All India Aakash Test Series for NEET - 2026

OPEN MOCK TEST - 3 (Code-E)

Click here for Code-F Sol.

Test Date : 19/04/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (2)

Hint: Use principle of calorimetry

Sol.: Energy released during temperature change of water from 100°C to 0°C

$E_{release} = mS_w\Delta T$

$= 10 \times 1 \times 100$

$= 1000$ cal

Energy required to convert ice at –10°C to water at 0°C

$E_{required} = mS_{ice}\Delta T + mL$

$= 10 \times \frac{1}{2} \times 10 + 10 \times 80$

$= 50 + 800$

$= 850$ cal

Since $E_{release} > E_{required}$

$\therefore$ Final composition = 20 g water.

2. Answer (2)

Hint: At constant pressure, $Q = nC_p\Delta T$

and $\Delta U = nC_V\Delta T$

Sol.: $\frac{\Delta U}{Q} = \frac{nC_v\Delta T}{nC_p\Delta T} = \frac{C_v}{C_p}$

For diatomic gas, $\gamma = \frac{C_p}{C_v} = 1 + \frac{2}{f}$

$\Rightarrow \frac{C_p}{C_v} = 1 + \frac{2}{5} = \frac{7}{5}$

$\therefore \frac{C_v}{C_p} = \frac{5}{7}$

3. Answer (2)

Hint: Use, $U = \frac{Kq_1q_2}{r}$

Sol.: $\Delta U = U_f - U_i$

$= \frac{Kq_1q_2}{r} - 0$

$= \frac{9 \times 10^9 \times 2 \times 10^{-6} \times 2 \times 10^{-6}}{10 \times 10^{-2}}$

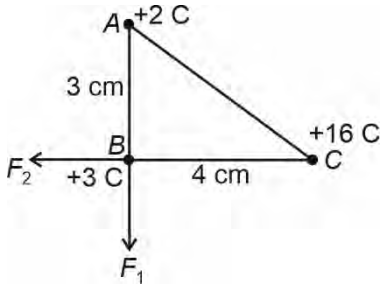
$= 36 \times 10^{-2}$ J

$= 0.36$ J

4. Answer (3)

Hint: Use superposition principle

Sol.:



$F_1 = \frac{K(2)(3)}{(3 \times 10^{-2})^2}$

$= \frac{2}{3} \times \frac{9 \times 10^9}{10^{-4}}$

$= 6 \times 10^{13}$ N

$F_2 = \frac{K(3)(16)}{(4 \times 10^{-2})^2} = \frac{9 \times 10^9 \times 3 \times 16}{16 \times 10^{-4}}$

$= 27 \times 10^{13}$ N

$F_{net} = \sqrt{F_1^2 + F_2^2} = 10^{13}\sqrt{36 + 729} = \sqrt{765} \times 10^{13}$ N

5. Answer (3)

Hint: Wave velocity $V_w = \frac{\lambda}{T}$ and maximum particle velocity $V_m = A\omega$

Sol.: $V_w = \frac{1}{2}(V_m)$

$\frac{\lambda}{T} = \frac{1}{2} \times A \times \frac{2\pi}{T}$

$\Rightarrow \lambda = A\pi$

$\lambda = 10\pi$ cm

$= 10 \times 3.14$ cm

$= 31.4$ cm

6. Answer (3)

Hint: Direction of electric field on the axis of a dipole is along the direction of dipole moment while at equatorial position it is opposite to direction of dipole moment.

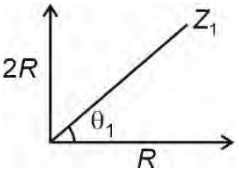
Sol.: Initially,

Finally,

7. Answer (1)

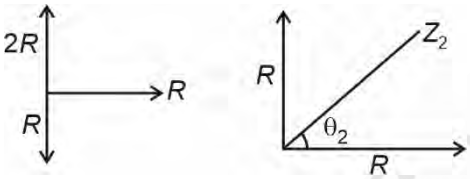
Hint: Power factor $\cos\theta = \frac{R}{Z}$

Sol.: Initially,



$$\cos\theta_1 = \frac{R}{Z_1} = \frac{R}{\sqrt{5}R} = \frac{1}{\sqrt{5}}$$

Finally,



$$\cos\theta_2 = \frac{R}{Z_2} = \frac{R}{\sqrt{2}R} = \frac{1}{\sqrt{2}}$$

$$\therefore \quad \frac{\cos\theta_2}{\cos\theta_1} = \sqrt{\frac{5}{2}}$$

8. Answer (3)

Hint and Sol.: Sensitivity $S_g = \frac{\theta}{i} = \frac{NAB}{C}$

$\therefore$ S_g can be increased by placing a suitable magnetic material. Soft iron has a high magnetic permeability and can be easily magnetized and demagnetized.

9. Answer (2)

Hint: Use photoelectric equation,

$$(KE)_{max} = \frac{hc}{\lambda} - \frac{hc}{\lambda_{th}}$$

Sol.: $(KE)_{max} = \frac{12400}{\lambda} - \frac{12400}{5000}$

$$\Rightarrow \quad 4 = \frac{12400}{\lambda} - 2.48$$

$$\Rightarrow \quad 6.48 = \frac{12400}{\lambda}$$

$$\Rightarrow \quad \lambda = \frac{12400}{6.48} = 1913.58 \text{ Å}$$

10. Answer (1)

Hint: Number of different photons emitted $= \frac{n(n-1)}{2}$

Sol.: $3 = \frac{n(n-1)}{2}$

$\Rightarrow$ $n = 3$

The three wavelengths corresponds to the transitions

$n = 3$ to $n = 2$

$n = 3$ to $n = 1$

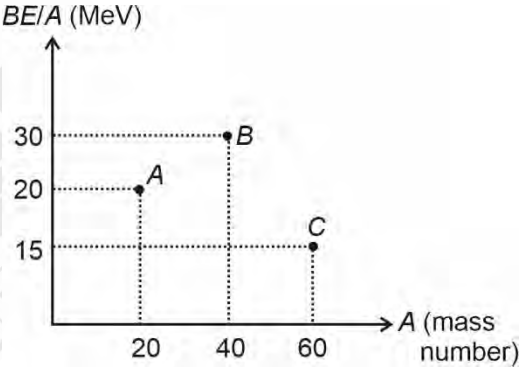
$n = 2$ to $n = 1$

11. Answer (4)

Hint: $C \rightarrow A + B$

Energy released $E = (BE)_A + (BE)_B - (BE)_C$

Sol.:



$(BE)_A = 20 \times 20 = 400$ MeV

$(BE)_B = 40 \times 30 = 1200$ MeV

$(BE)_C = 60 \times 15 = 900$ MeV

Energy released $E = 400 + 1200 - 900$

$= 700$ MeV

12. Answer (2)

Hint: Difference in potential energy does not depend on reference chosen.

Sol.: PE difference between first exited state and second exited state is equal to 3.78 eV

$\therefore$ $(PE)_2 - (PE)_1 = 3.78$

$(PE)_2 - 0 = 3.78$

$(PE)_2 = 3.78$ eV

13. Answer (3)

Hint: Average speed $v_{avg} = \frac{\text{Total distance}}{\text{Total time}}$

Sol.: $v_{avg} = \dfrac{5x}{\dfrac{3x}{v_1} + \dfrac{2x}{v_2}}$

$= \dfrac{5}{\dfrac{3v_2 + 2v_1}{v_1 v_2}}$

$= \dfrac{5v_1v_2}{2v_1 + 3v_2}$

14. Answer (1)

Hint: Horizontal distance $x = u_x t$

Sol.: $x = u_x t = 10 \times \cos 37° \times t$

$\Rightarrow \quad 32 = 10 \times \dfrac{4}{5} \times t$

$\Rightarrow \quad t = 4$ s

And $y = u_y t + \dfrac{1}{2}at^2$

$\Rightarrow \quad -H = 10 \sin 37° \times t - \dfrac{1}{2} \times 10 \times t^2$

$\Rightarrow \quad -H = 10 \times \dfrac{3}{5} \times 4 - 5 \times 4^2$

$\Rightarrow \quad -H = 24 - 80$

$\Rightarrow \quad H = 56$ m

15. Answer (1)

Hint: Youngs modulus $Y = \dfrac{F\ell}{A\Delta\ell}$

Sol.: $\Delta\ell = \dfrac{F\ell}{AY}$

$= \dfrac{250 \times 20}{4 \times 10^{-4} \times 10^{10}}$

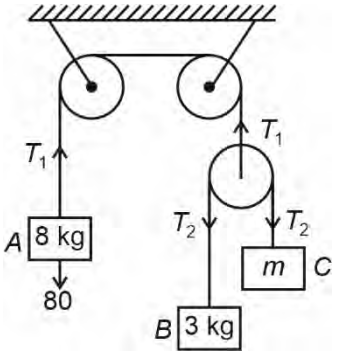
$= \dfrac{5000}{4} \times 10^{-6}$

$= 1.25 \times 10^{-3}$ m

16. Answer (1)

Hint: Since block 8 kg is at rest, so tension in the string connected to 8 kg block is 80 N

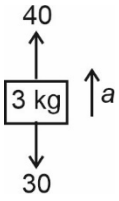
Sol.:



$2T_2 = T_1$

$\Rightarrow \quad T_2 = \dfrac{T_1}{2} = \dfrac{80}{2} = 40$ N

FBD of block 3 kg



$3a = 40 - 30$

$\Rightarrow \quad a = \dfrac{10}{3}$ m/s^2

For system,

$a = \dfrac{10}{3} = \dfrac{(m-3)g}{3+m}$

$\Rightarrow \quad 3 + m = 3m - 9$

$\Rightarrow \quad 2m = 12$

$\Rightarrow \quad m = 6$ kg

17. Answer (2)

Hint: Phase difference $\Delta\phi = \dfrac{2\pi}{\lambda}\Delta x$

Sol.: $v = f\lambda$

$\Rightarrow \quad \lambda = \dfrac{v}{f} = \dfrac{20}{200} = 0.1\,\text{m} = 10\,\text{cm}$

Phase difference $\Delta\phi = \dfrac{2\pi}{\lambda}\Delta x = \dfrac{\pi}{2}$ radian

18. Answer (2)

Hint: $\langle E \rangle = \dfrac{\int (E)dt}{\int dt}$

Sol.: $\langle E \rangle_{t=0 \text{ to } 2\text{ s}} = \dfrac{\int_0^2 4t^3 dt}{\int_0^2 dt} = \dfrac{[t^4]_0^2}{2-0}$

$= \dfrac{2^4 - 0}{2 - 0} = 8$ J

19. Answer (3)

Hint: Time of flight, $T = \sqrt{\dfrac{2h}{g}}$

Sol.: $T = \sqrt{\dfrac{2h}{g}}$

$\dfrac{T_1}{T_2} = \sqrt{\dfrac{h_1}{h_2}}$

20. Answer (2)

Hint: Use equation of trajectory $y = x\tan\theta\left(1-\frac{x}{R}\right)$

Sol.: $y = x\tan\theta\left(1-\frac{x}{R}\right)$

At x = 20 m, y = 20 m and R = 50 m

$$20 = 20\tan\theta\left(1-\frac{20}{50}\right)$$

$$1 = \tan\theta\left(\frac{3}{5}\right)$$

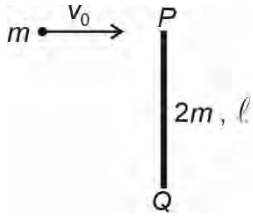
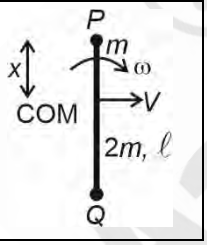
$$\tan\theta = \frac{5}{3}$$

$$\theta = \tan^{-1}\left(\frac{5}{3}\right)$$

21. Answer (4)

Hint: Apply conservation of angular momentum and linear momentum.

Sol.:

Before Collison	After collision
	

$$\Rightarrow\quad x = \frac{2m}{3m}\times\frac{\ell}{2} = \frac{\ell}{3}$$ (From point P)

Angular momentum conservation (rod will rotate about COM)

$L_i = L_f$

$$\Rightarrow\quad mV_0\frac{\ell}{3} = \left(m\left(\frac{\ell}{3}\right)^2 + \frac{2m\ell^2}{12} + 2m\left(\frac{\ell}{6}\right)^2\right)\omega$$

$$\Rightarrow\quad \frac{V_0\ell}{3} = \left(\frac{\ell^2}{9} + \frac{\ell^2}{6} + \frac{2\ell^2}{36}\right)\omega$$

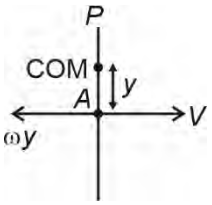
$$\Rightarrow\quad \frac{V_0}{3} = \frac{12\ell}{36}\omega$$

$$\Rightarrow\quad \omega = \frac{V_0}{\ell}$$

Linear momentum conservation

$$mV_0 = 3mV \Rightarrow V = \frac{V_0}{3}$$

Now,



$V_A = V - \omega y = 0$

$$\Rightarrow\quad \frac{V_0}{3} - \frac{V_0 y}{\ell} = 0$$

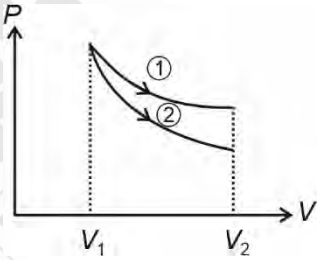
$$\Rightarrow\quad \boxed{\frac{\ell}{3} = y}$$

Distance from point P

$$x + y = \frac{\ell}{3} + \frac{\ell}{3} = \frac{2\ell}{3} = 24 \text{ cm}$$

22. Answer (3)

Hint:



Slope of adiabatic process $= -\frac{\gamma P}{V}$

Slope of isothermal process $= -\frac{P}{V}$

$\therefore$ Graph (1) is for isothermal process

Graph (2) is for adiabatic process.

Sol.: (W.D. by isothermal) > (W.D. by adiabatic)

$\Rightarrow$ By first law of thermodynamics

$dQ = dU + W$

for adiabatic process, $dQ = 0$

$\Rightarrow\quad dU = -W$

$\Rightarrow\quad dU < 0$

$\Rightarrow\quad \Delta T < 0$

and for isothermal process $\Delta T = 0$

$\therefore$ T_f isothermal > T_f adiabatic

23. Answer (2)

Hint: Magnetic flux $\phi = \vec{B}\cdot\vec{A}$

Sol.: $\vec{B} = B_0\left(-2\hat{i} + 3\hat{j} + 2\hat{k}\right)$

And $\vec{A} = \pi R^2\hat{k}$

$\phi = \vec{B}\cdot\vec{A}$

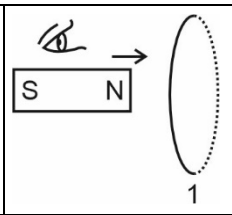
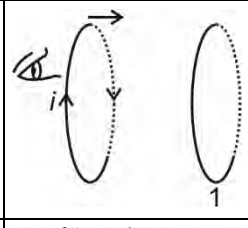
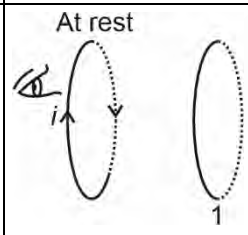
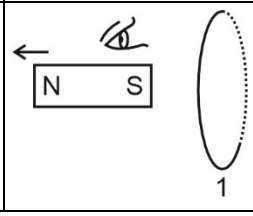
$= B_0\left(-2\hat{i} + 3\hat{j} + 2\hat{k}\right)\cdot\left(\pi R^2\hat{k}\right)$

$= 2B_0\pi R^2$

24. Answer (2)

Hint: When flux is changing through a loop, current is induced in the loop to oppose this change.

Sol.:

a.		(ii)	Anticlockwise
b.		(i)	Clockwise
c.		(iii)	$\Delta\phi = 0$ $\Rightarrow i = 0$
d.		(ii)	Anticlockwise

25. Answer (2)

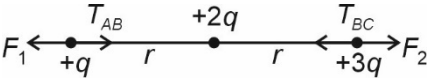
Hint: Use Pascal's law

Sol.: $\frac{F}{a} = \frac{600g}{2.5\times 0.8}$

$F = \frac{600\times 10\times 0.05}{2} = 150\text{ N}$

26. Answer (1)

Hint: Tension is developed due to electrostatic repulsive force.

Sol.: 

$F_1 = \frac{K(q)(2q)}{r^2} + \frac{K(q)(3q)}{(2r)^2} = \frac{Kq^2}{r^2}\left[2 + \frac{3}{4}\right] = \frac{11}{4}\frac{Kq^2}{r^2}$

$F_2 = \frac{K(3q)(2q)}{r^2} + \frac{K(3q)(q)}{(2r)^2} = \frac{Kq^2}{r^2}\left[6 + \frac{3}{4}\right] = \frac{27}{4}\frac{Kq^2}{r^2}$

$\frac{T_{AB}}{T_{BC}} = \frac{F_1}{F_2} = \frac{11}{27}$

27. Answer (1)

Hint: Focal length of lens is given by

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

Sol.: If $\mu_m > \mu_L$, then convex lens behaves like a diverging lens.

28. Answer (1)

Hint: Magnetic field due to straight wire on its axis is zero.

Sol.: $B = \frac{\mu_0 i}{4\pi d}\otimes + 0 = \frac{\mu_0 i}{4\pi d}\otimes$

29. Answer (4)

Hint: Direction of magnetic field is parallel to $\left(id\vec{\ell}\times\vec{r}\right)$

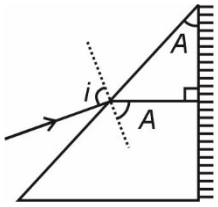
Sol.: $i\,d\vec{\ell}$ is vertically upwards

$\vec{r}$ is towards north

$\therefore$ Hence, direction of magnetic field will be towards west.

30. Answer (2)

Hint: For retracing of light, light will fall perpendicularly on the silver coated surface.

Sol.: 

$1\sin i = \mu\sin A$

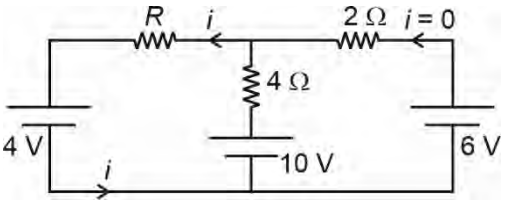
$\sin 53° = \mu \times \sin 37°$

$\frac{4}{5} = \mu\times\frac{3}{5} \Rightarrow \mu = \frac{4}{3}$

31. Answer (2)

Hint: Use Kirchhoff's loop law.

Sol.:



$\Rightarrow$ $10 - 4i = 6$

$4i = 4$

$i = 1$ A

And by loop law,

$\frac{10-4}{4+R} = 1 \Rightarrow 6 = 4 + R$

$R = 2\ \Omega$

32. Answer (3)

Hint: At mean position, net force on particle is zero and at extreme position particle is at rest.

Sol.: $F = 16 - 4x$

$F = -4(x - 4)$

$F = 0$, $x = 4$ m $\rightarrow$ mean position

Since particle is at rest at $x = 7$ m

$\therefore$ Extreme position is at $x = 7$ m

Amplitude = 7 – 4 = 3 m

33. Answer (1)

Hint: If mass m is displaced by y, the spring will also stretch by y.

Sol.:

$\therefore$ Time period, $T = 2\pi\sqrt{\frac{m}{k}}$

$= 2\pi\sqrt{\frac{2}{800}} = 2\pi\sqrt{\frac{1}{400}} = \frac{\pi}{10}$ s

34. Answer (2)

Hint: Since there is no external force on the system, therefore the horizontal position of COM remains same.

Sol.: Let wedge moves towards right by a distance x, then block will move towards left by a distance $(6.5 - x)$

$M(6.5 - x) = 12Mx$

$\Rightarrow \frac{13}{2} - x = 12x$

$\Rightarrow 13x = \frac{13}{2}$

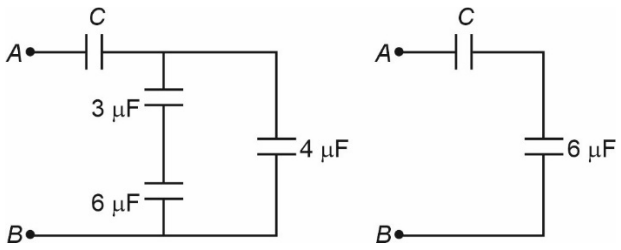
$\Rightarrow x = 0.5$ m

35. Answer (3)

Hint: In parallel, $C_{eq} = C_1 + C_2$.....

and in series, $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$

Sol.: Circuit can be redrawn as



$2 = \frac{6C}{6 + C}$

$\Rightarrow 12 + 2C = 6C$

$C = 3\ \mu$F

36. Answer (3)

Hint: Use, $\alpha = \frac{d\omega}{dt}$

Sol.: $\int_0^{\omega} d\omega = \int_0^2 \alpha dt$

$\omega = \int_0^2 (3t^2 - 2t)dt = \left[t^3 - t^2\right]_0^2$

$= 8 - 4 = 4$ rad/s

37. Answer (3)

Hint: In circular motion,

Tangential acceleration $a_t = \frac{dv}{dt}$

Radial acceleration $a_r = \frac{v^2}{R}$

Net acceleration $a_N = \sqrt{a_r^2 + a_t^2}$

Sol.: Speed $v = 4t$

$a_t = \frac{dv}{dt} = 4\ \text{m s}^{-2}$

$a_r = \frac{v^2}{R}$

at $t = 1$ s, $v = 4$ m s^{-1}

$a_r = \frac{4^2}{4} = 4\ \text{m s}^{-2}$

at $t = 1$ s, $a_N = \sqrt{a_r^2 + a_t^2}$

$= \sqrt{4^2 + 4^2}$

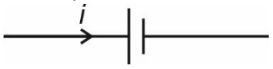
$= 4\sqrt{2}\ \text{m s}^{-2}$

at $t = 2$ s, $v = 8$ m s^{-1}

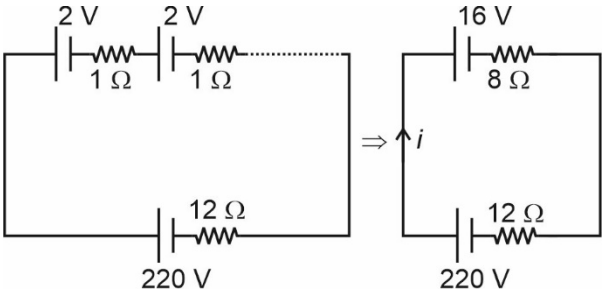
$a_r = \frac{64}{4} = 16\ \text{m s}^{-2}$

38. Answer (2)

Hint: In case of charging, current goes to the battery



Sol.:



$\Rightarrow \quad i = \dfrac{220-16}{20} = \dfrac{204}{20} = 10.2 \text{ A}$

39. Answer (2)

Hint: Surface energy $E = T \times 2A$ because thin film has two free surfaces.

Sol.: Surface energy, $E = T \times 2A$

$= 7 \times 2 \times 0.02$

$= 0.28$ J

40. Answer (2)

Hint: Thermal resistance of all rods are same.

Sol.: $R_1 = R_2 = R_3 = R$

Let temperature of junction be x

$$\frac{x-80}{R} + \frac{x-80}{R} + \frac{(x-0)}{R} = 0$$

$\Rightarrow \quad 3x = 160$

$$x = \frac{160}{3}^\circ\text{C}$$

41. Answer (2)

Hint: If path difference at central bright fringe is zero, then path difference at third bright fringe is 3λ

Sol.: $\Delta x = 3\lambda$

$= 3 \times 5000 \times 10^{-10}$ m

$= 15 \times 10^{-7}$ m

$= 1.5\ \mu$m

42. Answer (3)

Hint and Sol.: Photo-diode works in reverse bias condition.

Its V-I characteristics lies in III quadrant.

43. Answer (2)

Hint: If both inputs of NOR gate and NAND gate are same, then they behave as NOT gate.

Sol.: $Y = \overline{A} + \overline{B}$

$= \overline{A \cdot B}$

= NAND gate

44. Answer (2)

Hint: Intensity $I = \dfrac{P}{4\pi r^2}\eta = \dfrac{1}{2}\varepsilon_0 E_0^2 c$

Sol.: $\dfrac{P}{4\pi r^2}\eta = \dfrac{1}{2}\varepsilon_0 E_0^2 c$

$$\Rightarrow \quad \frac{2P}{4\pi\varepsilon_0 r^2 c}\eta = E_0^2$$

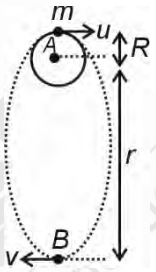
$$\Rightarrow \quad \frac{2\times 150 \times 9\times 10^9}{9\times 3\times 10^8} \times \frac{5}{100} = E_0^2$$

$$\Rightarrow \quad E_0 = \frac{10}{\sqrt{2}} \text{ V/m}$$

45. Answer (4)

Hint: Work done by gravity (W) = –(Change in potential energy) = $U_i - U_f$

Sol.:



$$W = \frac{-GMm}{R} - \left(\frac{-GMm}{r}\right)$$

$$\Rightarrow \quad \frac{-mgR}{3} = \frac{-GMm}{3R} = \frac{-GMm}{R} + \frac{GMm}{r}$$

$$\Rightarrow \quad r = \frac{3R}{2}$$

Applying conservation of angular momentum at A and B, $muR = mvr$

$$\Rightarrow \quad v = u\frac{R}{r} = \frac{2u}{3}$$

Conserving energy at A and B,

$$\frac{1}{2}mu^2 - \frac{GMm}{R} = \frac{1}{2}mv^2 - \frac{GMm}{r}$$

$$\Rightarrow \quad \frac{1}{2}mu^2 - mgR = \frac{1}{2}m\left(\frac{4u^2}{9}\right) - \frac{mgR^2}{3R}\times 2$$

$$\Rightarrow \quad \frac{1}{2}mu^2\left(\frac{5}{9}\right) = \frac{mgR}{3}$$

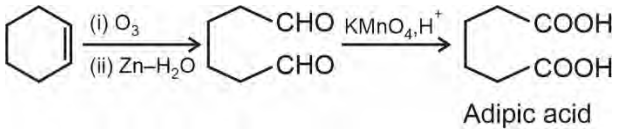
$$u = \sqrt{\frac{6gR}{5}}$$

[CHEMISTRY]

46. Answer (4)

Hint: $KMnO_4/H^+$ convert aldehydic group into carboxylic acid.

Sol.:



Adipic acid

47. Answer (4)

Hint: p-Nitrophenol is more acidic than ortho and meta nitrophenol.

Sol.: Hydrogen of –OH in o-Nitrophenol is involved in intramolecular H-bonding, due to which release of H^+ ion is not easy.

48. Answer (4)

Hint: Due to more lp-lp repulsion in F_2, bond enthalpy of F_2 becomes lower than the Cl_2 and Br_2.

Sol.:

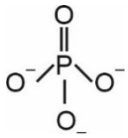
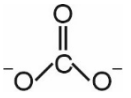
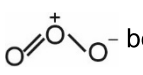
Molecules	Bond dissociation enthalpy (kJ mol^{-1})
Cl_2	242.6
Br_2	192.8
F_2	158.8
I_2	151.1

49. Answer (3)

Hint: For molecules with resonating structures

$$\text{Bond order} = \frac{\text{Number of } (\sigma+\pi) \text{ bonds}}{\text{Number of } \sigma \text{ bonds}}$$

Sol.:

- P – O in PO_4^{3-}  bond order $= \frac{5}{4}$
- C – O in CO_3^{2-}  bond order $= \frac{4}{3}$
- O – O in O_3  bond order $= \frac{3}{2}$
- CN^- bond order (C – N) = 3

50. Answer (4)

Hint: If $E°_{cell} > 0$, then cell reaction is Feasible.

Sol.:

- $E°_{cell} = E°_{cathode} - E°_{anode}$

= +1.510 – 1.233 = + 0.287 V

As $E°_{cell}$ is positive, hence MnO_4^- liberates O_2 from water in the presence of an acid.

51. Answer (4)

Hint: cis-$[CrCl_2(ox)_2]^{3-}$ is optically active molecule.

Sol.: cis-$[CrCl_2(ox)_2]^{3-}$ lacks plane of symmetry and centre of symmetry, so, it is a chiral molecule.

52. Answer (3)

Hint: Element P is Pt, belonging to d-block elements.

Sol.:

P – Ni

Q – Hf

R – Gd

S – Te

T – Mo

P, Q and T belongs to d-block

53. Answer (2)

Hint: Kinetic energy = – Total energy

Sol.:

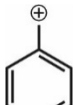
Energy of electron in first excited state is –3.4 eV, so the kinetic energy of electron in same orbit (n = 2) will be +3.4 eV

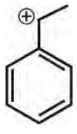
54. Answer (2)

Hint: Alcohol that forms tertiary carbocation reacts instantly with Lucas reagent.

Sol.:

b.  stabilised by +I effect and hyperconjugation.

c.  stabilised by resonance

e.  stabilised by resonance and hyperconjugation

55. Answer (3)

Hint: β-D-galactose and β-D-glucose are monomers of lactose

Sol.: The glycosidic linkage in lactose.

C1 of β-D-Galactose and C4 of β-D-glucose

56. Answer (1)

Hint: Apply initial rate method.

Sol.: x = order w.r.t. A and y = order w.r.t. B

- Rate = $k[A]^x [B]^y$

$6.93 \times 10^{-3} = k(0.1)^x (0.2)^y$

- Rate = $k(0.1)^x (0.8)^y = 13.86 \times 10^{-3}$

Dividing the two equations

$$\frac{1}{2} = \left(\frac{1}{4}\right)^y$$

$$\left(\frac{1}{2}\right) = \left(\frac{1}{2}\right)^{2y}$$

$2y = 1$

$$y = \frac{1}{2}$$

- Rate = $6.93 \times 10^{-3} = k (0.2)^x (0.2)^y$

$$\frac{6.93\times10^{-3}}{6.93\times10^{-3}} = \frac{(0.1)^x \times (0.2)^y}{(0.2)^x \times (0.2)^y}$$

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

$x = 0$

$$\text{Rate} = k[A]^0[B]^{\frac{1}{2}}$$

57. Answer (2)

Hint: For equimolal solutions,

$\boxed{\Delta T_f \propto i}$

Sol.:

a. $i = 1 + (n - 1)\alpha$

$= 1 + 0.7 = 1.7$

b. $i = 1 + 2 \times 1 = 3$

c. $i = 1 + 2 \times 0.4 = 1.8$

d. $i = 1$

Order of i :- b > c > a > d

Order T_f :- b < c < a < d

58. Answer (3)

Hint: Limiting molar conductivity of KCl is greater than NaCl.

Sol.: The value of $\wedge_m$ increases steeply for P on dilution due to increase in α and consequently the number of ions in total volume of solution.

59. Answer (4)

Hint: $r_n = \frac{52.9 \times n^2}{Z}$ pm

Sol.:

a. n = 3, Z = 1, r = 52.9 × 9 pm = $9a_0$

b. n = 1, Z = 3 $r = \frac{52.9\times1}{3}\text{ pm} = \frac{a_0}{3}$

c. n = 2, Z = 4, $r = \frac{52.9\times4}{4}\text{ pm} = a_0$

d. n = 1, Z = 2, $r = \frac{52.9\times1^2}{2}\text{ pm} = \frac{a_0}{2}$

60. Answer (3)

Hint: Osmotic pressure is widely used to determine molar masses of proteins, polymers and other macromolecules.

Sol.: The osmotic pressure method has the advantage over other methods as pressure measurement is around the room temperature and the molarity of the solution is used instead of molality.

61. Answer (3)

Hint: $\frac{r_{(T+\Delta T)}}{r_T} = 2^{\frac{\Delta T}{T}}$

Sol.: At 10°C rise in temperature, rate increases by 2

$$\frac{r_{80°C}}{r_{10°C}} = 2^{\left(\frac{80-10}{10}\right)} = 2^7 = 128 \text{ times}$$

62. Answer (2)

Hint: RMgX firstly takes away proton from –OH group

Sol.: 4 moles of RMgX required for the reaction with 1 mole of given compound.

63. Answer (1)

Hint: Alcohols have high boiling point due to intermolecular H-bonding.

Sol.: The correct order of boiling point of molecules with comparable molar masses is

Alcohols > 1° amines > 2° amines > 3° amines

64. Answer (2)

Hint: $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$

Sol.: The oxidation number of carbon is changing from –4 to + 4.

65. Answer (3)

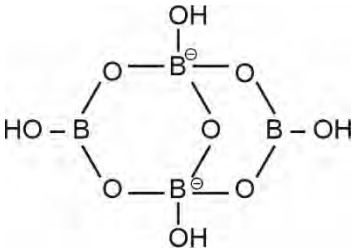
Hint: O_3 is a good oxidising agent due to the liberation of nascent oxygen.

Sol.: O_3 oxidised PbS to $PbSO_4$.

66. Answer (3)

Hint: Borax contains 5 (B – O – B) bonds.

Sol.: The correct formula is $[B_4O_5(OH)_4]^{2-}$



67. Answer (4)

Hint: The boiling point depends on H-bond and van der Waals forces

Sol.: Group 15 hydrides have the following values of boiling point.

Hydride	Boiling point (K)
NH_3	238.5
PH_3	185.5
AsH_3	210.6
SbH_3	254.6
BiH_3	290

68. Answer (2)

Hint: $2Cu^+ \rightarrow Cu^{2+} + Cu$

Sol.: The hydration enthalpy of $Cu^{2+}(aq.)$ is more negative due to greater charge on copper which compensate IE_2 of Cu.

69. Answer (1)

Hint: As the atomic number increases in actinoids, the ionic radii decreases due to increase in effective nuclear charge.

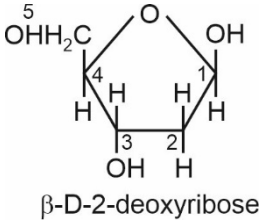
Sol.: The correct order is

$Am^{3+} < Pu^{3+} < Np^{3+} < U^{3+} < Ac^{3+}$

70. Answer (2)

Hint: The sugar moiety of DNA is β-D-2-deoxy ribose.

Sol.:



β-D-2-deoxyribose

Deficiency of vitamin K increases blood clotting time.

71. Answer (2)

Hint:

Solid salt treated with dil. H_2SO_4		Anion detected
Brown fumes	–	NO_2^-

Sol.:

Gas with rotten egg smell	–	S^{2-}
Colourless odourless effervescence	–	CO_3^{2-}
Gas with suffocating odour	–	SO_3^{2-}

72. Answer (2)

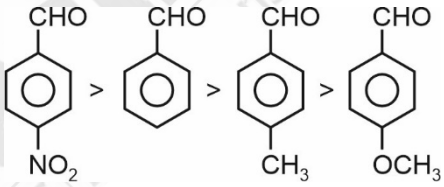
Hint: I_2 acting as oxidising agent with sodium thiosulphate.

Sol.: $2Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + 2NaI$

73. Answer (3)

Hint: Presence of electron donating groups decreases reactivity towards nucleophile addition reaction.

Sol.: Reactivity order will be



74. Answer (1)

Hint: Better is the leaving group ability faster will be the rate of dehydrohalogenation reaction for a given alkyl halides.

Sol.: The correct order of rate of dehydrohalogenation reaction will be

R–I > R–Br > R–Cl > R–F

75. Answer (3)

Hint: H_2O and NH_2^- are isoelectronic and both are sp^3 hybridized.

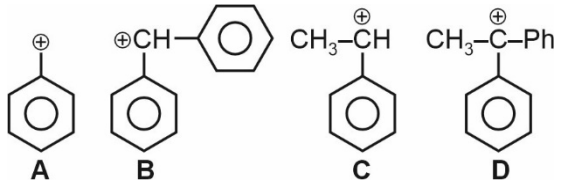
Sol.:

Species	Hybridization of central atom
NO_2^-	sp^2
BF_3	sp^2
H_2O	sp^3
NH_2^-	sp^3
Cl_2O	sp^3

76. Answer (3)

Hint: Rate of S_N1 reaction depends upon the stability of carbocation.

Sol.:



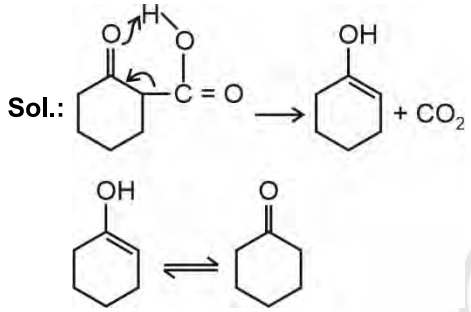
Order of stability of carbocation is

D > B > C > A

77. Answer (3)

Hint: β-keto acid on heating decarboxylate easily.

Sol.:



78. Answer (1)

Hint: With Co^{3+} metal ion $C_2O_4^{2-}$ acting as strong field ligand

Sol.:

- $[Co(C_2O_4)_3]^{3-}$ has zero unpaired electron, μ = 0 BM
- $[FeF_6]^{3-}$ has 5 unpaired electrons, $\mu = \sqrt{5(5+2)}$ = 5.9 BM
- $[MnCl_6]^{3-}$ has 4 unpaired electrons $\mu = \sqrt{4(4+2)}$, μ = 4.89 BM
- $[NiCl_4]^{2-}$ has 2 unpaired electrons $\mu = \sqrt{2(2+2)}$ = 2.8 BM

79. Answer (3)

Hint: For isoelectronic species, size of cation is smaller than size of anion.

Sol.: Order of ionic radii

$Al^{3+} < Na^+ < F^- < O^{2-}$

Z = 89 element is Ac and it is a d-block element.

80. Answer (2)

Hint: $pH = pK_a + \log\frac{[Salt]}{[Acid]}$

Sol.: $6 = 5 + \log\frac{[Salt]}{[Acid]}$

$1 = \log\frac{[Salt]}{[Acid]}$

$\frac{10}{1} = \frac{[Salt]}{[Acid]}$

81. Answer (1)

Hint: Number of atoms = number of moles × N_A × atomicity

Sol.: 36 u of H_2O

Number of molecules of $H_2O = \frac{36}{18} = 2$

Number of atoms = 2 × 3 = 6 atoms

5.6 L of CO_2 gas at STP,

Number of atoms $= \frac{5.6}{22.4} \times N_A \times 3 = 0.75\, N_A$

Number of atoms (in 180 u of glucose) $= \frac{180}{180} \times 24 = 24$ atoms

Number of atoms (in 1 g of H_2) $= \frac{1}{2} \times 2 \times N_A = N_A$

$N_A = 6.02 \times 10^{23}$

82. Answer (4)

Hint: Purple (or violet) coloured complex compound $Na_4[Fe(CN)_5NOS]$ is formed when sodium sulphide solution reacts with sodium nitroprusside solution.

Sol.:

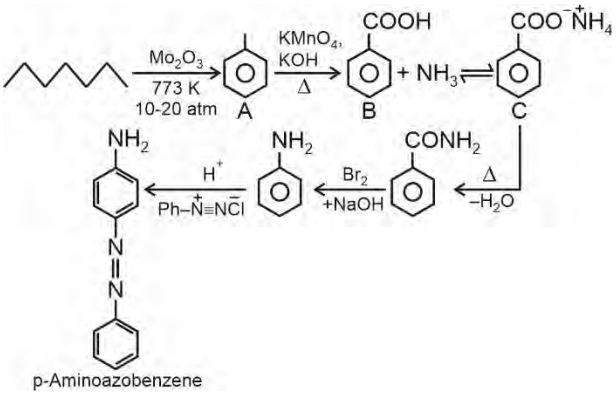
$Na_2S + Na_2[Fe(CN)_5NO] \rightarrow Na_4[Fe(CN)_5NOS]$

Sodium nitroprusside Purple colour

83. Answer (2)

Hint: Aniline gives yellow colour dye with benzene diazonium chloride in acidic medium.

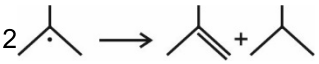
Sol.:



84. Answer (4)

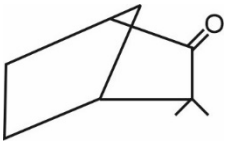
Hint: 3° RX does not give alkane as major product in Wurtz reaction.

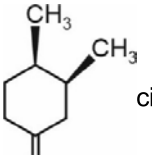
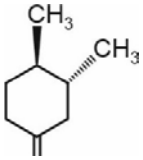
Sol.: If 3° RX is used in Wurtz reaction, free radicals undergo disproportionation reaction as major one.



85. Answer (3)

Hint: α-H from bridge head carbon should not be used for tautomerism since bridge head position cannot be sp^2 hybridised.

Sol.:  contains one α-H but it is present at bridge head carbon.

 cis isomer and  trans isomer

86. Answer (1)

Hint: Organic compound is fused with Na metal to convert elements from covalent form to the ionic form.

Sol.: $Na + C + N \xrightarrow{\Delta} NaCN$

$2Na + S \xrightarrow{\Delta} Na_2S$

$Na + X \xrightarrow{\Delta} NaX$

87. Answer (1)

Hint: 100 mL of NaOH when added to CH_3COOH, creates acidic buffer solution.

Sol.:

a. $\alpha = \sqrt{\frac{K_a}{C}} = \sqrt{\frac{10^{-5}}{10^{-1}}} = \sqrt{10^{-4}} = 10^{-2}$

$[H^+] = c\alpha = 10^{-1} \times 10^{-2} = 10^{-3}$ M

pH = 3

b. $pH = pK_a + \log\frac{[Salt]}{[Acid]}$

[Salt] = [Acid]

$pH = pK_a = 5$

c. At equivalence point salt hydrolysis will takes place

$pH = 7 + \frac{1}{2}(pK_a + \log C)$

Concentration of $CH_3COO^- = \frac{10 \text{ m moles}}{300 \text{ mL}}$

$pH = 7 + \frac{1}{2}\left(5 + \log\frac{1}{30}\right)$

$= 7 + \frac{1}{2}(5 - \log 30)$

= 8.76

88. Answer (3)

Hint: Decomposition reactions are endothermic in nature ($\Delta H > 0$)

Sol.: $\Delta n_g > 0$

Therefore, entropy increases $\Delta S > 0$

89. Answer (3)

Hint: $\Delta H = \Delta U + \Delta n_g RT$

Sol.:

a. $\Delta n_g = -1$ $\Delta H = \Delta U - RT$

b. $\Delta n_g = -3$ $\Delta H = \Delta U - 3RT$

c. $\Delta n_g = +2$ $\Delta H = \Delta U + 2RT$

d. $\Delta n_g = 1/2$ $\Delta H = \Delta U + 1/2RT$

90. Answer (3)

Hint: Intensive properties do not depend on the quantity or size of matter.

Sol.: At equilibrium, ΔG of the system is equal to zero.

Molar heat capacity and specific heat capacity are intensive properties.

[BIOLOGY]

91. Answer (3)

Hint: The basics of taxonomy like identification, naming and classification of organisms have universally evolved under international codes.

Sol.: Plant families like Convolvulaceae and Solanaceae are included in the order Polymoniales, mainly based on the floral characters.

92. Answer (2)

Hint: Members of the kingdom Mycota (Fungi) are eukaryotic and can show saprophytic or parasitic mode of nutrition.

Sol.: Cell wall of fungi is made up of chitin.

93. Answer (1)

Hint: Gametes in *Spirogyra* are non-flagellated.

Sol.: Oogamous type of reproduction is seen in *Fucus*.

94. Answer (3)

Hint: Flower of *Indigofera* can be divided into two equal halves in only one vertical plane.

Sol.: Seeds of *Indigofera* are non-endospermic.

95. Answer (2)

Hint: Seed is a result of sexual reproduction.

Sol.: Sunflower has basal placentation.

96. Answer (3)

Hint: Sepals in mustard show imbricate aestivation.

Sol.: Feature a, c, d, e and f are common for *Hibiscus* and Chilli.

97. Answer (3)

Hint: In pteridophytes, sporophytes bear sporangia that are subtended by sporophylls.

Sol.: Megaspores are not retained permanently within the megasporangium in *Marsilea*.

98. Answer (4)

Hint: The given figure represents a dinoflagellate.

Sol.: Diatoms are the chief producers in the oceans.

99. Answer (3)

Hint: Viruses are obligate parasites.

Sol.: Conidia are the asexual spores that are produced exogenously on the special mycelium called conidiophores.

100. Answer (2)

Hint: Subsidiary cells are devoid of chloroplasts.

Sol.: Monocot stems are comprised of sclerenchymatous hypodermis.

101. Answer (4)

Hint: Endodermis is the innermost layer of cortex.

Sol.: Cambium is a thin strip of primary meristem present between xylem and phloem in dicot stem.

102. Answer (1)

Hint: Isobilateral leaves have nearly similar sized vascular bundle.

Sol.: Parallel venation in monocot leaves is reflected in the near similar sizes of vascular bundles.

103. Answer (4)

Hint: Microbodies are membrane bound minute vesicles that contain various enzymes.

Sol.: A specialised differentiated form of cell membrane called mesosome is found in prokaryotes.

104. Answer (2)

Hint: In dioecious plants, male and female flowers are produced on two separate plants.

Sol.: Seed formation, even in the absence of any pollinating agent, is an advantage of cleistogamy. Cleistogamous flowers are found in the plants like *Oxalis* and *Commelina*.

105. Answer (4)

Hint: In interphase, most of the chromatin is relatively decondensed and loosely distributed throughout the nucleus of a cell.

Sol.: Centriole is devoid of membrane. Transmembrane proteins can be removed by using detergents. Mitochondrial DNA has high G ≡ C content.

106. Answer (3)

Hint: *Petromyzon* belongs to this taxon.

Sol.: *Salamandra* belongs to the division Gnathostomata.

Class – Amphibia

Super class – Tetrapoda

Subphylum – Vertebrata

Phylum – Chordata

107. Answer (3)

Hint: Trophoblast attaches to the innermost layer of uterus

Sol.: The blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called the inner cell mass. The trophoblast layer then gets attached to the endometrium and the inner cell mass gets differentiated into the embryo. After attachment, the uterine cells divide rapidly and cover the blastocyst.

108. Answer (2)

Hint: Sphygmomanometer measures blood pressure.

Sol.: ECG(electrocardiogram) is a graphical representation of the electrical activity of the heart during a cardiac cycle. Electrocardiograph is used to obtain an electrocardiogram (ECG). Spirometer helps to measure pulmonary volumes.

109. Answer (2)

Hint: Fascicle refers to muscle bundle

Sol.: Each organised skeletal muscle in our body is made up of a number of muscle bundles or fascicles held together by a common collagenous connective tissue layer called fascia. Each muscle bundle contains a number of muscle fibres. Each muscle fibre contains actin and myosin myofilaments. Thus, correct order is

Fascicle $\rightarrow$ Muscle fibre $\rightarrow$ Myofibril $\rightarrow$ Myofilament

110. Answer (1)

Hint: A part of forebrain

Sol.: Cerebrum forms the major part of human brain. Cerebrum and hypothalamus are the parts of forebrain while cerebellum and medulla oblongata are the parts of hindbrain.

The cerebrum is longitudinally divided into two halves that are connected by corpus callosum.

111. Answer (4)

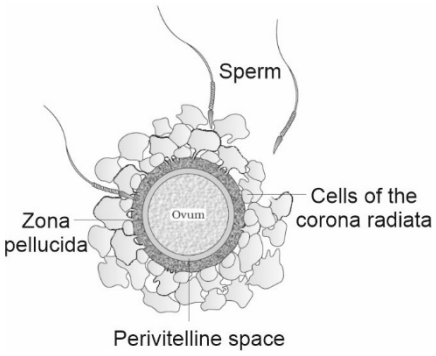
Hint: Molecular weight of lipid never exceeds 800 Da.

Sol.: Gingelly oil is a lipid while guanylic acid is a nucleotide. Former will be obtained in retentate (acid-insoluble) fraction and latter will be obtained in filtrate (acid-soluble) fraction. Both have molecular weights less than 800 Da.

112. Answer (1)

Hint: Produced from secondary oocyte

Sol.:



During fertilisation, a sperm first comes in contact with zona pellucida layer of the ovum and induces changes in the membrane that blocks the entry of additional sperms. Thus, it ensures that only one sperm can fertilize an ovum.

113. Answer (4)

Hint: Pars intermedia is a part of adenohypophysis

Sol.: Adenohypophysis consists of two portions, pars distalis and pars intermedia. In humans, the pars intermedia is almost merged with pars distalis. Neurohypophysis (pars nervosa) also known as posterior pituitary, stores and releases two hormones called oxytocin and vasopressin, which are actually synthesised by the hypothalamus and are transported axonally to the neurohypophysis.

114. Answer (3)

Hint: Dense regular connective tissue

Sol.: In dense connective tissue, orientation of fibres show a regular or irregular pattern and are called dense regular and dense irregular tissues respectively. In the dense regular connective tissues, the collagen fibres are present in rows between many parallel bundles of fibres. Tendons, which attach skeletal muscles to bones and ligaments which attach one bone to another are examples of this tissue.

115. Answer (3)

Hint: A structure present in a female cockroach

Sol.: In female cockroaches, oviducts of each ovary unite into a single median oviduct (also called vagina) which opens into the genital chamber. A pair of spermatheca is present in the 6th segment which opens into the genital chamber.

116. Answer (3)

Hint: Condensation of chromatin material begins in the prophase of karyokinesis.

Sol.: By the end of prophase, Golgi complex, ER, nuclear membrane and nucleolus disappear.

117. Answer (1)

Hint: Splitting of centromere occurs during anaphase II.

Sol.: During anaphase I, the two homologous chromosomes separate from each other. Since only one chromosome out of a pair reaches the pole, the number of chromosomes becomes half in the daughter cells. Next to anaphase I is telophase I. In this phase uncoiling of chromosome occurs.

118. Answer (1)

Hint: Crossing over takes place in the pachytene stage.

Sol.: In the pachytene stage, recombination nodules are formed at the site of crossing over.

119. Answer (3)

Hint: Joseph Priestley performed the bell jar experiment to show that the plants restore to the air, whatever the breathing mouse and the burning candle removed.

Sol.: Cornelius van Niel inferred from his experiments that the oxygen evolved by the green plants comes from H_2O and not from CO_2.

120. Answer (2)

Hint: When several factors affect any biochemical process, Blackman's law of limiting factors comes into effect.

Sol.: Photosynthesis is a physico-chemical process which follows the Blackman's law of limiting factors, according to which, if a chemical process is affected by more than one factor, then its rate is determined by the factor which is nearest to its minimal value.

121. Answer (1)

Hint: Enolase acts on 2-phosphoglycerate and converts it into phosphoenolpyruvate.

Sol.: Fructose-1,6-bisphosphate splits into dihydroxyacetone phosphate (DHAP) and 3-phosphoglyceraldehyde (PGAL) by the action of aldolase.

122. Answer (3)

Hint: Net gain of ATP is two, in both, lactic acid and alcohol fermentation.

Sol.: Alcohol fermentation results in the release of CO_2 along with alcohol, while lactic acid fermentation releases lactic acid only.

123. Answer (1)

Hint: Gibberellins stimulate the synthesis of hydrolytic enzymes for mobilisation of reserve food.

Sol.: Gibberellins stimulate stem elongation and other aerial parts but have no effect on roots.

124. Answer (1)

Hint: Geometric growth rate results in the formation of a sigmoid curve.

Sol.: Arithmetic growth rate refers to the constant growth of an organism or a part, per unit time and is represented by the equation, $L_t = L_0 + rt$.

125. Answer (2)

Hint: The outermost layer of a bacterial cell envelope is glycocalyx that can be in the form of a capsule which allows the bacterium to hide from the host's immune system.

Sol.: Special membranous structure formed by the invagination of plasma membrane in a prokaryotic cell is mesosome which helps in cell wall formation, DNA replication, respiration and secretory processes.

126. Answer (4)

Hint: Perispermic seed is the one in which the remains of nucellus are seen.

Sol.: Beet is an example of a perispermic seed.

127. Answer (4)

Hint: 'X' represents nucellus.

Sol.: The central tissue of ovule is nucellus in which the female gametophyte is located. In nucellus, a single specialized cell acts as the precursor to the MMC which forms the megaspores.

128. Answer (3)

Hint: If starch grain size is considered as the phenotype, then the alleles show incomplete dominance.

Sol.: The genotype 'Bb' will give rise to the starch grains of intermediate size.

129. Answer (4)

Hint: Thalassemia and sickle cell anaemia are the Mendelian disorders.

Sol.: Klinefelter's syndrome is a chromosomal disorder, caused due to the presence of an additional copy of X-chromosome, resulting into a karyotype of 47, XXY.

130. Answer (3)

Hint: The given pedigree is true for myotonic dystrophy.

Sol.: The given pedigree does not hold true for a sex-linked recessive trait, such as, haemophilia.

131. Answer (2)

Hint: Flame cells are also called protonephridia.

Sol.: *Pheretima*(earthworm) has nephridia for excretion. Protonephridia or flame cells are the excretory structures in platyhelminths (Flatworms, *e.g.*, *Planaria*).

King crabs *i.e.*, *Limulus* use book gills for respiration and coxal gland for excretion.

Periplaneta i.e., cockroach respire *via* tracheoles and excrete through Malpighian tubules.

Balaenoptera i.e., mammals respire through lungs and excrete through kidneys.

132. Answer (1)

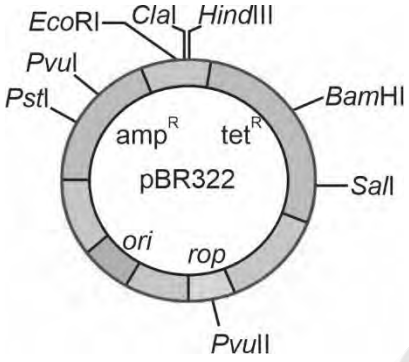
Hint: It concentrates the filtrate

Sol.: Counter current mechanism helps to maintain a concentration gradient in the medullary interstitium. Presence of such interstitial gradient helps in an easy passage of water from the collecting tubule thereby concentrating the filtrate (urine).

133. Answer (4)

Hint: *rop* codes for the proteins that controls the replication of plasmid

Sol.:



134. Answer (3)

Hint: Heteropolymers have different units

Sol.: Proteins are heteropolymers. Carbohydrates may be heteropolymers or homopolymers. Nucleic acids are heteropolymers.

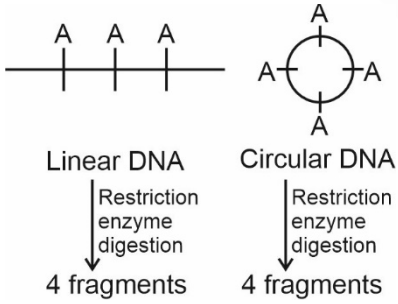
Three kinds of co-factors may be identified: prosthetic groups, co-enzymes and metal ions.

All metal ions are not co-factors.

135. Answer (4)

Hint: Number of fragments is more than the number of cuts in linear DNA.

Sol.:



136. Answer (3)

Hint: Thought of early Greek thinkers

Sol.: Some scientists believe that life came from outside. Early Greek thinkers thought units of life called spores were transferred to different planets including Earth. 'Panspermia' is still a favourite idea for some astronomers. For a long time, it was also believed that life came out of decaying and rotting matter like straw, mud, *etc*. This was the theory of spontaneous generation.

137. Answer (4)

Hint: Sterilisation procedure

Sol.: Natural methods work on the principle of avoiding chances of ovum and sperms meeting. Sterilisation procedure in the male is called 'vasectomy' and that in the female, 'tubectomy'. Periodic abstinence, lactational amenorrhea and coitus interruptus are natural methods of contraception.

138. Answer (3)

Hint: LH and FSH are gonadotropins

Sol.: Hormones that play role in erythropoiesis are testosterone, cortisol, erythropoietin and thyroxine.

139. Answer (1)

Hint: Gene of interest incorporated in the plasmid

Sol.: A nematode *Meloidegyne incognita* infects the roots of tobacco plants and causes a great reduction in yield. A novel strategy was adopted to prevent this infestation which was based on the process of RNA interference (RNAi).

This involves

a. Incorporating essential gene of *M. incognita* into *Agrobacterium* plasmid

b. Introduction of recombinant plasmid into tobacco plant

c. Plasmid allowed to replicate within host plant

d. *M. incognita* feeds on tobacco plant

e. RNAi causes silencing of essential genes of nematode

140. Answer (1)

Hint: Platelets are also called thrombocytes

Sol.: Platelets can release a variety of substances most of which are involved in the coagulation or clotting of blood. A reduction in their number can lead to clotting disorders which will lead to excessive loss of blood from the body.

141. Answer (1)

Hint: Frog shows incomplete double circulation

Sol.: Frog's heart has 3 chambers *i.e*. 2 atria and 1 ventricle. Both oxygenated and deoxygenated blood mix in the ventricle of heart.

142. Answer (2)

Hint: Innate immunity is present since birth

Sol.: Innate immunity is non-specific type of defence, that is present at the time of birth. This is accomplished by providing different types of barriers to the entry of the foreign agents into our body. Acquired immunity, on the other hand is pathogen specific. It is characterised by memory.

143. Answer (3)

Hint: External inter-costal muscle contraction increase volume in dorso-ventral axis

Sol.: Inspiration is initiated by the contraction of diaphragm which increases the volume of thoracic chamber in the antero-posterior axis. The contraction of external inter-costal muscles lifts up the ribs and the sternum causing an increase in the volume of the thoracic chamber in the dorso-ventral axis.

144. Answer (3)

Hint: Selective mating opposes Hardy-Weinberg equilibrium

Sol.: In a given population one can find out the frequency of occurrence of alleles of a gene or a locus. This frequency is supposed to remain fixed and even remain the same through generations. Hardy-Weinberg principle stated it using equation *i.e.*, $p + q = 1$.

145. Answer (2)

Hint: Reproduce by both sexually and asexually

Sol.: Sponges reproduce asexually by fragmentation and sexually by formation of gametes. Fertilisation is internal and development is indirect having a larval stage which is morphologically distinct from the adult.

146. Answer (1)

Hint: Follicular development takes place in ovaries.

Sol.: Uterine events include – Menstrual phase $\rightarrow$ Proliferative phase $\rightarrow$ Secretory phase

Ovarian events include – Follicular phase $\rightarrow$ Ovulatory phase $\rightarrow$ Luteal phase.

The follicular phase is a phase in ovarian cycle and is characterised by development of follicles and secretion of estrogens by growing follicles.

147. Answer (2)

Hint: Deoxygenated blood is present in pulmonary artery

Sol.: Every 100 mL of deoxygenated blood delivers approximately 4 mL of CO_2 to the alveoli.

2000 mL of deoxygenated blood delivers approximately 80 mL of CO_2 to the alveoli.

148. Answer (3)

Hint: Product released at last

Sol.: The catalytic cycle of an enzyme action can be described in the following steps:

(1) First, the substrate binds to the active site of the enzyme, fitting into the active site.

(2) The binding of the substrate induces the enzyme to alter its shape, fitting more tightly around the substrate.

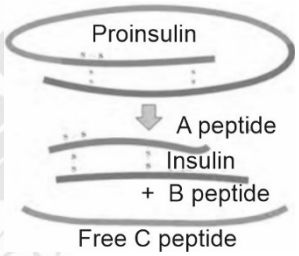
(3) The active site of the enzyme, now in close proximity of the substrate breaks the chemical bonds of the substrate and the new enzyme-product complex is formed.

(4) The enzyme releases the products of the reaction and the free enzyme is ready to bind to another molecule of the substrate and run through the catalytic cycle once again.

149. Answer (4)

Hint: Extra C-peptide is absent in mature insulin

Sol.:



150. Answer (2)

Hint: Darwin finches also represent this phenomenon

Sol.: A is a Wombat

B is a Marsupial rat

A number of marsupials, each different from the other evolved from an ancestral stock, but all within the Australian island continent. When more than one adaptive radiation appeared to have occurred in an isolated geographical area (representing different habitats), one can call this convergent evolution.

151. Answer (2)

Hint: Associated with vision

Sol.: The brain is divided into fore-brain, mid-brain and hind-brain. Forebrain includes olfactory lobes, paired cerebral hemispheres and unpaired diencephalon. The midbrain is characterised by a pair of optic lobes. Hind-brain consists of cerebellum and medulla oblongata. The medulla oblongata passes out through the foramen magnum and continues into spinal cord, which is enclosed in the vertebral column.

152. Answer (3)

Hint: Sponges contain spongin fibres

Sol.: The body of porifers is supported a skeleton made of spicules or spongin fibres.

Echinoderms have an endoskeleton made of calcareous ossicles.

153. Answer (3)

Hint: Fats are the esters of fatty acid with alcohol

Sol.: Lipids are not strictly macromolecule. Some lipids have phosphorous and a phosphorylated organic compound in them. These are phospholipids. They are found in cell membrane. Lecithin is one example. Some tissues especially the neural tissues have lipids with more complex structures. DNA contains phosphate but it is not the esters of fatty acids with alcohol.

Alanine is an amino acid and sucrose is a disaccharide.

154. Answer (3)

Hint: Nephron consists of glomerulus and renal tubule

Sol.:

- The renal tubule begins with a double walled cup-like structure called Bowman's capsule, which encloses the glomerulus.
- The amount of the filtrate formed by the kidneys per minute is called glomerular filtration rate (GFR).
- NaCl is transported by the ascending limb of Henle's loop which is exchanged with the descending limb of vasa recta.
- NaCl is returned to the interstitium by the ascending portion of vasa recta.
- Sebaceous glands eliminate certain substances like sterols, hydrocarbons and waxes through sebum.

155. Answer (2)

Hint: Forms the base of the skull

Sol.: Cranial bones are frontal, temporal, parietal, occipital, sphenoid and ethmoid.

Out of these, parietal and temporal are paired bones, rest all are unpaired bones.

156. Answer (1)

Hint: Punnett square is a graphical representation of all possible genotypes of offsprings in a genetic cross.

Sol.: Law of segregation is based on the fact that alleles do not show any blending and characters are recovered in next generation.

157. Answer (4)

Hint: For translation, the order and sequence of amino acids are defined by the sequence of bases in mRNA.

Sol.: In some viruses, RNA acts as the genetic material.

158. Answer (1)

Hint: Point mutation will lead to loss of function of lac *i*.

Sol.: A point mutation in lac *i* can cause a loss of repressor function, leading constitutive expression of operon. Deletion will affect the operator region where repressor bind leading to constitutive expression.

159. Answer (3)

Hint: Diploid content of human DNA is 6.6×10^9 bp.

Sol.: $\phi \times 174$ bacteriophage – 5386 nucleotides

Bacteriophage lambda – 48502 base pairs

E. coli – 4.6×10^6 base pairs

Haploid content of human DNA – 3.3×10^9 base pairs

160. Answer (1)

Hint: A typical nucleosome contains 200 base pairs of DNA helix.

Sol.: If the sequence of bases in one strand is known, the sequence in the other strand can be predicted.

161. Answer (3)

Hint: HGP was launched to determine the sequences of 3 billion chemical base pairs and was completed by the year 2003.

Sol.: Methodologies like ESTs and sequence annotation were used during HGP. It was called a mega project, as it required the identification and sequencing of a very large number of base pairs (3×10^9).

162. Answer (3)

Hint: Statins are obtained from *Monascus* purpureus.

Sol.: *Aspergillus niger* – Citric acid

Penicillium – Gluconic acid

Streptococcus – Clot buster

163. Answer (4)

Hint: In the anaerobic sludge digesters, bacteria produce a mixture of gases such as, methane, H_2S and CO_2.

Sol.: Primary treatment of sewage involves sequential filtration and sedimentation of grit.

164. Answer (3)

Hint: Third trophic level is occupied by secondary consumers.

Sol.: Deer is a herbivore and always occupies the second trophic level.

165. Answer (4)

Hint: Standing crop refers to the amount of living material present at different trophic levels at a given time.

Sol.: For an inverted pyramid of biomass, the biomass of producers is less than that of primary consumers in a given area at a time. It is usually found in sea ecosystem.

166. Answer (3)

Sol.: In the species-area relationships among a very large area, like an entire continent, the value of Z ranges from 0.6 to 1.2.

167. Answer (2)

Sol.: Amphibians are more vulnerable to extinction.

India's share in global species diversity is 1.8 per cent, although it has only 2.4 per cent of the world's land area.

168. Answer (4)

Hint: Exponential growth is described by the equation : $\frac{dN}{dt} = rN$

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

If K >> N, N will be negligible

Then $\frac{dN}{dt} = rN\left(\frac{K}{K}\right)$

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

Thus, plot of $\frac{dN}{dt}$ v/s t will show a J-shaped graph.

169. Answer (4)

Hint: Mycorrhizae refers to a mutualistic relationship between fungus and roots of higher plants.

Sol.: Predation helps to maintain species diversity in a community.

170. Answer (2)

Sol.: Population ecology is an important area of study because it links ecology to population genetics and evolution.

171. Answer (1)

Hint: A canal called the cerebral aqueduct passes through the midbrain

Sol.: Three major regions make up the brain stem; mid brain, pons and medulla oblongata. Brain stem forms the connections between the brain and spinal cord. The dorsal portion of the midbrain consists mainly of four round swellings (lobes) called corpora quadrigemina. The cerebellum integrates information received from the semi-circular canals of the ear and the auditory system.

172. Answer (1)

Hint: DNA directly injected into nucleus

Sol.: Microinjection is a method in which recombinant DNA is directly injected into the nucleus of an animal cell.

In another method, suitable for plants, cells are bombarded with high velocity microparticles of gold or tungsten coated with DNA in a method known as biolistics or gene gun. And another method uses 'disarmed pathogen' vectors, which when allowed to infect the cell, transfer the recombinant DNA into the host.

173. Answer (1)

Hint: CCK acts on both pancreas and gall bladder

Sol.:

- Gastrin acts on the gastric glands and stimulates the secretion of hydrochloric acid and pepsinogen.
- Secretin acts on the exocrine pancreas and stimulates secretion of water and bicarbonate ions.
- CCK acts on both pancreas and gall bladder and stimulates the secretion of pancreatic enzymes and bile juice, respectively.
- GIP inhibits gastric secretion and motility

174. Answer (4)

Hint: 20 Feet in height

Sol.: The biggest of the dinosaurs, *i.e.*, *Tyrannosaurus rex* was about 20 feet in height and had huge fearsome daggerlike teeth. Rest all *i.e. Tricerotops*, *Brachiosaurus*, *Stegosaurus* were herbivorous and show quadripedal locomotion.

175. Answer (1)

Hint: Blood is fibreless

Sol.: The defining characteristic of connective tissue is the presence of a large amount of extracellular matrix (ECM). This matrix consists of ground substance (which can be fluid, gel-like, or solid) and fibers (such as collagen, elastin, or reticular fibers). The ECM provides support and structure to tissues and organs.

176. Answer (3)

Hint: Primers are oligonucleotides

Sol.: In PCR, multiple copies of the gene (or DNA) of interest is synthesised *in vitro* using two sets of primers.

Primers are small chemically synthesised oligonucleotides that are complementary to the regions of DNA and the enzyme DNA polymerase.

Repeated amplifications in PCR is achieved by use of thermostable DNA polymerase isolated from bacterium *Thermus aquaticus*.

177. Answer (2)

Hint: Causes cerebral malaria

Sol.: *Plasmodium*, a tiny protozoan is responsible for malaria. Different species of *Plasmodium* (*P. vivax*, *P. malaria* and *P. falciparum*) are responsible for different types of malaria. Of these, malignant malaria caused by *Plasmodium falciparum* is the most serious one and can even be fatal.

178. Answer (4)

Hint: Heroin is an opioid

Sol.: The drugs, which are commonly abused are opioids, cannabinoids and coca alkaloids. Majority of these are obtained from flowering plants. Some are obtained from fungi. Generally taken by snorting and injection, heroin(opioid) is a depressant and slows down body functions. Generally taken by inhalation and oral ingestion, cannabinoids are known for their effects on cardiovascular system of the body.

179. Answer (2)

Hint: Each testis has about 250 compartments

Sol.: Each testis has about 250 compartments called testicular lobules. Each lobule contains one to three highly coiled seminiferous tubules in which sperms are produced.

180. Answer (2)

Hint: Receives oxygenated blood.

Sol.: A patch of nodal tissue is present in the right upper corner of the right atrium called the sino-atrial node (SAN). Another mass of this tissue is seen in the lower left corner of the right atrium close to the atrio-ventricular septum called the atrio-ventricular node (AVN).

❑ ❑ ❑

All India Aakash Test Series for NEET - 2026

OPEN MOCK TEST - 3 (Code-F)

Click here for Code-E Sol.

Test Date : 19/04/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (2)

Hint: Use principle of calorimetry

Sol.: Energy released during temperature change of water from 100°C to 0°C

$E_{release} = mS_w\Delta T$

$= 10 \times 1 \times 100$

$= 1000$ cal

Energy required to convert ice at –10°C to water at 0°C

$E_{required} = mS_{ice}\Delta T + mL$

$= 10 \times \frac{1}{2} \times 10 + 10 \times 80$

$= 50 + 800$

$= 850$ cal

Since $E_{release} > E_{required}$

$\therefore$ Final composition = 20 g water.

2. Answer (2)

Hint: At constant pressure, $Q = nC_p\Delta T$

and $\Delta U = nC_V\Delta T$

Sol.: $\frac{\Delta U}{Q} = \frac{nC_v\Delta T}{nC_p\Delta T} = \frac{C_v}{C_p}$

For diatomic gas, $\gamma = \frac{C_p}{C_v} = 1 + \frac{2}{f}$

$\Rightarrow \frac{C_p}{C_v} = 1 + \frac{2}{5} = \frac{7}{5}$

$\therefore \frac{C_v}{C_p} = \frac{5}{7}$

3. Answer (2)

Hint: Use, $U = \frac{Kq_1q_2}{r}$

Sol.: $\Delta U = U_f - U_i$

$= \frac{Kq_1q_2}{r} - 0$

$= \frac{9 \times 10^9 \times 2 \times 10^{-6} \times 2 \times 10^{-6}}{10 \times 10^{-2}}$

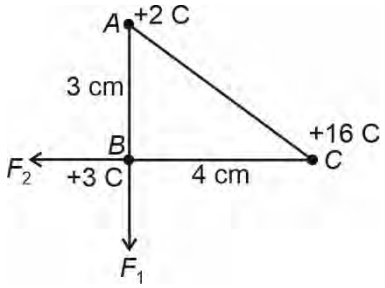
$= 36 \times 10^{-2}$ J

$= 0.36$ J

4. Answer (3)

Hint: Use superposition principle

Sol.:



$F_1 = \frac{K(2)(3)}{(3 \times 10^{-2})^2}$

$= \frac{2}{3} \times \frac{9 \times 10^9}{10^{-4}}$

$= 6 \times 10^{13}$ N

$F_2 = \frac{K(3)(16)}{(4 \times 10^{-2})^2} = \frac{9 \times 10^9 \times 3 \times 16}{16 \times 10^{-4}}$

$= 27 \times 10^{13}$ N

$F_{net} = \sqrt{F_1^2 + F_2^2} = 10^{13}\sqrt{36 + 729} = \sqrt{765} \times 10^{13}$ N

5. Answer (3)

Hint: Wave velocity $V_w = \frac{\lambda}{T}$ and maximum particle velocity $V_m = A\omega$

Sol.: $V_w = \frac{1}{2}(V_m)$

$\frac{\lambda}{T} = \frac{1}{2} \times A \times \frac{2\pi}{T}$

$\Rightarrow \lambda = A\pi$

$\lambda = 10\pi$ cm

$= 10 \times 3.14$ cm

$= 31.4$ cm

6. Answer (3)

Hint: Direction of electric field on the axis of a dipole is along the direction of dipole moment while at equatorial position it is opposite to direction of dipole moment.

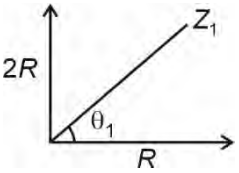
Sol.: Initially,

Finally,

7. Answer (1)

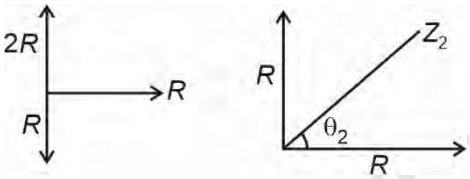
Hint: Power factor $\cos\theta = \frac{R}{Z}$

Sol.: Initially,



$$\cos\theta_1 = \frac{R}{Z_1} = \frac{R}{\sqrt{5}R} = \frac{1}{\sqrt{5}}$$

Finally,



$$\cos\theta_2 = \frac{R}{Z_2} = \frac{R}{\sqrt{2}R} = \frac{1}{\sqrt{2}}$$

$$\therefore \quad \frac{\cos\theta_2}{\cos\theta_1} = \sqrt{\frac{5}{2}}$$

8. Answer (3)

Hint and Sol.: Sensitivity $S_g = \frac{\theta}{i} = \frac{NAB}{C}$

$\therefore$ S_g can be increased by placing a suitable magnetic material. Soft iron has a high magnetic permeability and can be easily magnetized and demagnetized.

9. Answer (2)

Hint: Use photoelectric equation,

$$(KE)_{max} = \frac{hc}{\lambda} - \frac{hc}{\lambda_{th}}$$

Sol.: $(KE)_{max} = \frac{12400}{\lambda} - \frac{12400}{5000}$

$$\Rightarrow \quad 4 = \frac{12400}{\lambda} - 2.48$$

$$\Rightarrow \quad 6.48 = \frac{12400}{\lambda}$$

$$\Rightarrow \quad \lambda = \frac{12400}{6.48} = 1913.58 \text{ Å}$$

10. Answer (1)

Hint: Number of different photons emitted $= \frac{n(n-1)}{2}$

Sol.: $3 = \frac{n(n-1)}{2}$

$\Rightarrow$ $n = 3$

The three wavelengths corresponds to the transitions

$n = 3$ to $n = 2$

$n = 3$ to $n = 1$

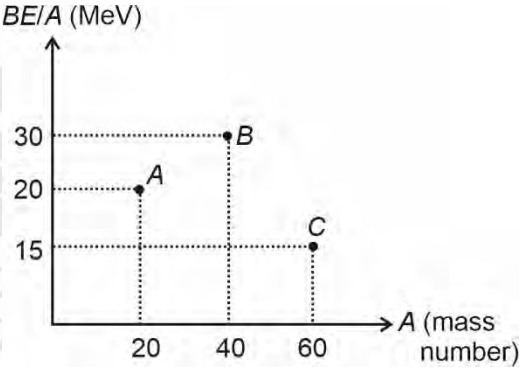
$n = 2$ to $n = 1$

11. Answer (4)

Hint: C $\rightarrow A + B$

Energy released $E = (BE)_A + (BE)_B - (BE)_C$

Sol.:



$(BE)_A = 20 \times 20 = 400$ MeV

$(BE)_B = 40 \times 30 = 1200$ MeV

$(BE)_C = 60 \times 15 = 900$ MeV

Energy released $E = 400 + 1200 - 900$

$= 700$ MeV

12. Answer (2)

Hint: Difference in potential energy does not depend on reference chosen.

Sol.: PE difference between first exited state and second exited state is equal to 3.78 eV

$\therefore$ $(PE)_2 - (PE)_1 = 3.78$

$(PE)_2 - 0 = 3.78$

$(PE)_2 = 3.78$ eV

13. Answer (3)

Hint: Average speed $v_{avg} = \frac{\text{Total distance}}{\text{Total time}}$

Sol.: $v_{avg} = \dfrac{5x}{\dfrac{3x}{v_1} + \dfrac{2x}{v_2}}$

$= \dfrac{5}{\dfrac{3v_2 + 2v_1}{v_1 v_2}}$

$= \dfrac{5v_1v_2}{2v_1 + 3v_2}$

14. Answer (1)

Hint: Horizontal distance $x = u_x t$

Sol.: $x = u_x t = 10 \times \cos 37° \times t$

$\Rightarrow \quad 32 = 10 \times \dfrac{4}{5} \times t$

$\Rightarrow \quad t = 4$ s

And $y = u_y t + \dfrac{1}{2}at^2$

$\Rightarrow \quad -H = 10 \sin 37° \times t - \dfrac{1}{2} \times 10 \times t^2$

$\Rightarrow \quad -H = 10 \times \dfrac{3}{5} \times 4 - 5 \times 4^2$

$\Rightarrow \quad -H = 24 - 80$

$\Rightarrow \quad H = 56$ m

15. Answer (1)

Hint: Youngs modulus $Y = \dfrac{F\ell}{A\Delta\ell}$

Sol.: $\Delta\ell = \dfrac{F\ell}{AY}$

$= \dfrac{250 \times 20}{4 \times 10^{-4} \times 10^{10}}$

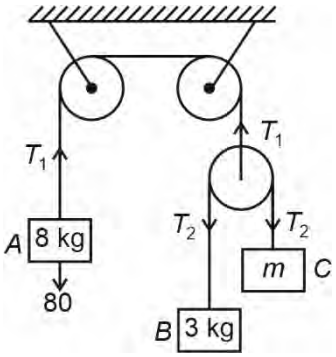
$= \dfrac{5000}{4} \times 10^{-6}$

$= 1.25 \times 10^{-3}$ m

16. Answer (1)

Hint: Since block 8 kg is at rest, so tension in the string connected to 8 kg block is 80 N

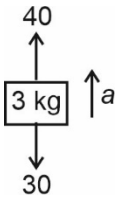
Sol.:



$2T_2 = T_1$

$\Rightarrow \quad T_2 = \dfrac{T_1}{2} = \dfrac{80}{2} = 40$ N

FBD of block 3 kg



$3a = 40 - 30$

$\Rightarrow \quad a = \dfrac{10}{3}$ m/s^2

For system,

$a = \dfrac{10}{3} = \dfrac{(m-3)g}{3+m}$

$\Rightarrow \quad 3 + m = 3m - 9$

$\Rightarrow \quad 2m = 12$

$\Rightarrow \quad m = 6$ kg

17. Answer (2)

Hint: Phase difference $\Delta\phi = \dfrac{2\pi}{\lambda}\Delta x$

Sol.: $v = f\lambda$

$\Rightarrow \quad \lambda = \dfrac{v}{f} = \dfrac{20}{200} = 0.1\,\text{m} = 10$ cm

Phase difference $\Delta\phi = \dfrac{2\pi}{\lambda}\Delta x = \dfrac{\pi}{2}$ radian

18. Answer (2)

Hint: $\langle E \rangle = \dfrac{\int (E)dt}{\int dt}$

Sol.: $\langle E \rangle_{t=0 \text{ to } 2\text{ s}} = \dfrac{\int_0^2 4t^3 dt}{\int_0^2 dt} = \dfrac{[t^4]_0^2}{2-0}$

$= \dfrac{2^4 - 0}{2 - 0} = 8$ J

19. Answer (3)

Hint: Time of flight, $T = \sqrt{\dfrac{2h}{g}}$

Sol.: $T = \sqrt{\dfrac{2h}{g}}$

$\dfrac{T_1}{T_2} = \sqrt{\dfrac{h_1}{h_2}}$

20. Answer (2)

Hint: Use equation of trajectory $y = x\tan\theta\left(1-\frac{x}{R}\right)$

Sol.: $y = x\tan\theta\left(1-\frac{x}{R}\right)$

At x = 20 m, y = 20 m and R = 50 m

$20 = 20\tan\theta\left(1-\frac{20}{50}\right)$

$1 = \tan\theta\left(\frac{3}{5}\right)$

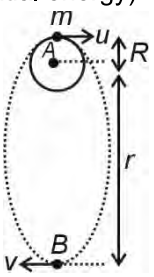
$\tan\theta = \frac{5}{3}$

$\theta = \tan^{-1}\left(\frac{5}{3}\right)$

21. Answer (4)

Hint: Work done by gravity (W) = –(Change in potential energy) = $U_i - U_f$

Sol.:



$W = \frac{-GMm}{R} - \left(\frac{-GMm}{r}\right)$

$\Rightarrow \frac{-mgR}{3} = \frac{-GMm}{3R} = \frac{-GMm}{R} + \frac{GMm}{r}$

$\Rightarrow r = \frac{3R}{2}$

Applying conservation of angular momentum at A and B, $muR = mvr$

$\Rightarrow v = u\frac{R}{r} = \frac{2u}{3}$

Conserving energy at A and B,

$\frac{1}{2}mu^2 - \frac{GMm}{R} = \frac{1}{2}mv^2 - \frac{GMm}{r}$

$\Rightarrow \frac{1}{2}mu^2 - mgR = \frac{1}{2}m\left(\frac{4u^2}{9}\right) - \frac{mgR^2}{3R}\times 2$

$\Rightarrow \frac{1}{2}mu^2\left(\frac{5}{9}\right) = \frac{mgR}{3}$

$u = \sqrt{\frac{6gR}{5}}$

22. Answer (2)

Hint: Intensity $I = \frac{P}{4\pi r^2}\eta = \frac{1}{2}\varepsilon_0 E_0^2 c$

Sol.: $\frac{P}{4\pi r^2}\eta = \frac{1}{2}\varepsilon_0 E_0^2 c$

$\Rightarrow \frac{2P}{4\pi\varepsilon_0 r^2 c}\eta = E_0^2$

$\Rightarrow \frac{2\times 150\times 9\times 10^9}{9\times 3\times 10^8}\times\frac{5}{100} = E_0^2$

$\Rightarrow E_0 = \frac{10}{\sqrt{2}}$ V/m

23. Answer (2)

Hint: If both inputs of NOR gate and NAND gate are same, then they behave as NOT gate.

Sol.: $Y = \overline{A} + \overline{B}$

$= \overline{A\cdot B}$

= NAND gate

24. Answer (3)

Hint and Sol.: Photo-diode works in reverse bias condition.

Its V-I characteristics lies in III quadrant.

25. Answer (2)

Hint: If path difference at central bright fringe is zero, then path difference at third bright fringe is 3λ

Sol.: $\Delta x = 3\lambda$

$= 3 \times 5000 \times 10^{-10}$ m

$= 15 \times 10^{-7}$ m

$= 1.5\ \mu$m

26. Answer (2)

Hint: Thermal resistance of all rods are same.

Sol.: $R_1 = R_2 = R_3 = R$

Let temperature of junction be x

$\frac{x-80}{R} + \frac{x-80}{R} + \frac{(x-0)}{R} = 0$

$\Rightarrow 3x = 160$

$x = \frac{160}{3}^\circ$C

27. Answer (2)

Hint: Surface energy $E = T \times 2A$ because thin film has two free surfaces.

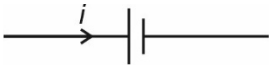
Sol.: Surface energy, $E = T \times 2A$

$= 7 \times 2 \times 0.02$

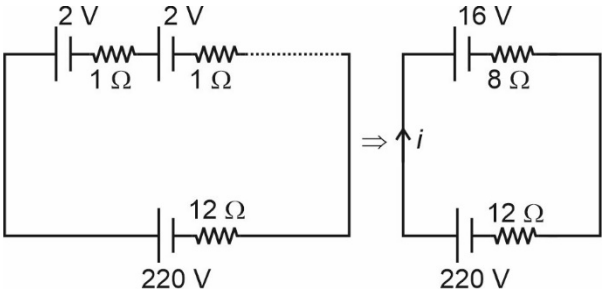
= 0.28 J

28. Answer (2)

Hint: In case of charging, current goes to the battery



Sol.:



$\Rightarrow \quad i = \dfrac{220-16}{20} = \dfrac{204}{20} = 10.2$ A

29. Answer (3)

Hint: In circular motion,

Tangential acceleration $a_t = \dfrac{dv}{dt}$

Radial acceleration $a_r = \dfrac{v^2}{R}$

Net acceleration $a_N = \sqrt{a_r^2 + a_t^2}$

Sol.: Speed $v = 4t$

$a_t = \dfrac{dv}{dt} = 4 \text{ m s}^{-2}$

$a_r = \dfrac{v^2}{R}$

at $t = 1$ s, $v = 4$ m s^{-1}

$a_r = \dfrac{4^2}{4} = 4 \text{ m s}^{-2}$

at $t = 1$ s, $a_N = \sqrt{a_r^2 + a_t^2}$

$= \sqrt{4^2 + 4^2}$

$= 4\sqrt{2} \text{ m s}^{-2}$

at $t = 2$ s, $v = 8$ m s^{-1}

$a_r = \dfrac{64}{4} = 16 \text{ m s}^{-2}$

30. Answer (3)

Hint: Use, $\alpha = \dfrac{d\omega}{dt}$

Sol.: $\displaystyle\int_0^{\omega} d\omega = \int_0^2 \alpha\, dt$

$\omega = \displaystyle\int_0^2 (3t^2 - 2t)dt = \left[t^3 - t^2\right]_0^2$

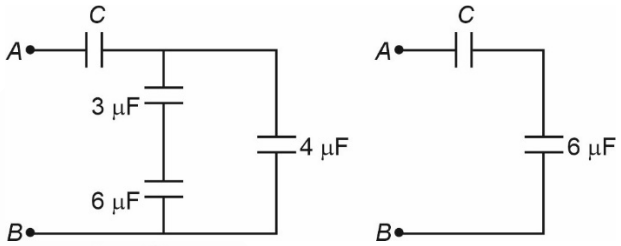
$= 8 - 4 = 4$ rad/s

31. Answer (3)

Hint: In parallel, $C_{eq} = C_1 + C_2 \ldots..$

and in series, $\dfrac{1}{C_{eq}} = \dfrac{1}{C_1} + \dfrac{1}{C_2}$

Sol.: Circuit can be redrawn as



$2 = \dfrac{6C}{6 + C}$

$\Rightarrow \quad 12 + 2C = 6C$

$C = 3$ μF

32. Answer (2)

Hint: Since there is no external force on the system, therefore the horizontal position of COM remains same.

Sol.: Let wedge moves towards right by a distance x, then block will move towards left by a distance $(6.5 - x)$

$M(6.5 - x) = 12Mx$

$\Rightarrow \quad \dfrac{13}{2} - x = 12x$

$\Rightarrow \quad 13x = \dfrac{13}{2}$

$\Rightarrow \quad x = 0.5$ m

33. Answer (1)

Hint: If mass m is displaced by y, the spring will also stretch by y.

Sol.:

$\therefore$ Time period, $T = 2\pi\sqrt{\dfrac{m}{k}}$

$= 2\pi\sqrt{\dfrac{2}{800}} = 2\pi\sqrt{\dfrac{1}{400}} = \dfrac{\pi}{10}$ s

34. Answer (3)

Hint: At mean position, net force on particle is zero and at extreme position particle is at rest.

Sol.: $F = 16 - 4x$

$F = -4(x - 4)$

$F = 0$, $x = 4$ m $\rightarrow$ mean position

Since particle is at rest at $x = 7$ m

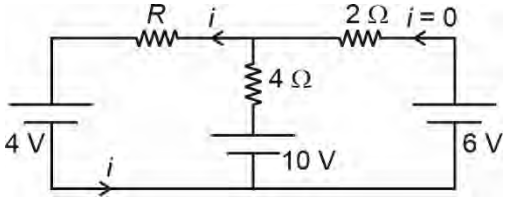
$\therefore$ Extreme position is at $x = 7$ m

Amplitude = 7 – 4 = 3 m

35. Answer (2)

Hint: Use Kirchhoff's loop law.

Sol.:



$\Rightarrow$ $10 - 4i = 6$

$4i = 4$

$i = 1$ A

And by loop law,

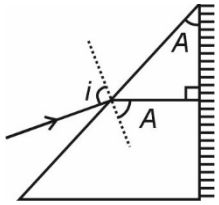
$$\frac{10-4}{4+R} = 1 \Rightarrow 6 = 4 + R$$

$R = 2\ \Omega$

36. Answer (2)

Hint: For retracing of light, light will fall perpendicularly on the silver coated surface.

Sol.:



$1\sin i = \mu \sin A$

$\sin 53° = \mu \times \sin 37°$

$$\frac{4}{5} = \mu \times \frac{3}{5} \Rightarrow \mu = \frac{4}{3}$$

37. Answer (4)

Hint: Direction of magnetic field is parallel to $\left(id\vec{\ell} \times \vec{r}\right)$

Sol.: $id\vec{\ell}$ is vertically upwards

$\vec{r}$ is towards north

$\therefore$ Hence, direction of magnetic field will be towards west.

38. Answer (1)

Hint: Magnetic field due to straight wire on its axis is zero.

Sol.: $B = \frac{\mu_0 i}{4\pi d} \otimes + 0 = \frac{\mu_0 i}{4\pi d} \otimes$

39. Answer (1)

Hint: Focal length of lens is given by

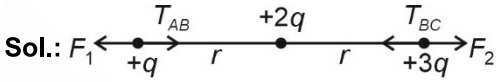
$$\frac{1}{f} = \left(\frac{\mu_L}{\mu_m} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

Sol.: If $\mu_m > \mu_L$, then convex lens behaves like a diverging lens.

40. Answer (1)

Hint: Tension is developed due to electrostatic repulsive force.

Sol.:



$$F_1 = \frac{K(q)(2q)}{r^2} + \frac{K(q)(3q)}{(2r)^2} = \frac{Kq^2}{r^2}\left[2 + \frac{3}{4}\right] = \frac{11}{4}\frac{Kq^2}{r^2}$$

$$F_2 = \frac{K(3q)(2q)}{r^2} + \frac{K(3q)(q)}{(2r)^2} = \frac{Kq^2}{r^2}\left[6 + \frac{3}{4}\right] = \frac{27}{4}\frac{Kq^2}{r^2}$$

$$\frac{T_{AB}}{T_{BC}} = \frac{F_1}{F_2} = \frac{11}{27}$$

41. Answer (2)

Hint: Use Pascal's law

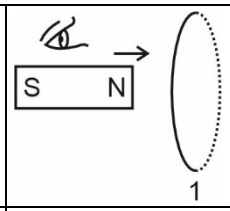
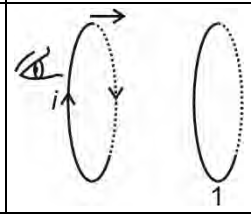
Sol.: $\frac{F}{a} = \frac{600g}{2.5 \times 0.8}$

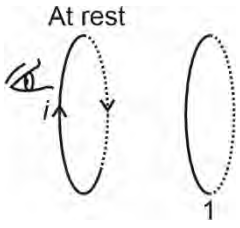
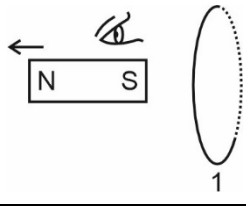
$$F = \frac{600 \times 10 \times 0.05}{2} = 150\ \text{N}$$

42. Answer (2)

Hint: When flux is changing through a loop, current is induced in the loop to oppose this change.

Sol.:

a.		(ii)	Anticlockwise
b.		(i)	Clockwise

c.		(iii)	$\Delta\phi = 0$ $\Rightarrow i = 0$
d.		(ii)	Anticlockwise

43. Answer (2)

Hint: Magnetic flux $\phi = \vec{B}\cdot\vec{A}$

Sol.: $\vec{B} = B_0\left(-2\hat{i}+3\hat{j}+2\hat{k}\right)$

And $\vec{A} = \pi R^2\hat{k}$

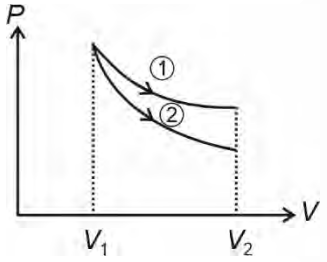
$\phi = \vec{B}\cdot\vec{A}$

$= B_0\left(-2\hat{i}+3\hat{j}+2\hat{k}\right)\cdot\left(\pi R^2\hat{k}\right)$

$= 2B_0\pi R^2$

44. Answer (3)

Hint:



Slope of adiabatic process $= -\dfrac{\gamma P}{V}$

Slope of isothermal process $= -\dfrac{P}{V}$

$\therefore$ Graph (1) is for isothermal process

Graph (2) is for adiabatic process.

Sol.: (W.D. by isothermal) > (W.D. by adiabatic)

$\Rightarrow$ By first law of thermodynamics

$dQ = dU + W$

for adiabatic process, $dQ = 0$

$\Rightarrow dU = -W$

$\Rightarrow dU < 0$

$\Rightarrow \Delta T < 0$

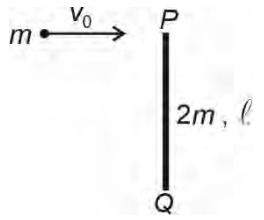
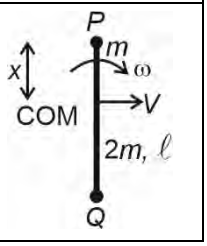
and for isothermal process $\Delta T = 0$

$\therefore$ T_f isothermal > T_f adiabatic

45. Answer (4)

Hint: Apply conservation of angular momentum and linear momentum.

Sol.:

Before Collison	After collision
	

$\Rightarrow \quad x = \dfrac{2m}{3m}\times\dfrac{\ell}{2} = \dfrac{\ell}{3}$ (From point P)

Angular momentum conservation (rod will rotate about COM)

$L_i = L_f$

$\Rightarrow \quad mV_0\dfrac{\ell}{3} = \left(m\left(\dfrac{\ell}{3}\right)^2 + \dfrac{2m\ell^2}{12} + 2m\left(\dfrac{\ell}{6}\right)^2\right)\omega$

$\Rightarrow \quad \dfrac{V_0\ell}{3} = \left(\dfrac{\ell^2}{9} + \dfrac{\ell^2}{6} + \dfrac{2\ell^2}{36}\right)\omega$

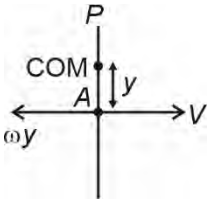
$\Rightarrow \quad \dfrac{V_0}{3} = \dfrac{12\ell}{36}\omega$

$\Rightarrow \quad \omega = \dfrac{V_0}{\ell}$

Linear momentum conservation

$mV_0 = 3mV \Rightarrow V = \dfrac{V_0}{3}$

Now,



$V_A = V - \omega y = 0$

$\Rightarrow \quad \dfrac{V_0}{3} - \dfrac{V_0 y}{\ell} = 0$

$\Rightarrow \quad \boxed{\dfrac{\ell}{3} = y}$

Distance from point P

$x + y = \dfrac{\ell}{3} + \dfrac{\ell}{3} = \dfrac{2\ell}{3} = 24$ cm

[CHEMISTRY]

46. Answer (3)

Hint: Intensive properties do not depend on the quantity or size of matter.

Sol.: At equilibrium, ΔG of the system is equal to zero.

Molar heat capacity and specific heat capacity are intensive properties.

47. Answer (3)

Hint: $\Delta H = \Delta U + \Delta n_g RT$

Sol.:

a. $\Delta n_g = -1$ $\Delta H = \Delta U - RT$

b. $\Delta n_g = -3$ $\Delta H = \Delta U - 3RT$

c. $\Delta n_g = +2$ $\Delta H = \Delta U + 2RT$

d. $\Delta n_g = 1/2$ $\Delta H = \Delta U + 1/2RT$

48. Answer (3)

Hint: Decomposition reactions are endothermic in nature ($\Delta H > 0$)

Sol.: $\Delta n_g > 0$

Therefore, entropy increases $\Delta S > 0$

49. Answer (1)

Hint: 100 mL of NaOH when added to CH_3COOH, creates acidic buffer solution.

Sol.:

a. $\alpha = \sqrt{\frac{K_a}{C}} = \sqrt{\frac{10^{-5}}{10^{-1}}} = \sqrt{10^{-4}} = 10^{-2}$

$[H^+] = c\alpha = 10^{-1} \times 10^{-2} = 10^{-3}$ M

pH = 3

b. $pH = pK_a + \log\frac{[Salt]}{[Acid]}$

[Salt] = [Acid]

$pH = pK_a = 5$

c. At equivalence point salt hydrolysis will takes place

$$pH = 7 + \frac{1}{2}(pK_a + \log C)$$

Concentration of $CH_3COO^- = \frac{10 \text{ m moles}}{300 \text{ mL}}$

$$pH = 7 + \frac{1}{2}\left(5 + \log\frac{1}{30}\right)$$

$$= 7 + \frac{1}{2}(5 - \log 30)$$

= 8.76

50. Answer (1)

Hint: Organic compound is fused with Na metal to convert elements from covalent form to the ionic form.

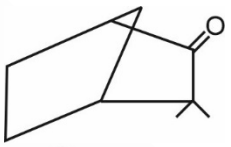
Sol.: $Na + C + N \xrightarrow{\Delta} NaCN$

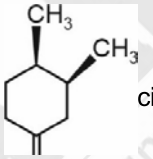
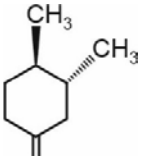
$2Na + S \xrightarrow{\Delta} Na_2S$

$Na + X \xrightarrow{\Delta} NaX$

51. Answer (3)

Hint: α-H from bridge head carbon should not be used for tautomerism since bridge head position cannot be sp^2 hybridised.

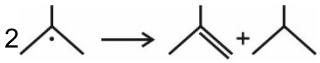
Sol.:  contains one α-H but it is present at bridge head carbon.

 cis isomer and  trans isomer

52. Answer (4)

Hint: 3° RX does not give alkane as major product in Wurtz reaction.

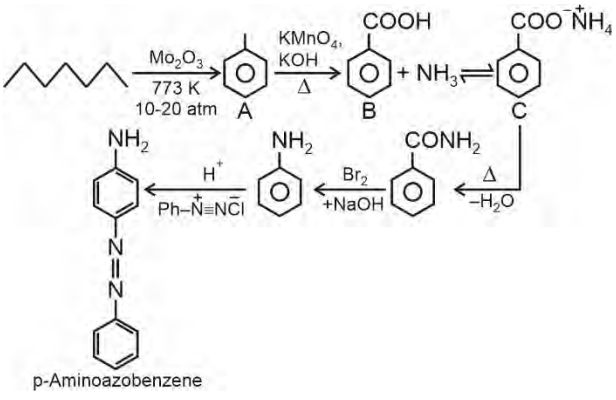
Sol.: If 3° RX is used in Wurtz reaction, free radicals undergo disproportionation reaction as major one.



53. Answer (2)

Hint: Aniline gives yellow colour dye with benzene diazonium chloride in acidic medium.

Sol.:



54. Answer (4)

Hint: Purple (or violet) coloured complex compound $Na_4[Fe(CN)_5NOS]$ is formed when sodium sulphide solution reacts with sodium nitroprusside solution.

Sol.:

$Na_2S + Na_2[Fe(CN)_5NO] \rightarrow Na_4[Fe(CN)_5NOS]$

Sodium nitroprusside Purple colour

55. Answer (1)

Hint: Number of atoms = number of moles × N_A × atomicity

Sol.: 36 u of H_2O

Number of molecules of $H_2O = \frac{36}{18} = 2$

Number of atoms = 2 × 3 = 6 atoms

5.6 L of CO_2 gas at STP,

Number of atoms $= \frac{5.6}{22.4} \times N_A \times 3 = 0.75\, N_A$

Number of atoms (in 180 u of glucose) $= \frac{180}{180} \times 24 = 24$ atoms

Number of atoms (in 1 g of H_2) $= \frac{1}{2} \times 2 \times N_A = N_A$

$N_A = 6.02 \times 10^{23}$

56. Answer (2)

Hint: $pH = pK_a + \log\frac{[Salt]}{[Acid]}$

Sol.: $6 = 5 + \log\frac{[Salt]}{[Acid]}$

$1 = \log\frac{[Salt]}{[Acid]}$

$\frac{10}{1} = \frac{[Salt]}{[Acid]}$

57. Answer (3)

Hint: For isoelectronic species, size of cation is smaller than size of anion.

Sol.: Order of ionic radii

$Al^{3+} < Na^+ < F^- < O^{2-}$

Z = 89 element is Ac and it is a d-block element.

58. Answer (1)

Hint: With Co^{3+} metal ion $C_2O_4^{2-}$ acting as strong field ligand

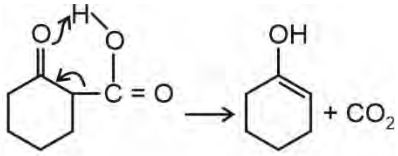
Sol.:

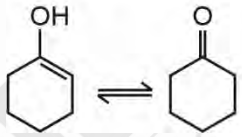
- $[Co(C_2O_4)_3]^{3-}$ has zero unpaired electron, μ = 0 BM
- $[FeF_6]^{3-}$ has 5 unpaired electrons, $\mu = \sqrt{5(5+2)}$ = 5.9 BM
- $[MnCl_6]^{3-}$ has 4 unpaired electrons $\mu = \sqrt{4(4+2)}$, μ = 4.89 BM
- $[NiCl_4]^{2-}$ has 2 unpaired electrons $\mu = \sqrt{2(2+2)}$ = 2.8 BM

59. Answer (3)

Hint: β-keto acid on heating decarboxylate easily.

Sol.:

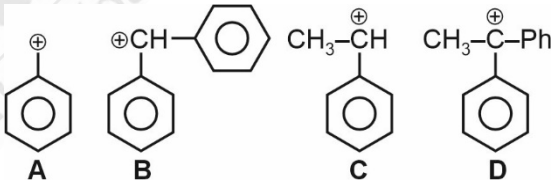




60. Answer (3)

Hint: Rate of S_N1 reaction depends upon the stability of carbocation.

Sol.:



Order of stability of carbocation is

D > B > C > A

61. Answer (3)

Hint: H_2O and NH_2^- are isoelectronic and both are sp^3 hybridized.

Sol.:

Species	Hybridization of central atom
NO_2^-	sp^2
BF_3	sp^2
H_2O	sp^3
NH_2^-	sp^3
Cl_2O	sp^3

62. Answer (1)

Hint: Better is the leaving group ability faster will be the rate of dehydrohalogenation reaction for a given alkyl halides.

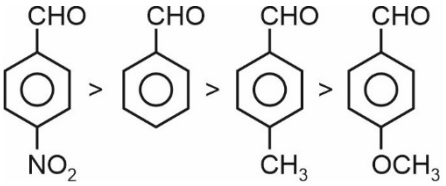
Sol.: The correct order of rate of dehydrohalogenation reaction will be

R–I > R–Br > R–Cl > R–F

63. Answer (3)

Hint: Presence of electron donating groups decreases reactivity towards nucleophile addition reaction.

Sol.: Reactivity order will be



64. Answer (2)

Hint: I_2 acting as oxidising agent with sodium thiosulphate.

Sol.: $2Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + 2NaI$

65. Answer (2)

Hint:

Solid salt treated with dil. H_2SO_4		**Anion detected**
Brown fumes	–	NO_2^-

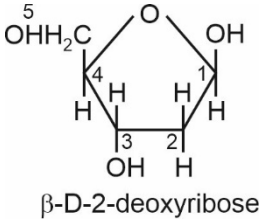
Sol.:

Gas with rotten egg smell	–	S^{2-}
Colourless odourless effervescence	–	CO_3^{2-}
Gas with suffocating odour	–	SO_3^{2-}

66. Answer (2)

Hint: The sugar moiety of DNA is β-D-2-deoxy ribose.

Sol.:



β-D-2-deoxyribose

Deficiency of vitamin K increases blood clotting time.

67. Answer (1)

Hint: As the atomic number increases in actinoids, the ionic radii decreases due to increase in effective nuclear charge.

Sol.: The correct order is

$Am^{3+} < Pu^{3+} < Np^{3+} < U^{3+} < Ac^{3+}$

68. Answer (2)

Hint: $2Cu^+ \rightarrow Cu^{2+} + Cu$

Sol.: The hydration enthalpy of $Cu^{2+}(aq.)$ is more negative due to greater charge on copper which compensate IE_2 of Cu.

69. Answer (4)

Hint: The boiling point depends on H-bond and van der Waals forces

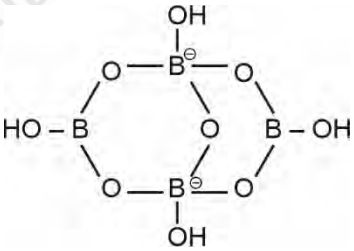
Sol.: Group 15 hydrides have the following values of boiling point.

Hydride	**Boiling point (K)**
NH_3	238.5
PH_3	185.5
AsH_3	210.6
SbH_3	254.6
BiH_3	290

70. Answer (3)

Hint: Borax contains 5 (B – O – B) bonds.

Sol.: The correct formula is $[B_4O_5(OH)_4]^{2-}$



71. Answer (3)

Hint: O_3 is a good oxidising agent due to the liberation of nascent oxygen.

Sol.: O_3 oxidised PbS to $PbSO_4$.

72. Answer (2)

Hint: $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$

Sol.: The oxidation number of carbon is changing from –4 to + 4.

73. Answer (1)

Hint: Alcohols have high boiling point due to intermolecular H-bonding.

Sol.: The correct order of boiling point of molecules with comparable molar masses is

Alcohols > 1° amines > 2° amines > 3° amines

74. Answer (2)

Hint: RMgX firstly takes away proton from –OH group

Sol.: 4 moles of RMgX required for the reaction with 1 mole of given compound.

75. Answer (3)

Hint: $\frac{r_{(T+\Delta T)}}{r_T} = 2^{\frac{\Delta T}{T}}$

Sol.: At 10°C rise in temperature, rate increases by 2

$$\frac{r_{80^\circ C}}{r_{10^\circ C}} = 2^{\left(\frac{80-10}{10}\right)} = 2^7 = 128 \text{ times}$$

76. Answer (3)

Hint: Osmotic pressure is widely used to determine molar masses of proteins, polymers and other macromolecules.

Sol.: The osmotic pressure method has the advantage over other methods as pressure measurement is around the room temperature and the molarity of the solution is used instead of molality.

77. Answer (4)

Hint: $r_n = \frac{52.9 \times n^2}{Z} \text{pm}$

Sol.:

a. n = 3, Z = 1, r = 52.9 × 9 pm = $9a_0$

b. n = 1, Z = 3 $r = \frac{52.9 \times 1}{3} \text{pm} = \frac{a_0}{3}$

c. n = 2, Z = 4, $r = \frac{52.9 \times 4}{4} \text{pm} = a_0$

d. n = 1, Z = 2, $r = \frac{52.9 \times 1^2}{2} \text{pm} = \frac{a_0}{2}$

78. Answer (3)

Hint: Limiting molar conductivity of KCl is greater than NaCl.

Sol.: The value of $\wedge_m$ increases steeply for P on dilution due to increase in α and consequently the number of ions in total volume of solution.

79. Answer (2)

Hint: For equimolal solutions,

$\boxed{\Delta T_f \propto i}$

Sol.:

a. $i = 1 + (n-1)\alpha$

$= 1 + 0.7 = 1.7$

b. $i = 1 + 2 \times 1 = 3$

c. $i = 1 + 2 \times 0.4 = 1.8$

d. $i = 1$

Order of i :- b > c > a > d

Order T_f :- b < c < a < d

80. Answer (1)

Hint: Apply initial rate method.

Sol.: x = order w.r.t. A and y = order w.r.t. B

- Rate = $k[A]^x [B]^y$

$6.93 \times 10^{-3} = k(0.1)^x (0.2)^y$

- Rate = $k(0.1)^x (0.8)^y = 13.86 \times 10^{-3}$

Dividing the two equations

$$\frac{1}{2} = \left(\frac{1}{4}\right)^y$$

$$\left(\frac{1}{2}\right) = \left(\frac{1}{2}\right)^{2y}$$

$2y = 1$

$$y = \frac{1}{2}$$

- Rate = $6.93 \times 10^{-3} = k (0.2)^x (0.2)^y$

$$\frac{6.93 \times 10^{-3}}{6.93 \times 10^{-3}} = \frac{(0.1)^x \times (0.2)^y}{(0.2)^x \times (0.2)^y}$$

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

$x = 0$

$\text{Rate} = k[A]^0[B]^{\frac{1}{2}}$

81. Answer (3)

Hint: β-D-galactose and β-D-glucose are monomers of lactose

Sol.: The glycosidic linkage in lactose.

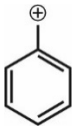
C1 of β-D-Galactose and C4 of β-D-glucose

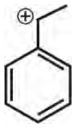
82. Answer (2)

Hint: Alcohol that forms tertiary carbocation reacts instantly with Lucas reagent.

Sol.:

b.  stabilised by +I effect and hyperconjugation.

c.  stabilised by resonance

e.  stabilised by resonance and hyperconjugation

83. Answer (2)

Hint: Kinetic energy = – Total energy

Sol.:

Energy of electron in first excited state is –3.4 eV, so the kinetic energy of electron in same orbit (n = 2) will be +3.4 eV

84. Answer (3)

Hint: Element P is Pt, belonging to d-block elements.

Sol.:

P – Ni

Q – Hf

R – Gd

S – Te

T – Mo

P, Q and T belongs to d-block

85. Answer (4)

Hint: cis-$[CrCl_2(ox)_2]^{3-}$ is optically active molecule.

Sol.: cis-$[CrCl_2(ox)_2]^{3-}$ lacks plane of symmetry and centre of symmetry, so, it is a chiral molecule.

86. Answer (4)

Hint: If $E^\circ_{cell} > 0$, then cell reaction is Feasible.

Sol.:

- $E^\circ_{cell} = E^\circ_{cathode} - E^\circ_{anode}$

= +1.510 – 1.233 = + 0.287 V

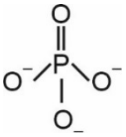
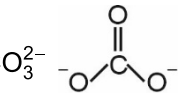
As E°_{cell} is positive, hence MnO_4^- liberates O_2 from water in the presence of an acid.

87. Answer (3)

Hint: For molecules with resonating structures

$$\text{Bond order} = \frac{\text{Number of } (\sigma + \pi) \text{ bonds}}{\text{Number of } \sigma \text{ bonds}}$$

Sol.:

- P – O in PO_4^{3-}  bond order $= \frac{5}{4}$
- C – O in CO_3^{2-}  bond order $= \frac{4}{3}$
- O – O in O_3  bond order $= \frac{3}{2}$
- CN^- bond order (C – N) = 3

88. Answer (4)

Hint: Due to more lp-lp repulsion in F_2, bond enthalpy of F_2 becomes lower than the Cl_2 and Br_2.

Sol.:

Molecules	Bond dissociation enthalpy (kJ mol^{-1})
Cl_2	242.6
Br_2	192.8
F_2	158.8
I_2	151.1

89. Answer (4)

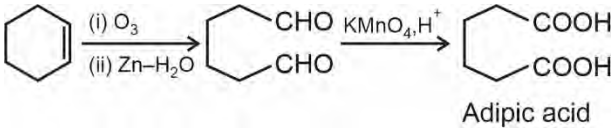
Hint: p-Nitrophenol is more acidic than ortho and meta nitrophenol.

Sol.: Hydrogen of –OH in o-Nitrophenol is involved in intramolecular H-bonding, due to which release of H^+ ion is not easy.

90. Answer (4)

Hint: $KMnO_4/H^+$ convert aldehydic group into carboxylic acid.

Sol.:



Adipic acid

[BIOLOGY]

91. Answer (4)

Hint: In interphase, most of the chromatin is relatively decondensed and loosely distributed throughout the nucleus of a cell.

Sol.: Centriole is devoid of membrane. Transmembrane proteins can be removed by using detergents. Mitochondrial DNA has high G ≡ C content.

92. Answer (2)

Hint: In dioecious plants, male and female flowers are produced on two separate plants.

Sol.: Seed formation, even in the absence of any pollinating agent, is an advantage of cleistogamy. Cleistogamous flowers are found in the plants like *Oxalis* and *Commelina*.

93. Answer (4)

Hint: Microbodies are membrane bound minute vesicles that contain various enzymes.

Sol.: A specialised differentiated form of cell membrane called mesosome is found in prokaryotes.

94. Answer (1)

Hint: Isobilateral leaves have nearly similar sized vascular bundle.

Sol.: Parallel venation in monocot leaves is reflected in the near similar sizes of vascular bundles.

95. Answer (4)

Hint: Endodermis is the innermost layer of cortex.

Sol.: Cambium is a thin strip of primary meristem present between xylem and phloem in dicot stem.

96. Answer (2)

Hint: Subsidiary cells are devoid of chloroplasts.

Sol.: Monocot stems are comprised of sclerenchymatous hypodermis.

97. Answer (3)

Hint: Viruses are obligate parasites.

Sol.: Conidia are the asexual spores that are produced exogenously on the special mycelium called conidiophores.

98. Answer (4)

Hint: The given figure represents a dinoflagellate.

Sol.: Diatoms are the chief producers in the oceans.

99. Answer (3)

Hint: In pteridophytes, sporophytes bear sporangia that are subtended by sporophylls.

Sol.: Megaspores are not retained permanently within the megasporangium in *Marsilea*.

100. Answer (3)

Hint: Sepals in mustard show imbricate aestivation.

Sol.: Feature a, c, d, e and f are common for *Hibiscus* and Chilli.

101. Answer (2)

Hint: Seed is a result of sexual reproduction.

Sol.: Sunflower has basal placentation.

102. Answer (3)

Hint: Flower of *Indigofera* can be divided into two equal halves in only one vertical plane.

Sol.: Seeds of *Indigofera* are non-endospermic.

103. Answer (1)

Hint: Gametes in *Spirogyra* are non-flagellated.

Sol.: Oogamous type of reproduction is seen in *Fucus*.

104. Answer (2)

Hint: Members of the kingdom Mycota (Fungi) are eukaryotic and can show saprophytic or parasitic mode of nutrition.

Sol.: Cell wall of fungi is made up of chitin.

105. Answer (3)

Hint: The basics of taxonomy like identification, naming and classification of organisms have universally evolved under international codes.

Sol.: Plant families like Convolvulaceae and Solanaceae are included in the order Polymoniales, mainly based on the floral characters.

106. Answer (3)

Hint: A structure present in a female cockroach

Sol.: In female cockroaches, oviducts of each ovary unite into a single median oviduct (also called vagina) which opens into the genital chamber. A pair of spermatheca is present in the 6^{th} segment which opens into the genital chamber.

107. Answer (3)

Hint: Dense regular connective tissue

Sol.: In dense connective tissue, orientation of fibres show a regular or irregular pattern and are called dense regular and dense irregular tissues respectively. In the dense regular connective tissues, the collagen fibres are present in rows between many parallel bundles of fibres. Tendons, which attach skeletal muscles to bones and ligaments which attach one bone to another are examples of this tissue.

108. Answer (4)

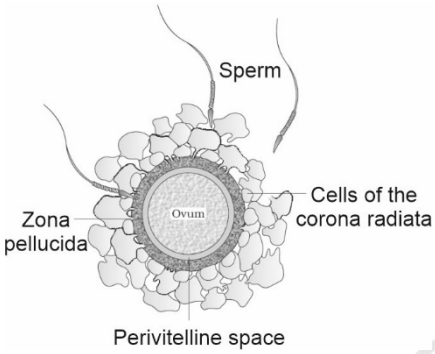
Hint: Pars intermedia is a part of adenohypophysis

Sol.: Adenohypophysis consists of two portions, pars distalis and pars intermedia. In humans, the pars intermedia is almost merged with pars distalis. Neurohypophysis (pars nervosa) also known as posterior pituitary, stores and releases two hormones called oxytocin and vasopressin, which are actually synthesised by the hypothalamus and are transported axonally to the neurohypophysis.

109. Answer (1)

Hint: Produced from secondary oocyte

Sol.:



During fertilisation, a sperm first comes in contact with zona pellucida layer of the ovum and induces changes in the membrane that blocks the entry of additional sperms. Thus, it ensures that only one sperm can fertilize an ovum.

110. Answer (4)

Hint: Molecular weight of lipid never exceeds 800 Da.

Sol.: Gingelly oil is a lipid while guanylic acid is a nucleotide. Former will be obtained in retentate (acid-insoluble) fraction and latter will be obtained in filtrate (acid-soluble) fraction. Both have molecular weights less than 800 Da.

111. Answer (1)

Hint: A part of forebrain

Sol.: Cerebrum forms the major part of human brain. Cerebrum and hypothalamus are the parts of forebrain while cerebellum and medulla oblongata are the parts of hindbrain.

The cerebrum is longitudinally divided into two halves that are connected by corpus callosum.

112. Answer (2)

Hint: Fascicle refers to muscle bundle

Sol.: Each organised skeletal muscle in our body is made up of a number of muscle bundles or fascicles held together by a common collagenous connective tissue layer called fascia. Each muscle bundle contains a number of muscle fibres. Each muscle fibre contains actin and myosin myofilaments. Thus, correct order is

Fascicle → Muscle fibre → Myofibril → Myofilament

113. Answer (2)

Hint: Sphygmomanometer measures blood pressure.

Sol.: ECG(electrocardiogram) is a graphical representation of the electrical activity of the heart during a cardiac cycle. Electrocardiograph is used to obtain an electrocardiogram (ECG). Spirometer helps to measure pulmonary volumes.

114. Answer (3)

Hint: Trophoblast attaches to the innermost layer of uterus

Sol.: The blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called the inner cell mass. The trophoblast layer then gets attached to the endometrium and the inner cell mass gets differentiated into the embryo. After attachment, the uterine cells divide rapidly and cover the blastocyst.

115. Answer (3)

Hint: *Petromyzon* belongs to this taxon.

Sol.: *Salamandra* belongs to the division Gnathostomata.

Class – Amphibia

Super class – Tetrapoda

Subphylum – Vertebrata

Phylum – Chordata

116. Answer (3)

Hint: The given pedigree is true for myotonic dystrophy.

Sol.: The given pedigree does not hold true for a sex-linked recessive trait, such as, haemophilia.

117. Answer (4)

Hint: Thalassemia and sickle cell anaemia are the Mendelian disorders.

Sol.: Klinefelter's syndrome is a chromosomal disorder, caused due to the presence of an additional copy of X-chromosome, resulting into a karyotype of 47, XXY.

118. Answer (3)

Hint: If starch grain size is considered as the phenotype, then the alleles show incomplete dominance.

Sol.: The genotype 'Bb' will give rise to the starch grains of intermediate size.

119. Answer (4)

Hint: 'X' represents nucellus.

Sol.: The central tissue of ovule is nucellus in which the female gametophyte is located. In nucellus, a single specialized cell acts as the precursor to the MMC which forms the megaspores.

120. Answer (4)

Hint: Perispermic seed is the one in which the remains of nucellus are seen.

Sol.: Beet is an example of a perispermic seed.

121. Answer (2)

Hint: The outermost layer of a bacterial cell envelope is glycocalyx that can be in the form of a capsule which allows the bacterium to hide from the host's immune system.

Sol.: Special membranous structure formed by the invagination of plasma membrane in a prokaryotic cell is mesosome which helps in cell wall formation, DNA replication, respiration and secretory processes.

122. Answer (1)

Hint: Geometric growth rate results in the formation of a sigmoid curve.

Sol.: Arithmetic growth rate refers to the constant growth of an organism or a part, per unit time and is represented by the equation, $L_t = L_0 + rt$.

123. Answer (1)

Hint: Gibberellins stimulate the synthesis of hydrolytic enzymes for mobilisation of reserve food.

Sol.: Gibberellins stimulate stem elongation and other aerial parts but have no effect on roots.

124. Answer (3)

Hint: Net gain of ATP is two, in both, lactic acid and alcohol fermentation.

Sol.: Alcohol fermentation results in the release of CO_2 along with alcohol, while lactic acid fermentation releases lactic acid only.

125. Answer (1)

Hint: Enolase acts on 2-phosphoglycerate and converts it into phosphoenolpyruvate.

Sol.: Fructose-1,6-bisphosphate splits into dihydroxyacetone phosphate (DHAP) and 3-phosphoglyceraldehyde (PGAL) by the action of aldolase.

126. Answer (2)

Hint: When several factors affect any biochemical process, Blackman's law of limiting factors comes into effect.

Sol.: Photosynthesis is a physico-chemical process which follows the Blackman's law of limiting factors, according to which, if a chemical process is affected by more than one factor, then its rate is determined by the factor which is nearest to its minimal value.

127. Answer (3)

Hint: Joseph Priestley performed the bell jar experiment to show that the plants restore to the air, whatever the breathing mouse and the burning candle removed.

Sol.: Cornelius van Niel inferred from his experiments that the oxygen evolved by the green plants comes from H_2O and not from CO_2.

128. Answer (1)

Hint: Crossing over takes place in the pachytene stage.

Sol.: In the pachytene stage, recombination nodules are formed at the site of crossing over.

129. Answer (1)

Hint: Splitting of centromere occurs during anaphase II.

Sol.: During anaphase I, the two homologous chromosomes separate from each other. Since only one chromosome out of a pair reaches the pole, the number of chromosomes becomes half in the daughter cells. Next to anaphase I is telophase I. In this phase uncoiling of chromosome occurs.

130. Answer (3)

Hint: Condensation of chromatin material begins in the prophase of karyokinesis.

Sol.: By the end of prophase, Golgi complex, ER, nuclear membrane and nucleolus disappear.

131. Answer (2)

Hint: Forms the base of the skull

Sol.: Cranial bones are frontal, temporal, parietal, occipital, sphenoid and ethmoid.

Out of these, parietal and temporal are paired bones, rest all are unpaired bones.

132. Answer (3)

Hint: Nephron consists of glomerulus and renal tubule

Sol.:

- The renal tubule begins with a double walled cup-like structure called Bowman's capsule, which encloses the glomerulus.
- The amount of the filtrate formed by the kidneys per minute is called glomerular filtration rate (GFR).
- NaCl is transported by the ascending limb of Henle's loop which is exchanged with the descending limb of vasa recta.
- NaCl is returned to the interstitium by the ascending portion of vasa recta.
- Sebaceous glands eliminate certain substances like sterols, hydrocarbons and waxes through sebum.

133. Answer (3)

Hint: Fats are the esters of fatty acid with alcohol

Sol.: Lipids are not strictly macromolecule. Some lipids have phosphorous and a phosphorylated organic compound in them. These are phospholipids. They are found in cell membrane. Lecithin is one example. Some tissues especially the neural tissues have lipids with more complex structures. DNA contains phosphate but it is not the esters of fatty acids with alcohol.

Alanine is an amino acid and sucrose is a disaccharide.

134. Answer (3)

Hint: Sponges contain spongin fibres

Sol.: The body of porifers is supported a skeleton made of spicules or spongin fibres.

Echinoderms have an endoskeleton made of calcareous ossicles.

135. Answer (2)

Hint: Associated with vision

Sol.: The brain is divided into fore-brain, mid-brain and hind-brain. Forebrain includes olfactory lobes, paired cerebral hemispheres and unpaired diencephalon. The midbrain is characterised by a pair of optic lobes. Hind-brain consists of cerebellum and medulla oblongata. The medulla oblongata passes out through the foramen magnum and continues into spinal cord, which is enclosed in the vertebral column.

136. Answer (2)

Hint: Darwin finches also represent this phenomenon

Sol.: A is a Wombat

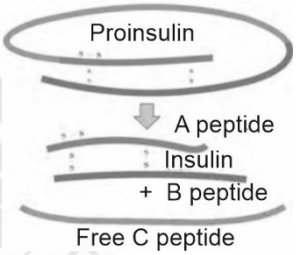
B is a Marsupial rat

A number of marsupials, each different from the other evolved from an ancestral stock, but all within the Australian island continent. When more than one adaptive radiation appeared to have occurred in an isolated geographical area (representing different habitats), one can call this convergent evolution.

137. Answer (4)

Hint: Extra C-peptide is absent in mature insulin

Sol.:



138. Answer (3)

Hint: Product released at last

Sol.: The catalytic cycle of an enzyme action can be described in the following steps:

(1) First, the substrate binds to the active site of the enzyme, fitting into the active site.

(2) The binding of the substrate induces the enzyme to alter its shape, fitting more tightly around the substrate.

(3) The active site of the enzyme, now in close proximity of the substrate breaks the chemical bonds of the substrate and the new enzyme-product complex is formed.

(4) The enzyme releases the products of the reaction and the free enzyme is ready to bind to another molecule of the substrate and run through the catalytic cycle once again.

139. Answer (2)

Hint: Deoxygenated blood is present in pulmonary artery

Sol.: Every 100 mL of deoxygenated blood delivers approximately 4 mL of CO_2 to the alveoli.

2000 mL of deoxygenated blood delivers approximately 80 mL of CO_2 to the alveoli.

140. Answer (1)

Hint: Follicular development takes place in ovaries.

Sol.: Uterine events include – Menstrual phase → Proliferative phase → Secretory phase

Ovarian events include – Follicular phase → Ovulatory phase → Luteal phase.

The follicular phase is a phase in ovarian cycle and is characterised by development of follicles and secretion of estrogens by growing follicles.

141. Answer (2)

Hint: Reproduce by both sexually and asexually

Sol.: Sponges reproduce asexually by fragmentation and sexually by formation of gametes. Fertilisation is internal and development is indirect having a larval stage which is morphologically distinct from the adult.

142. Answer (3)

Hint: Selective mating opposes Hardy-Weinberg equilibrium

Sol.: In a given population one can find out the frequency of occurrence of alleles of a gene or a locus. This frequency is supposed to remain fixed and even remain the same through generations. Hardy-Weinberg principle stated it using equation *i.e.*, $p + q = 1$.

143. Answer (3)

Hint: External inter-costal muscle contraction increase volume in dorso-ventral axis

Sol.: Inspiration is initiated by the contraction of diaphragm which increases the volume of thoracic chamber in the antero-posterior axis. The contraction of external inter-costal muscles lifts up the ribs and the sternum causing an increase in the volume of the thoracic chamber in the dorso-ventral axis.

144. Answer (2)

Hint: Innate immunity is present since birth

Sol.: Innate immunity is non-specific type of defence, that is present at the time of birth. This is accomplished by providing different types of barriers to the entry of the foreign agents into our body. Acquired immunity, on the other hand is pathogen specific. It is characterised by memory.

145. Answer (1)

Hint: Frog shows incomplete double circulation

Sol.: Frog's heart has 3 chambers *i.e.* 2 atria and 1 ventricle. Both oxygenated and deoxygenated blood mix in the ventricle of heart.

146. Answer (1)

Hint: Platelets are also called thrombocytes

Sol.: Platelets can release a variety of substances most of which are involved in the coagulation or clotting of blood. A reduction in their number can lead to clotting disorders which will lead to excessive loss of blood from the body.

147. Answer (1)

Hint: Gene of interest incorporated in the plasmid

Sol.: A nematode *Meloidegyne incognita* infects the roots of tobacco plants and causes a great reduction in yield. A novel strategy was adopted to prevent this infestation which was based on the process of RNA interference (RNAi).

This involves

a. Incorporating essential gene of *M. incognita* into *Agrobacterium* plasmid

b. Introduction of recombinant plasmid into tobacco plant

c. Plasmid allowed to replicate within host plant

d. *M. incognita* feeds on tobacco plant

e. RNAi causes silencing of essential genes of nematode

148. Answer (3)

Hint: LH and FSH are gonadotropins

Sol.: Hormones that play role in erythropoiesis are testosterone, cortisol, erythropoietin and thyroxine.

149. Answer (4)

Hint: Sterilisation procedure

Sol.: Natural methods work on the principle of avoiding chances of ovum and sperms meeting. Sterilisation procedure in the male is called 'vasectomy' and that in the female, 'tubectomy'. Periodic abstinence, lactational amenorrhea and coitus interruptus are natural methods of contraception.

150. Answer (3)

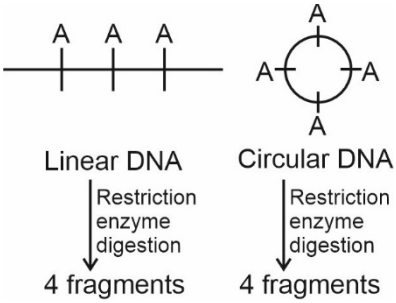
Hint: Thought of early Greek thinkers

Sol.: Some scientists believe that life came from outside. Early Greek thinkers thought units of life called spores were transferred to different planets including Earth. 'Panspermia' is still a favourite idea for some astronomers. For a long time, it was also believed that life came out of decaying and rotting matter like straw, mud, *etc.* This was the theory of spontaneous generation.

151. Answer (4)

Hint: Number of fragments is more than the number of cuts in linear DNA.

Sol.:



152. Answer (3)

Hint: Heteropolymers have different units

Sol.: Proteins are heteropolymers. Carbohydrates may be heteropolymers or homopolymers. Nucleic acids are heteropolymers.

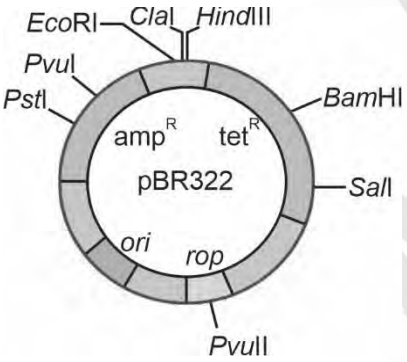
Three kinds of co-factors may be identified: prosthetic groups, co-enzymes and metal ions.

All metal ions are not co-factors.

153. Answer (4)

Hint: *rop* codes for the proteins that controls the replication of plasmid

Sol.:



154. Answer (1)

Hint: It concentrates the filtrate

Sol.: Counter current mechanism helps to maintain a concentration gradient in the medullary interstitium. Presence of such interstitial gradient helps in an easy passage of water from the collecting tubule thereby concentrating the filtrate (urine).

155. Answer (2)

Hint: Flame cells are also called protonephridia.

Sol.: *Pheretima*(earthworm) has nephridia for excretion. Protonephridia or flame cells are the excretory structures in platyhelminths (Flatworms, *e.g.*, *Planaria*).

King crabs *i.e.*, *Limulus* use book gills for respiration and coxal gland for excretion.

Periplaneta i.e., cockroach respire *via* tracheoles and excrete through Malpighian tubules.

Balaenoptera i.e., mammals respire through lungs and excrete through kidneys.

156. Answer (2)

Sol.: Population ecology is an important area of study because it links ecology to population genetics and evolution.

157. Answer (4)

Hint: Mycorrhizae refers to a mutualistic relationship between fungus and roots of higher plants.

Sol.: Predation helps to maintain species diversity in a community.

158. Answer (4)

Hint: Exponential growth is described by the equation : $\frac{dN}{dt} = rN$

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

If K >> N, N will be negligible

Then $\frac{dN}{dt} = rN\left(\frac{K}{K}\right)$

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

Thus, plot of $\frac{dN}{dt}$ v/s t will show a J-shaped graph.

159. Answer (2)

Sol.: Amphibians are more vulnerable to extinction.

India's share in global species diversity is 1.8 per cent, although it has only 2.4 per cent of the world's land area.

160. Answer (3)

Sol.: In the species-area relationships among a very large area, like an entire continent, the value of Z ranges from 0.6 to 1.2.

161. Answer (4)

Hint: Standing crop refers to the amount of living material present at different trophic levels at a given time.

Sol.: For an inverted pyramid of biomass, the biomass of producers is less than that of primary consumers in a given area at a time. It is usually found in sea ecosystem.

162. Answer (3)

Hint: Third trophic level is occupied by secondary consumers.

Sol.: Deer is a herbivore and always occupies the second trophic level.

163. Answer (4)

Hint: In the anaerobic sludge digesters, bacteria produce a mixture of gases such as, methane, H_2S and CO_2.

Sol.: Primary treatment of sewage involves sequential filtration and sedimentation of grit.

164. Answer (3)

Hint: Statins are obtained from *Monascus* purpureus.

Sol.: *Aspergillus niger* – Citric acid

Penicillium – Gluconic acid

Streptococcus – Clot buster

165. Answer (3)

Hint: HGP was launched to determine the sequences of 3 billion chemical base pairs and was completed by the year 2003.

Sol.: Methodologies like ESTs and sequence annotation were used during HGP. It was called a mega project, as it required the identification and sequencing of a very large number of base pairs (3×10^9).

166. Answer (1)

Hint: A typical nucleosome contains 200 base pairs of DNA helix.

Sol.: If the sequence of bases in one strand is known, the sequence in the other strand can be predicted.

167. Answer (3)

Hint: Diploid content of human DNA is 6.6×10^9 bp.

Sol.: $\phi \times 174$ bacteriophage – 5386 nucleotides

Bacteriophage lambda – 48502 base pairs

E. coli – 4.6×10^6 base pairs

Haploid content of human DNA – 3.3×10^9 base pairs

168. Answer (1)

Hint: Point mutation will lead to loss of function of lac *i*.

Sol.: A point mutation in lac *i* can cause a loss of repressor function, leading constitutive expression of operon. Deletion will affect the operator region where repressor bind leading to constitutive expression.

169. Answer (4)

Hint: For translation, the order and sequence of amino acids are defined by the sequence of bases in mRNA.

Sol.: In some viruses, RNA acts as the genetic material.

170. Answer (1)

Hint: Punnett square is a graphical representation of all possible genotypes of offsprings in a genetic cross.

Sol.: Law of segregation is based on the fact that alleles do not show any blending and characters are recovered in next generation.

171. Answer (2)

Hint: Receives oxygenated blood.

Sol.: A patch of nodal tissue is present in the right upper corner of the right atrium called the sino-atrial node (SAN). Another mass of this tissue is seen in the lower left corner of the right atrium close to the atrio-ventricular septum called the atrio-ventricular node (AVN).

172. Answer (2)

Hint: Each testis has about 250 compartments

Sol.: Each testis has about 250 compartments called testicular lobules. Each lobule contains one to three highly coiled seminiferous tubules in which sperms are produced.

173. Answer (4)

Hint: Heroin is an opioid

Sol.: The drugs, which are commonly abused are opioids, cannabinoids and coca alkaloids. Majority of these are obtained from flowering plants. Some are obtained from fungi. Generally taken by snorting and injection, heroin(opioid) is a depressant and slows down body functions. Generally taken by inhalation and oral ingestion, cannabinoids are known for their effects on cardiovascular system of the body.

174. Answer (2)

Hint: Causes cerebral malaria

Sol.: *Plasmodium*, a tiny protozoan is responsible for malaria. Different species of *Plasmodium* (*P. vivax*, *P. malaria* and *P. falciparum*) are responsible for different types of malaria. Of these, malignant malaria caused by *Plasmodium falciparum* is the most serious one and can even be fatal.

175. Answer (3)

Hint: Primers are oligonucleotides

Sol.: In PCR, multiple copies of the gene (or DNA) of interest is synthesised *in vitro* using two sets of primers.

Primers are small chemically synthesised oligonucleotides that are complementary to the regions of DNA and the enzyme DNA polymerase.

Repeated amplifications in PCR is achieved by use of thermostable DNA polymerase isolated from bacterium *Thermus aquaticus*.

176. Answer (1)

Hint: Blood is fibreless

Sol.: The defining characteristic of connective tissue is the presence of a large amount of extracellular matrix (ECM). This matrix consists of ground substance (which can be fluid, gel-like, or solid) and fibers (such as collagen, elastin, or reticular fibers). The ECM provides support and structure to tissues and organs.

177. Answer (4)

Hint: 20 Feet in height

Sol.: The biggest of the dinosaurs, *i.e.*, *Tyrannosaurus rex* was about 20 feet in height and had huge fearsome daggerlike teeth. Rest all *i.e*. *Tricerotops*, *Brachiosaurus*, *Stegosaurus* were herbivorous and show quadripedal locomotion.

178. Answer (1)

Hint: CCK acts on both pancreas and gall bladder

Sol.:

- Gastrin acts on the gastric glands and stimulates the secretion of hydrochloric acid and pepsinogen.
- Secretin acts on the exocrine pancreas and stimulates secretion of water and bicarbonate ions.
- CCK acts on both pancreas and gall bladder and stimulates the secretion of pancreatic enzymes and bile juice, respectively.
- GIP inhibits gastric secretion and motility

179. Answer (1)

Hint: DNA directly injected into nucleus

Sol.: Microinjection is a method in which recombinant DNA is directly injected into the nucleus of an animal cell.

In another method, suitable for plants, cells are bombarded with high velocity microparticles of gold or tungsten coated with DNA in a method known as biolistics or gene gun. And another method uses 'disarmed pathogen' vectors, which when allowed to infect the cell, transfer the recombinant DNA into the host.

180. Answer (1)

Hint: A canal called the cerebral aqueduct passes through the midbrain

Sol.: Three major regions make up the brain stem; mid brain, pons and medulla oblongata. Brain stem forms the connections between the brain and spinal cord. The dorsal portion of the midbrain consists mainly of four round swellings (lobes) called corpora quadrigemina. The cerebellum integrates information received from the semi-circular canals of the ear and the auditory system.

❑ ❑ ❑