Answer: B)

172. Which is not correct about bones?

A) Ground substance is hard and non pliable.
B) It is connective tissue.
C) Bones support and protect softer tissuesand organs.
D) Bone marrow is not site for production of blood cells.

Solution : (Correct Answer: D)

173. The adult frog is

A) Carnivorous **B)** Herbivorous
C) Omnivorous **D)** None of these

Solution : (Correct Answer: A)

(a)The adult frog is carnivorous and feeds upon insects, spiders, worms etc.

174. Parotid glands are found in

A) Bufo **B)** Hyla
C) Rana **D)** Alytes

Solution : (Correct Answer: A)

(a) The elevated poison secreting glands or parotid glands are present behind each tympanum of Bufo.

175. A coelom is a

A) cavity between inner and outer gut wall
B) body cavity lined by mesoderm
C) body cavity not lined by mesoderm
D) body cavity lined by endoderm

Solution : (Correct Answer: B)

176. Match the following group of organisms with their respective distinctive characteristics and select the correct option:

Organisms	Characteristics
(a) Platyhelminthes	(i) Cylindrical body with no segmentation
(b) Echinoderms	(ii) Warm blooded animals with direct development
(c) Hemichordates	(iii) Bilateral symmetry with incomplete digestive system
(d) Aves	(iv) Radial symmetry with indirect development

A) $(a)-(i),(b)-(ii),(c)-(iii),(d)-(iv)$
B) $(a)-(iii),(b)-(iv),(c)-(i),(d)-(ii)$
C) $(a)-(ii),(b)-(iii),(c)-(iv),(d)-(i)$
D) $(a)-(iv),(b)-(i),(c)-(ii),(d)-(iii)$

Solution : (Correct Answer: B)

Option (2) is the correct answer.
Birds and mammals are homeotherms (warm blooded). Metameric segmentation is present in annelids, Arthropods and chordates.
Adult echinoderms are radially symmetrical but larvae are bilaterally symmetrical.
In most of the platyhelminths, single opening of digestive system serves the function of both mouth and anus.

177. Chordates are distinguished from non-chordates by the presence of

A) Ventral nerve cord
B) Dorsal nerve cord
C) Brain
D) Dorsal tubular nerve cord

Solution : (Correct Answer: D)

(d)The central nervous system of chordates is present dorsally in the body. It is in the form of a longitudinal, hollow or tubular nerve cord laying just above the notochord and extending lengthwise in the body.

178. Which of the following is an insect

A) Moth **B)** Mites
C) Prawn **D)** Scorpion

Solution : (Correct Answer: A)

It's obvious

179. Which of the following is not found in Hydra

A) Epithelio-muscular cells
B) Cnidocyte
C) Choanocyte
D) Nerve cells

Solution : (Correct Answer: C)

(c)Choanocytes cells is a characteristic feature of sponge which are also known as collar cells.

180. Animals devoid of respiratory, excretory and circulatory organs are

A) Tapeworms **B)** Sponges
C) Thread worms **D)** Live Fluke

Solution : (Correct Answer: B)

It's obvious.