## Answer Key for Mock Test- 4 (For 2020 Aspirants) 27th March 2020

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1. (3)

We know that \( \frac{Q^2}{2C} \) is energy of capacitor so it represent the dimension of energy = \([ML^2T^{-2}]\)

2. (3)

We have, \( S_n = u + \frac{a}{2} (2n - 1) \)

or \( 65 = u + \frac{a}{2} (2 \times 5 - 1) \)

or \( 65 = u + \frac{9}{2} a \) \( \ldots (1) \)

also, \( 105 = u + \frac{a}{2} (2 \times 9 - 1) \)

or \( 105 = u + \frac{17}{2} a \) \( \ldots (2) \)

Equation (2) – (1) gives,

\( 40 = \frac{17}{2} a - \frac{9}{2} a = 4a \) or \( a = 10 \text{ m/s}^2 \)

Substitute this value in (1) we get,

\( u = 65 - \frac{9}{2} \times 10 = 65 - 45 = 20 \text{ m/s} \)

\( \therefore \) The distance travelled by the body in 20 s is.

\( s = ut + \frac{1}{2} at^2 = 20 \times 20 + \frac{1}{2} \times 10 \times (20)^2 \)

\( = 400 + 2000 = 2400 \text{ m.} \)

3. (2)

Consider \( \theta \) is angle of projection and \( \alpha \) is elevation angle of the projectile of its highest point as seen from the point of projection then

\( \tan \alpha = \frac{1}{2} \tan \theta \)

\( = \frac{1}{2} (\tan 45^\circ) \)

\( = \frac{1}{2} \)

\( \therefore \alpha = \tan^{-1} \left( \frac{1}{2} \right) \)
4. Let $T$ be the tension in the branch of a tree when monkey is descending with acceleration $a$. Then $mg - T = ma$; and $T = 75\%$ of weight of money = $(3/4)mg$

$$mg - \frac{3}{4}mg = ma \Rightarrow a = \frac{g}{4}$$

5. \(v = u - at \Rightarrow t = \frac{u}{a} [As \ v = 0]\)

$$t = \frac{u \times m}{F} = \frac{30 \times 1000}{5000} = 6 \text{ sec}$$

6. \(\text{In the case of elastic collision with identical masses, velocities will be interchanged just after collision.}\)

So, just after collision velocity of block A is $v_0$ (towards right).

According to conservation of momentum between A and B is

$$mv_0 = (m + 2m)v \Rightarrow v = \frac{v_0}{3}$$

According to conservation of energy,

$$\frac{1}{2}mv_0^2 = \frac{1}{2}(3m)v^2 + \frac{1}{2}kx_0^2$$

$$mv_0^2 = (3m)\left(\frac{v_0^2}{9}\right) + kx_0^2$$

$$\frac{2}{3}mv_0^2 = kx_0^2$$

$$k = \frac{2mv_0^2}{3x_0^2}$$

7. \(W_{mg} = \Delta K \Rightarrow -mg\ell = \frac{1}{2}mv^2 - \frac{1}{2}mu^2 \)

or $mv^2 = m(u^2 - 2g\ell)$ or $v = \sqrt{u^2 - 2g\ell}$

$$\vec{v} = \vec{u} i$$

$$\therefore \vec{v} - \vec{u} = \sqrt{u^2 - 2g\ell} \hat{j} - \vec{u} i$$

$$\therefore |\vec{v} - \vec{u}| = [(u^2 - 2g\ell) + u^2]^{1/2} = \sqrt{2u^2 - 2g\ell} = \sqrt{2(u^2 - g\ell)}$$
8. (4)
Initially centre of mass is at the centre. When sand is poured it will fall and again after a limit, centre of mass will rise.

9. (1)
\[ F = 20t - 5t^2 \]
\[ \therefore \alpha = \frac{FR}{I} = 4t - t^2 \]
\[ \Rightarrow \frac{d\omega}{dt} = 4t - t^2 \]
\[ \Rightarrow \int_{0}^{6} d\omega = \int_{0}^{6} (4t - t^2) dt \]
\[ \Rightarrow \omega = 2t^2 - \frac{t^3}{3} \] (as \( \omega = 0 \) at \( t = 0, 6s \))
\[ \int_{0}^{6} d\theta = \int_{0}^{6} \left(2t^2 - \frac{t^3}{3}\right) dt \]
\[ \Rightarrow \theta = 36 \text{ rad} \]
\[ \Rightarrow n = \frac{36}{2\pi} < 6 \]

10. (2)
\[ \text{Rotational KE} = \frac{1}{2}mv^2 \left(\frac{K^2}{R^2}\right) \]
\[ \text{Total KE} = \frac{1}{2}mv^2 \left(1 + \frac{K^2}{R^2}\right) \]
\[ = \frac{K^2}{R^2} \]

11. (1)
\[ \text{Square hole:} \quad \left(\frac{dV}{dt}\right)_{\text{square}} = Av = \ell^2 \sqrt{2gh} \]
\[ \text{Circular hole:} \quad \left(\frac{dV}{dt}\right)_{\text{circular}} = Av = \pi r^2 \sqrt{2g(4h)} = 2\pi r^2 \sqrt{2gh} \]
\[ \left(\frac{dV}{dt}\right)_{\text{square}} = \left(\frac{dV}{dt}\right)_{\text{circular}} \]
\[ \ell^2 \sqrt{2gh} = 2\pi r^2 \sqrt{2gh} \]
\[ \ell^2 = 2\pi r^2 \]
\[ r = \frac{\ell}{\sqrt{2\pi}} \]

12. (3)
Sum of volumes of 2 smaller drops = Volume of the bigger drop
\[ 2 \left(\frac{4}{3} \pi r^3\right) = \frac{4}{3} \pi R^3 \Rightarrow R = 2^{1/3}r \]
Surface energy = \( T4\pi R^2 = T(4\pi)\left(2^{1/3}r\right)^2 = 2^{2/3}\left(T 4\pi r^2\right) = 2^{8/3}T\pi r^2 \)
13. \[ V = \frac{\pi Pr^4}{8\eta \ell} \Rightarrow \frac{m}{d t} = \frac{\pi Pr^4}{8\eta \ell} \Rightarrow \frac{m}{d t} = \frac{\pi Pr^4}{8\eta \ell} d \]

\[ \eta \propto \frac{d t}{t} \]

\[ \frac{\eta_1}{\eta_2} = \frac{d_1 t_1}{d_2 t_2} \]

14. (3)

Using the usual expression for the Young’s modulus, the force constant for the wire can be written as

\[ k = \frac{F}{\Delta \ell} = \frac{Y A}{L} \]

where the symbols have their usual meanings.

\[ \frac{1}{k_{eq}} = \frac{1}{k_1} + \frac{1}{k_2} = \frac{L_1}{Y_1 A} + \frac{L_2}{Y_2 A} = \frac{L_1 Y_2 + L_2 Y_1}{A (Y_1 Y_2)} \]

\[ k_{eq} = \frac{A Y_1 Y_2}{L_1 Y_2 + L_2 Y_1} \]

15. (4)

Angular momentum, \( L = I \omega \); moment of inertia of sphere along the axis passing through centre of mass, \( I = \frac{2}{5} M R^2 \) and \( \omega = \frac{2\pi}{T} \).

Putting these values, \( L = \frac{4\pi MR^2}{5T} \)

16. (1)

Applying linear momentum conservation, \( 0.5 \times 3 = (1 + 0.5) v \) or \( v = 1 \text{ m/s} \)

By conservation of energy,

\[
\begin{align*}
\text{mean position} \\
0.5\text{kg} & \quad 3\text{m/s} & \quad 1\text{kg} \\
\end{align*}
\]

After collision

\[ \frac{1}{2} (1 + 0.5) v^2 = \frac{1}{2} kA^2 \Rightarrow A = \sqrt{\frac{1.5}{k}} \times v \]

\[
\begin{align*}
\text{mean position} \\
0.5\text{kg} & \quad 1\text{kg} \\
\end{align*}
\]

\[ \Rightarrow A = \sqrt{\frac{1.5}{600}} \times 1 = \frac{1}{20} \text{m} = 0.05\text{m} \]

\( A = 5 \text{ cm} \)

Time period of oscillation,
17. (1)
Moment of inertia of a rod is \( I = \frac{1}{12} ML^2 \) ………(1)

Differentiating w.r.t ‘L’ on both sides, we get
\[
\frac{\Delta I}{\Delta L} = \frac{1}{12} \times 2ML
\]
\[
\Delta I = \frac{1}{12} \times 2ML \Delta L \quad \text{…….. (2)}
\]

From (1) and (2), \( \frac{\Delta I}{I} = 2 \frac{\Delta L}{L} \)

As we know, \( \Delta L = L \alpha \Delta t \) or \( \frac{\Delta L}{L} = \alpha \Delta t \)

Substituting the value \( \frac{\Delta L}{L} \), we get
\[
\frac{\Delta I}{I} = 2 \alpha \Delta t
\]

18. (4)
According to the principle of calorimetry.
Heat lost = Heat gained
\[
m L v + m S \Delta \theta = m s s \Delta \theta
\]
\[
\Rightarrow m_s \times 540 + m_s \times 1 \times (100 - 80) = 20 \times 1 \times (80 - 10)
\]
\[
\Rightarrow m_s = 2.5g
\]
Therefore, total amount of water present = 20 g + 2.5 g = 22.5 g

19. (4)
Two rods have same length, same area of cross section, same k (thermal conductivity), so thermal
resistance \( R \left( R = \frac{\ell}{kA} \right) \) also same.

In figure (i), the two rods are connected in parallel, so \( R_1 = \frac{R}{2} \)

In figure (ii), the two rods are connected in series, so \( R_2 = 2R \)

According to thermal conductivity, \( \frac{\Delta Q}{\Delta t} = \frac{\Delta \theta}{R} \)

As \( \Delta Q \) and \( \Delta \theta \) are same then \( \Delta t \propto R \)
\[
\frac{\Delta t_2}{\Delta t_1} = \frac{R_2}{R_1} \Rightarrow \frac{\Delta t_2}{\Delta t_1} = \frac{2R}{R} = 4 \Rightarrow \Delta t_2 = 48 \text{ s}
\]

20. (2)
In the first-case adiabatic change.
\( \Delta Q = 0, \Delta W = - 35 \text{ J} \)

From 1st law of thermodynamics,
\( \Delta Q = \Delta U + \Delta W, \)
or, \( 0 = \Delta - 35 \)
\( \therefore \Delta U = 35 \text{ J} \)

In the second case
ΔQ = 12 cal = 12 × 4.2J = 50.4 J
ΔW = ΔQ − ΔU = 50.4 − 35 = 15.4 J

21. (1)
Let $T$ be the temperature of the mixture, then
\[ U = U_1 + U_2 \]
\[ \Rightarrow \frac{f}{2} (n_1 + n_2)RT = \frac{f}{2} (n_1)(R)(T_0) + \frac{f}{2} (n_2)(R)(2T_0) \]
\[ \Rightarrow (2 + 4)T = 2T_0 + 8T_0 (\because n_1 = 2, n_2 = 4) \]
\[ \therefore T = \frac{5}{3} T_0 \]

22. (3)
Apparent frequency received stationary observer when source (car) moves away from him is
\[ f_1 = \left( \frac{V_{\text{sound}}}{V_{\text{sound}} + V_{\text{source}}} \right) f_0 \]
\[ f_1 = \left( \frac{V}{V + V_0} \right) f_0 \] \hspace{1cm} (1)

Apparent frequency received by stationary observer due to reflected wave from the wall is
\[ f_2 = \frac{f_0 V}{V - V_0} \] \hspace{1cm} (2)

Beats = \[ f_2 - f_1 = \frac{f_0 V}{V - V_0} - \frac{f_0 V}{V + V_0} = \frac{2f_0 V V_0}{V^2 - V_0^2} \]

23. (2)
Force on charge $q_1$ due to $q_2$ is
\[ F_{12} = k \frac{q_1 q_2}{b^2} \]

Force on charge $q_1$ due to $q_3$ is
\[ F_{13} = k \frac{q_1 q_3}{a^2} \]

The X-component of the force ($F_x$) on $q_1$ is $F_{12} + F_{13} \sin \theta$
\[ \therefore F_x = k \frac{q_1 q_2}{b^2} + k \frac{q_1 q_3}{a^2} \sin \theta \]
\[ \therefore F_x \propto \frac{q_2}{b^2} + \frac{q_3}{a^2} \sin \theta \]
24. (1) 
\( \lambda = \text{linear charge density;} \)
Charge on elementary portion \( dx = \lambda \ dx \).

Electric field at O, \( dE = \frac{\lambda \ dx}{4\pi \varepsilon_0 a^2} \)
Horizontal electric field, i.e., perpendicular to AO, will be cancelled.
Hence, net electric field – addition of all electrical fields in direction of AO
\( = \Sigma dE \cos \theta \)
\( \Rightarrow E = \int \frac{\lambda \ dx}{4\pi \varepsilon_0 a^2} \cos \theta \)
Also, \( d\theta = \frac{dx}{a} \) or \( dx = ad\theta \)
\( E = \int_{-\pi/2}^{\pi/2} \frac{\lambda \cos \theta d\theta}{4\pi \varepsilon_0 a} = -\frac{\lambda}{4\pi \varepsilon_0 a} [\sin \theta]_{-\pi/2}^{\pi/2} \)
\( = \frac{\lambda}{4\pi \varepsilon_0 a} [1 - (-1)] = \frac{\lambda}{2\pi \varepsilon_0 a} \)

25. (3)
\( V_f = \frac{Q_2}{4\pi \varepsilon_0 r} + \frac{Q_1}{4\pi \varepsilon_0 R_1} \)
\( V_f = \frac{1}{4\pi \varepsilon_0} \left( \frac{Q_2}{r} + \frac{Q_1}{R_1} \right) \)

26. (1)
The equivalent circuit is shown in figure
\( C_{AB} = 3\mu F \)
27. (4)

\[ R_{\text{net between AB}} = \frac{3R \times R}{3} = \frac{R^2}{3} = 4\Omega \]

28. (3)

In series, \( R_s = nR \)

In parallel, \( \frac{1}{R_p} = \frac{1}{R} + \frac{1}{R} + \ldots \text{ n terms} \)

\[ \therefore \frac{R_s}{R_p} = \frac{n^2}{1} = n^2 \]

29. (4)

\[ B_1 = -\frac{\mu_0 i_1}{2\pi / 2} + \frac{\mu_0 i_2}{2\pi / 2} = \frac{\mu_0 (i_2 - i_1)}{\pi} = 6 \times 10^{-6} \text{T} \quad \text{............... (1)} \]

When the current \( i_2 \) is reversed then

\[ B_2 = -\frac{\mu_0 (i_1 + i_2)}{2\pi / 2} = \frac{\mu_0 (i_1 + i_2)}{\pi} = 3 \times 10^{-5} \text{T} = 30 \times 10^{-6} \text{T} \quad \text{............... (2)} \]

Dividing (ii) by (i) we get

\[ \frac{-(i_1 + i_2)}{i_2 - i_1} = \frac{30}{6} = 5 \]

\[ -(i_1 + i_2) = 5i_2 - 5i_1 \Rightarrow 6i_2 = 4i_1 \]

\[ \frac{i_1}{i_2} = \frac{3}{2} \]
30. (1)
\[ T = 2\pi \sqrt{\frac{I}{MB}} \]
\[ T' = 2\pi \sqrt{\frac{I}{n^3 M B}} = \frac{2\pi}{n} \sqrt{\frac{I}{MB}} \]
\[ T' = \frac{T}{n} \]

31. (2)
\[ F = I\ell B = \left( \frac{vB\ell}{r} \right) B = \frac{vB^2\ell^2}{r} \]

32. (1)
As the magnetic field increases, its flux also increases into the page and so induced current in bigger loop will be anticlockwise. i.e., from D to C in bigger loop and then from B to A smaller loop.

33. (1)
\[ I = I_0 \left( 1 - e^{-\frac{R}{L}} \right) \]  
(When current is in growth in LR circuit)
\[ = \frac{E}{R} \left( 1 - e^{-\frac{R}{L}} \right) = \frac{5}{5} \left( 1 - e^{-5^{10^{-2}}} \right) = (1 - e^{-1}) \]

34. (4)
\[ \frac{1}{2} \varepsilon_0 E_0^2 \] is elastic energy density
\[ \frac{B^2}{2\mu_0} \] is magnetic energy density.
So, total energy density = \[ \frac{1}{2} \varepsilon_0 E_0^2 + \frac{B_0^2}{2\mu_0} \]

35. (4)
\[ \mu = \frac{\text{Apparent height}}{\text{Real height}} \]
Now, real height = 24 cm and \( \mu = \frac{4}{3} \)
\[ \frac{4}{3} \times 24 = \text{Apparent height} \]
\[ \therefore \text{Apparent height} = 32 \text{ cm} \]

36. (2)
Angle of deviation, \( \delta = i + e - A \)
Here, \( e = I \), and \( e = \frac{3}{4} A \)
\[ \therefore \delta = \frac{3}{4} A + \frac{3}{4} A - A = \frac{A}{2} \]
For equilibrium prism, \( A = 60^\circ \)
\[ \therefore \delta = \frac{60^\circ}{2} = 30^\circ \]

37. (3)

38. (2)
\[ \Delta x_1 = (\mu_1 - 1)t = (1.5 - 1)t = 0.5t \]
and \[ \Delta x_2 = (\mu_2 - 1) \times 2t = \left( \frac{4}{3} - 1 \right) \times 2t = \frac{2}{3}t \]
as \[ \Delta x_2 > \Delta x_1 \], so shift will be along \(-\)ve \(y\)-axis.

39. (4)
\[ W_0 = h\nu_1 - eV_i \]
\[ W_0 = h\nu_2 - eV_2 \]
\[ h\nu_2 - eV_i = h\nu_1 - eV_i \]
\[ eV_2 = h\nu_2 - h\nu_1 + eV_i \]
\[ eV_2 = h(n_2 - n_1) + eV_i \]
\[ V_2 = \frac{h(n_2 - n_1)}{e} + V_i \]

40. (3)
\[ \frac{n}{3} \]

\[ \text{Case (I)} \]

\[ \frac{n}{2} \]

\[ \text{Case (II)} \]

\[ \frac{n}{1} \]

The wave number \( (\bar{\nu}) \) of the radiation = \[ \frac{1}{\lambda} = R \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right] \]

For the transition \( 3 \rightarrow 2 \) \((n_2 \rightarrow n_1)\), \[ \frac{1}{\lambda_1} = R \left[ \frac{1}{4} - \frac{1}{9} \right] = \frac{5R}{36} \Rightarrow \lambda_1 = \frac{36}{5R} \]

For the transition \( 2 \rightarrow 1 \) \((n_2 \rightarrow n_1)\), \[ \frac{1}{\lambda_2} = R \left[ \frac{1}{1} - \frac{1}{4} \right] = \frac{3R}{4} \Rightarrow \lambda_2 = \frac{4}{3R} \]

\[ \frac{\lambda_1}{\lambda_2} = \left( \frac{36}{5R} \right) \left( \frac{3R}{4} \right) = \frac{27}{5} \]

41. (3)
As \( \lambda \) is increased, there will be a value of \( \lambda \) above which photoelectrons will cease to come out. So, photocurrent will be zero.

42. (3)
\[ _{\text{A}}^{\text{Z}}X \rightarrow _{\text{Z-2}}^{\text{A-4}}Y + ^4_2\text{He} + Q \]
We assume that mass number of nucleus when it was at rest = \( A \)
\[ ; \text{Mass number of } \alpha \text{- particle} = 4 \]
\[ \text{Mass number of remaining nucleus} = A - 4 \]
As there is no external force, so momentum of the system will remain conserved.

\[ 0 = (A-4)v' + 4v \Rightarrow v' = -\frac{4v}{A-4} \]

43. (3)

44. (1)
As we know,

\[ eV_s = \frac{hc}{\lambda} - \Psi \]

\[ 3eV_o = \frac{hc}{2\lambda} - \Psi \quad \text{... (1)} \]

\[ eV_o = \frac{hc}{2\lambda} - \Psi \]

\[ 3eV_o = \frac{3hc}{2\lambda} - 3\Psi \quad \text{... (2)} \]

\[ (2) - (1) \text{ we get } \Psi = \frac{hc}{4\lambda} \]

So, threshold wavelength, \( \lambda_{th} = \frac{hc}{\Psi} = \frac{hc}{hc/4\lambda} = 4\lambda. \)

45. (4)

Voltage gain \( A_v = \beta \left( \frac{R_L}{R_m} \right) \)

Transconductance \( g_m = \frac{\beta}{R_m} \)

\[ \Rightarrow A_v = g_m R_L \]

\[ \Rightarrow A_v \propto g_m \]

\[ \Rightarrow A_2 = \left( \frac{g_m}{g_1} \right)^2 \]

\[ \Rightarrow A_2 = \frac{0.02 \text{ mho}}{0.03 \text{ mho}} \]

\[ \Rightarrow A_2 = \frac{2}{3} G \]

<p>| | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>46</td>
<td>2</td>
<td>Living World</td>
<td>Genus is a group of related species.</td>
</tr>
<tr>
<td>47</td>
<td>1</td>
<td>Biological classification</td>
<td>Nostoc and Anabaena are examples of Cyanobacteria (Monera), 3) Paramoecium and Plasmodium are protozoans, Penicillium is a fungus. 4) Lichen has algae and fungus.</td>
</tr>
</tbody>
</table>
48. Archegoniophore has a different structure than Antheridiophore. Check NCERT page 34

49. A is Sporophyte since 2n ploidy given. B: Meiosis since the products formed are haploid spores. C: Gametogenesis by gametophyte. D: Zygote since it follows syngamy.

50. b: lichens are perennials; e: Orchids seldom occur without mycorrhizae; f: phytoplanktons are pioneers of succession in a water body. Lichens are pioneers of succession on a rock.


52. Thylakoid lumen space is present only in chloroplast

53. Oxygen is evolved from water. Not from carbon dioxide.

54. Floral formula is of family LILIACEAE. Allium and Asparagus are
<table>
<thead>
<tr>
<th>Question</th>
<th>Type</th>
<th>Description</th>
<th>Answer</th>
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<tr>
<td>55.</td>
<td>1</td>
<td>Photosynthesis in higher plants</td>
<td>ATP and NADPH2 are produced during light reaction in plants with evolution of oxygen and photolysis of water.</td>
</tr>
<tr>
<td>56.</td>
<td>1</td>
<td>Cell cycle and cell division</td>
<td>2 is Interphase; 3 is Anaphase; 4 is Pachytene.</td>
</tr>
<tr>
<td>57.</td>
<td>2</td>
<td>Anatomy of flowering plants</td>
<td>Heartwood does not perform function of conduction.</td>
</tr>
<tr>
<td>58.</td>
<td>2</td>
<td>Transport in plants</td>
<td>Cell A = -9+6 = -3 B→-9+3 = -6 C→-12+10 = -2 D=-18+16 = -2</td>
</tr>
<tr>
<td>59.</td>
<td>4</td>
<td>Cell the unit of life</td>
<td>Peroxisomes are involved in the process of Photorespiration. Glycolate is produced as a first step of photorespiration, which is then recycled to glycerate in peroxisome.</td>
</tr>
<tr>
<td>60.</td>
<td>3</td>
<td>Anatomy of flowering plants</td>
<td>Trichomes are multicelled.</td>
</tr>
<tr>
<td>61.</td>
<td>4</td>
<td>Photosynthesis in higher plants</td>
<td>a) F 1 part of ATPase is associated with breakdown of proton gradient. b, c and d are correct.</td>
</tr>
<tr>
<td>62.</td>
<td>4</td>
<td>Morphology of flowering plants</td>
<td>a) iii Syncarpous; b) i Gametogenesis; c) iv Dikaryotic d) ii Pistillate</td>
</tr>
<tr>
<td>63.</td>
<td>2</td>
<td>Transport in plants</td>
<td>Porins are large pores and allow small sized proteins to pass through.</td>
</tr>
<tr>
<td>64.</td>
<td>3</td>
<td>Mineral nutrition</td>
<td>C is incorrect. Zn is activator of alcohol dehydrogenase, Mo is activator of Nitrogenase.</td>
</tr>
<tr>
<td>No.</td>
<td>Mark</td>
<td>Section</td>
<td>Statement</td>
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<td>--------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>65</td>
<td>3</td>
<td>Reproduction in organisms</td>
<td>E</td>
</tr>
<tr>
<td>66</td>
<td>2</td>
<td>Plant growth and development</td>
<td>Auxin in apical buds does not allow growth of axillary buds. This is apical dominance.</td>
</tr>
<tr>
<td>67</td>
<td>4</td>
<td>Sexual reproduction in flowering plants</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>2</td>
<td>Cell cycle and cell division</td>
<td>Cell plate grows centrifugally (away from centre).</td>
</tr>
<tr>
<td>69</td>
<td>1</td>
<td>Plant growth and development</td>
<td>Photochrome absorbs red light and becomes active to Pfr.</td>
</tr>
<tr>
<td>70</td>
<td>4</td>
<td>Morphology of flowering plants</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>4</td>
<td>Plant growth and development</td>
<td>SDPs do not flower in an interrupted dark period.</td>
</tr>
<tr>
<td>72</td>
<td>2</td>
<td>Mineral nutrition</td>
<td>Azotobacter and Beijerinkia are non-symbiotic/free living nitrogen fixers.</td>
</tr>
<tr>
<td>73</td>
<td>3</td>
<td>Respiration in plants</td>
<td>Succinate dehydrogenase catalyses formation of $\text{FADH}_2$. NADH$_2$ is produced at 2 locations in the Krebs cycle.</td>
</tr>
<tr>
<td>74</td>
<td>2</td>
<td>Respiration in plants</td>
<td>ii is not Acetyl CoA since Acetyl CoA formation results in yielding of NADH$_2$ (not consumption). Fermentation of pyruvic acid consumes NADH$_2$. ii can be any fermentation product.</td>
</tr>
<tr>
<td>75</td>
<td>1</td>
<td>Sexual reproduction in flowering plants</td>
<td>Exile exhibits array of patterns and designs.</td>
</tr>
<tr>
<td>76</td>
<td>3</td>
<td>Sexual reproduction in flowering plants</td>
<td>If $2n=24$, $n$ is 12. Therefore,</td>
</tr>
<tr>
<td>77. 2</td>
<td>Principles of inheritance and variations</td>
<td>GAG of 7th codon is replaced by GTG (A replaced by T or, Purine by a pyrimidine= Transversion type of mutation)</td>
<td>M</td>
</tr>
<tr>
<td>78. 2</td>
<td>Molecular basis of inheritance</td>
<td>UAG is a non sense/stop codon.</td>
<td>M</td>
</tr>
<tr>
<td>79. 4</td>
<td>Principles of inheritance and variations</td>
<td></td>
<td>D</td>
</tr>
<tr>
<td>80. 3</td>
<td>Principles of inheritance and variations</td>
<td>Stevens genotype = X^H Y aa  Probability of sperm having recessive X^H, ( \frac{1}{2} )  Probability of sperm having autosome = ( \frac{1}{2} )  ( \because ) Prob of having X^H &amp; a is ( \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} )</td>
<td>D</td>
</tr>
<tr>
<td>81. 1</td>
<td>Environmental issues</td>
<td>CO(_2) ( \rightarrow ) 60% contribution, N(_2)O ( \rightarrow ) 6% contribution (other contributors are Methane ( \rightarrow ) 20% and CFCs ( \rightarrow ) &gt; 14%).</td>
<td>E</td>
</tr>
<tr>
<td>82. 3</td>
<td>Molecular basis of inheritance</td>
<td>Feed back repression is shown by a repressible Oberon like Trp Oberon. Not by inducible Oberon like lac operon.</td>
<td>M</td>
</tr>
<tr>
<td>83. 3</td>
<td>Biodiversity and conservation</td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>84. 3</td>
<td>Respiration in plants</td>
<td>4 complexes are involved. They are NADH2</td>
<td>E</td>
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<tr>
<td>85.</td>
<td>3</td>
<td>Ecosystem</td>
<td>Dehydrogenase complex II] FADH2 Dehydrogenase complex III] Cyt bC1 complex IV] cyt aa3 complex</td>
</tr>
<tr>
<td>86.</td>
<td>2</td>
<td>Biodiversity and conservation</td>
<td>Ecosystem B) GPP-Respiratory losses = NPP; C) Rate of biomass production is Productivity.</td>
</tr>
<tr>
<td>87.</td>
<td>1</td>
<td>Environmental issues</td>
<td>Ecosystem Rate of biomass production is Productivity. Western Ghats is a hotspot in India</td>
</tr>
<tr>
<td>88.</td>
<td>2</td>
<td>Ecosystem</td>
<td>Biodiversity and conservation Western Ghats is a hotspot in India</td>
</tr>
<tr>
<td>89.</td>
<td>4</td>
<td>Organisms and populations</td>
<td>Biodiversity and conservation Western Ghats is a hotspot in India</td>
</tr>
<tr>
<td>90.</td>
<td>3</td>
<td>Molecular basis of inheritance</td>
<td>Biodiversity and conservation Western Ghats is a hotspot in India</td>
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<tr>
<td>91.</td>
<td>1</td>
<td>Microbes in human welfare</td>
<td>Biodiversity and conservation Western Ghats is a hotspot in India</td>
</tr>
<tr>
<td>92.</td>
<td>3</td>
<td>Strategies for enhancement of food production</td>
<td>Biodiversity and conservation Western Ghats is a hotspot in India</td>
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</tr>
<tr>
<td>93.</td>
<td>3</td>
<td>Microbes in human welfare</td>
<td>M</td>
</tr>
<tr>
<td>94.</td>
<td>3</td>
<td>Organisms and populations</td>
<td>Both A and B populations are competing against one another for common resource, which is grass. A could not compete well, so it’s population decreased. B being superior competitor, survived and increased in numbers.</td>
</tr>
<tr>
<td>95.</td>
<td>2</td>
<td>Strategies for enhancement of food production</td>
<td>E</td>
</tr>
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96. (4) XI, NCERT Page - 49
97. (1) XII, NCERT Page – 212, 5th para, 4th line
98. (2) XI, NCERT Page – 52, 2nd para
99. (2) XII, NCERT Page – 202, Fig. – 11.6
100. (4) XI, NCERT Page – 54, 2nd para, last lines
101. (2) XII, NCERT Page – 194, 195
102. (3) XI, NCERT, Page - 59
103. (1) XII, NCERT, Page – 169, 5th para, 4th line
104. (3) XI, NCERT, Page – 104, 1st para
105. (1) XII, NCERT, Page – 154, Last para, 2nd line
106. (4) XI, NCERT, Page – 112, 1st para, 15th line
107. (1) XII, NCERT, Page – 153, 2nd para, 1st line
108. (2) XI, NCERT, Page - 144
109. (4) XII, NCERT, Page – 157, 2nd para, 3rd line
110. (2) XI, NCERT, Page – 312,20.5 3rd line
111. (2) XII, NCERT, Page – 137, 3rd para, last line
112. (2) XI, NCERT, Page – 157, Fig. 9.7C
113. (4) XII, NCERT, Page – 141, 2nd line
114. (1) XI, NCERT, Page – 258, 2nd line
115. (3) XII, NCERT, Page – 136, Fig. 7.8
116. (1) XI, NCERT, Page – 262 & 263
117. (2) XII NCERT Page – 53, 2nd para
118. (1) XI, NCERT, Page – 274, 2nd para, 9th line
119. (4) XI NCERT Hindbrain made of cerebellum,pons and medulla
120. (2) XI, NCERT, Page – 272, Table 17.1
121. (2) XII, NCERT, Page – 53, 2nd para, 1st line
122. (1) XI, NCERT, Papillary muscles are found in ventricles. Ductus arteriosus is found only in foetal heart.
123. (3) XII, NCERT, Gastrulation involves cell differentiation and morphogenetic movements.
124. (3) XI, NCERT, Page – 284, 2nd para
125. (4) XII, NCERT
126. (3) XI, NCERT, Page – 293, 2nd para
127. (4) XI, NCERT, Page – 288
128. (4) XI, NCERT, Page – 296, 1st para
129. (3) XI, NCERT, Page – 332, 2nd para, 1st line
130. (4) XI, NCERT, Page – 306, 3rd line, 1st para
131. (2) XI, NCERT, Page – 335, 1st para
132. (4) XI, NCERT, Page – 321, 1st para
133. (2) XI, NCERT, Page – 337, 335, 2nd para
134. (4) XI, NCERT, Its inborn reflex hence unconditional. As it involves many neurons and effectors hence polysynaptic.
135. (1) XI, NCERT, Page – 324, 4th para

136. Only NaOH will react with H₂SO₄

\[ 2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O} \]

Applying molarity equation

\[ \frac{M_{\text{NaOH}} \times V_{\text{NaOH}}}{2} = 0.5 \times 10 \]

or \[ M_{\text{NaOH}} = \frac{0.5 \times 10 \times 2}{100} = 0.1 \]

Amount of NaOH per litre = 0.1 × 40 = 4.0 g

Hence NaOH in 100 mL = 0.4 g

137. \[ u = \sqrt{\frac{3RT}{M}} \]

Hence, \[ u_{o_2} = \sqrt{\frac{3R \times 298}{32}} \]; \[ u_{so_2} = \sqrt{\frac{3R \times T}{64}} \]

Since, \[ u_{o_2} = u_{so_2} \]

\[ \therefore \frac{3R \times 298}{32} = \frac{3R \times T}{64} \]

or \[ T = 298 \times 2 = 596 \text{K} \]

138. The edge length ‘a’ of NaCl (fcc) type cell is

\[ 2r^+ + 2r^- = 552 \]

\[ \therefore r^+ + r^- = 276 \]

\[ r_{Cl^-} = 276 - 95 = 181 \text{pm} \]

139. Radial node = \( n - \ell - 1 \); Angular node = \( \ell \).

140. No solution

141. We know that greater the difference in electronegativity of two atoms forming a covalent bond. More is its polar nature. In HF there is a much difference in the electronegatives of hydrogen and fluorine. Therefore (HF) is a polar compound.

142. Molecular orbital electronic configuration of these species are:

\[ \text{O}_2^-(17e^-) = \sigma 1s^2 \sigma^* 1s^2, \sigma 2s^2 \sigma^* 2s^2, \sigma 2p_x^2, \sigma^* 2p_y^2, \pi 2p_z^2, \pi^* 2p_y^2, \pi^* 2p_z^1 \]

\[ \text{O}_2^-(16e) = \sigma 1s^2 \sigma^* 1s^2, \sigma 2s^2 \sigma^* 2s^2, \sigma 2p_x^2, \sigma^* 2p_y^2, \pi 2p_z^2, \pi^* 2p_y^2, \pi^* 2p_z^1 \]

\[ \text{O}_2^2- (18e) = \sigma 1s^2 \sigma^* 1s^2, \sigma 2s^2 \sigma^* 2s^2, \sigma 2p_x^2, \sigma^* 2p_y^2, \pi 2p_z^2, \pi^* 2p_y^2, \pi^* 2p_z^2 \]

Hence number of antibonding electrons are 7, 6 and 8 respectively.
Applying Hess’s Law we get the value.

\[ W = -2.303 \, nRT \, \log \frac{P_1}{P_2} \]
\[ W = -2.303 \times 1 \times 0.082 \times 300 \log \frac{10}{1} \]
\[ W = -1381.9 \text{cal} \]

The solute that gives more no. of particles in solution will lower the f.p. to more extent.

Solubility of AgCl in water = \( \sqrt{K_{sp}} = S_1 \)

In 0.01 M CaCl\(_2\) it is given by

\[ K_{sp} = S \times (0.01 \times 2 + S) \quad \therefore S_2 = \frac{K_{sp}}{0.02} \]

In 0.01 M NaCl it is given by

\[ K_{sp} = S \times (0.01 + S) \quad \therefore S_3 = \frac{K_{sp}}{0.01} \]

In 0.05 M AgNO\(_3\) it is given by

\[ K_{sp} = S \times (0.05 + S) \quad \therefore S_4 = \frac{K_{sp}}{0.05} \]

The solubilities are derived by neglecting \( S \) in comparison to 0.02, 0.01 and 0.05.

\([H^+]\) increases from \(10^{-6}\) to \(10^{-2}\) i.e. 10000 times.

\[ 2AB_3(g) \rightleftharpoons A_2(g) + 3B_2(g) \]

\[ \begin{array}{c|c|c|c}
8 & 0 & 0 & \text{at } t = 0 \\
(8-a) & \frac{a}{2} & \frac{3a}{2} & \text{at eq.} \\
\end{array} \]

Thus, \( K_c = \frac{[A_2][B_2]^3}{[AB_3]^2} \); Also \( \frac{a}{2} = 2 \), so \( a = 4 \)

and \([AB_3] = \frac{4}{1} \); \([A_2] = \frac{2}{1} \) and \([B_2] = \frac{6}{1} \)

\[ K_c = \frac{2 \times 6^3}{4^2} = 27 \text{mol}^2 \text{liter}^{-2} \]

In \( \text{OCl}^- \) the oxidation state of \( \text{Cl} = +1 \) and it changes to \(-1\) in \( \text{Cl}^- \) ion.

\[ w = \frac{E \times i \times t}{96500} = \frac{63.5 \times 2.6 \times 380}{2 \times 96500} = 0.325 \text{g} \]

Cell constant \( = \frac{\text{Sp.cond.}}{1/55} = \frac{0.0212}{1.166} = 1.166 \text{cm}^{-1} \)

\[ \lambda_{\infty}^{\text{NH}_4\text{OH}} = \lambda_{\infty}^{\text{NH}_4\text{Cl}} + \lambda_{\infty}^{\text{NaOH}} - \lambda_{\infty}^{\text{NaCl}} \]
153. \[ k = \frac{2.303}{t} \log \frac{100}{90} \]
\[ = \frac{2.303}{5} \log \frac{100}{90} = \frac{2.303}{5} \times 0.045 \]
\[ = 0.021 \text{s}^{-1} \]
Hence amount left after 25 sec
\[ \frac{0.021 \times 25}{2.303} = \log \frac{[100]}{[A]} \]
or \[ 0.228 = 2 - \log [A] \]
\[ \log [A] = 2 - 0.228 = 1.772 \]
\[ [A] = 59.156 = 60\% \]

154. \[ r = K[A]^m; 6.25r = K[2.5A]^m \]
\[ \therefore 6.25 = (2.5)^m \text{ or } (2.5)^2 = (2.5)^m \]
\[ \therefore m = 2 \]

155. \[ \log \frac{x}{m} = \log K + \frac{1}{n} \log P; \text{ this is Freundlich isotherm.} \]
Thus slope \[ = \frac{1}{n} \]

156. A colloidal with rigid appearance is called gel.

157. When the difference between the two successive ionisation potentials is less than 10 eV. Then, the higher oxidation state is more stable. And, when this difference is more than 16 eV, the lower oxidation state is more stable.
\[ \because E_2 - E_1 = 5.5 \text{eV}, (< 10 \text{eV}) \]
and \[ E_3 - E_2 = -29.8 \text{eV}, (> 16 \text{eV}) \]
Hence, +2 oxidation state will be the most stable.

158. Froth floatation method is based on the fact that the surface of sulphide ores is preferentially wetted by oil while that of gangue is wetted by water.

159. KHCO$_3$ is soluble in water.

160. Boiling points of SbH$_3$(254K), NH$_3$(238K), AsH$_3$(211K) and PH$_3$(185K) therefore boiling points are of the order SbH$_3$ > NH$_3$ > AsH$_3$ > PH$_3$.

161. Reducing agent: \[ F^- < Cl^- < Br^- < I^- \]

162. Partial hydrolysis; \[ \text{XeF}_4 + \text{H}_2\text{O} \rightarrow \text{XeOF}_2 + 2\text{HF} \]
Complete hydrolysis; \[ 2\text{XeF}_4 + 3\text{H}_2\text{O} \rightarrow \text{Xe} + \text{XeO}_3 + \text{F}_2 + 6\text{HF} \]

163. MnO is strong basic and Mn$_2$O$_7$ is strong acidic.

164. Co-ordination isomerism is possible when both +ve and –ve ions of a salt are complex ions and the two isomers differ in the distribution of ligands in the cation and the anion.
The cyano and ammine complexes are far more stable than those formed by halide ions. This is due to the fact that NH₃ and CN⁻ are strong lewis bases.
is a non-planar molecule.