## ANSWER KEY FOR MOCK TEST- 7 (FOR 2020 ASPIRANTS) 6th April 2020

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**CENTERS:** MUMBAI / DELHI / AKOLA / LUCKNOW / NAGPUR / NASHIK / PUNE / GOA / BOKARO / DUBAI # 1
1. (4) [Units and Dimensions]
   Sol. \[bt^2 = [x] \Rightarrow (2) = LT^{-2}\]

2. (4) [Motion in Two Dimension]
   Sol. \[t = \sqrt{\frac{2H}{g}}\]

3. (1) [Friction]
   Sol. \[\mu\] depends upon nature of contact surfaces only

4. (4) [Vertical Circular Motion]
   Sol. \[v = \sqrt{rg}\]

5. (2) [Collision]
   Sol. Loss in kinetic energy is converted into sound energy and heat.

6. (2) [Rotational Motion]
   Sol. \[K.E. = \frac{1}{2} I \omega^2 = \frac{1}{2} (I \omega)(\omega)\]
   or \[K.E. = \frac{1}{2} L \omega\]
   or \[L = \frac{2K.E.}{\omega}\]
   Now \[L' = \frac{2(2K.E.)}{(\omega/2)^2} = 4 L\]

7. (3) [Fluid Mechanics]
   Sol. Thrust force
   \[F = F_1 - F_2 = \rho a v_1^2 - \rho a v_2^2\]
   \[= \rho a (2gh_1) - \rho a (2gh_2)\]
   \[= 2 \rho ag (h_1 - h_2)\]
   \[= 2 \rho ag h\]

8. (2) [Viscosity]
   Sol. mass = \[\frac{2}{3} \pi r^3 \times \rho\] so when mass become 8M so radius will become 2r & terminal velocity \[V_t \propto r^2\] so it becomes 4 times of its previous value.

9. (3) [Surface Tension]
\[ h = \frac{2T \cos \theta}{\text{rdg}} \Rightarrow r_1 h_1 = r_2 h_2 \]

and \( A = 2 \pi r^2 \Rightarrow r \alpha \sqrt{A} \)

\[ \therefore \sqrt{A_1} h_1 = \sqrt{A_2} h_2 \]

\[ \Rightarrow \sqrt{A} \times 4 = \frac{A}{\sqrt{4}} \times h_2 \]

\[ \Rightarrow h_2 = 8 \text{ cm} \]

10. (4) **[Mechanical properties of solids]**

Sol. It is proportional limit so OA is correct

11. (4) **[SHM]**

Sol. \[ \Delta \phi = (\omega_1 - \omega_2) t = \left( \frac{2\pi}{T} - \frac{2\pi}{5T/4} \right) T = \frac{2\pi}{5} \]

12. (1) **[Gravitation]**

Sol. \[ g = \frac{GM}{(R + h)^2} \]

\[ \therefore \frac{GM}{9R^2} = \frac{GM}{(R + h)^2} \]

\[ \Rightarrow 3R = R + h \]

\[ \Rightarrow h = 2R \]

13. (3) **[Thermal Properties of Matter]**

Sol. For isotropic material \[ \gamma = \alpha a + 2\alpha + 3\alpha = 6\alpha \]

14. (4) **[Calorimetry]**

Sol. Heat released by water

\[ \Delta Q = 80 \times 1 \times 30 = 2400 \text{ cal} \quad \text{……(i)} \]

Mass of Ice melt

\[ 2400 = m \times 80 \quad [\Delta Q = mL] \]

\[ \therefore m = \frac{2400}{80} = 30 \text{ gm} \]

15. (4) **[Heat transfer]**

Sol. Water of lake gets cooled by convection till 4ºC after that it is cooled by conduction through ice.

16. (3) **[KTG]**

Sol. \[ \gamma_{\text{mix}} = \frac{\mu_1 C_p_1 + \mu_2 C_p_2}{\mu_1 C_v_1 + \mu_2 C_v_2} \]

\[ = \left( \frac{1 \times \frac{5}{2} R}{1 \times \frac{3}{2} R} + \frac{2 \times \frac{7}{2} R}{2 \times \frac{5}{2} R} \right) = \frac{19}{13} \]

17. (4) **[Thermodynamics]**

Sol. For adiabatic process

\[ P \propto T^{(\gamma-1)} \quad \text{(i)} \]

Given \( P \propto T^3 \quad \text{(ii)} \)

From eq. (i) & (ii)
\[ \frac{\gamma}{\gamma - 1} = 3 \Rightarrow \gamma = 3 \gamma - 3 \Rightarrow \gamma = 3/2 \]

18. (3)[Waves]
Sol. \( n' = n \) as No relative motion.

19. (2)[Motion in One Dimension]
Sol. \[ x = 6t^2 - t^3 \]
\[ \frac{dx}{dt} = v = 12t - 3t^2 \]
\[ \frac{dv}{dt} = \frac{d^2x}{dt^2} = a = 12 - 6t \]
\[ \frac{dv}{dt} = 0 \text{ for } v \text{ to be maximum} \]
\[ 12 - 6t \Rightarrow t = 2 \text{ s} \]

20. (3) [Laws of Motion]
Sol. \[ a = \frac{a_A + a_B}{2} = \frac{3 + 4}{2} = \frac{7}{2} = 3.5 \text{ m/s}^2 \]

21. (2) [WPE]
Sol. \[ P = a + bt + ct^2 \]
\[ F = \frac{dP}{dt} = 0 + b + 2ct \]

22. (2)[COM]
Sol.
\[ \begin{align*}
x_{cm} &= \frac{2m \times \frac{a}{2} + m \times 2a}{3m} = a \\
y_{cm} &= \frac{2m \times \frac{a}{2} - ma}{3m} = 0
\end{align*} \]

23. (2)[Rolling]
Sol. Total energy, \( K = K_R + K_T = \frac{1}{2} I \omega^2 + \frac{1}{2} mv^2 \)
\[ = \frac{1}{2} \left( \frac{2}{5}mr^2 \right) \omega^2 + \frac{1}{2} mr^2 \omega^2 = \frac{1}{5} mr^2 \omega^2 + \frac{1}{2} mr^2 \omega^2 = \frac{7}{10} mr^2 \omega^2 \]
Now, rotational kinetic energy, \( K_R = \frac{1}{2} I \omega^2 = \frac{1}{5} mr^2 \omega^2 \)
\[ \therefore \frac{K_R}{K} = \frac{\frac{1}{5} mr^2 \omega^2}{\frac{7}{10} mr^2 \omega^2} = \frac{2}{7} \]

24. (4)[Electric Potential]
Sol. As we know conductor are equipotential,
\[ \therefore \text{ Ratio of potential is } 1:1. \]
25. (1) [Electric Charges]

**Sol.**

Since net force on charge Q is zero (Placed at corner A).

\[
\frac{KQ^2}{(\sqrt{2}a)^2} + \sqrt{2} \frac{kQq}{a^2} = 0
\]

\[
\Rightarrow \frac{kQ^2}{2a^2} = -\sqrt{2} \frac{kQq}{a^2} \Rightarrow \frac{Q}{q} = -2\sqrt{2}
\]

So option (1) is correct.

26. (3) [Electric field]

**Sol.**

\[
T \cos \theta = mg
\]

\[
T \sin \theta = qE
\]

during equilibrium

\[
T = \sqrt{(mg)^2 + (qE)^2}
\]

\[
T = \sqrt{(80 \times 10^{-6})^2 + (2 \times 10^{-8} \times 2 \times 10^{-4})^2}
\]

\[
T = \sqrt{64 \times 10^{-8} + 16 \times 10^{-8}}
\]

\[
T = 8.8 \times 10^{-4} \text{ N}
\]

27. (1) [Electrons and Photons]

**Sol.**

\[
n = \frac{P\beta}{hc}
\]

Where \( n \) is number of photons per sec.

\[
n_e = n \times \beta \% = \frac{P\beta}{hc} \times \frac{\beta}{100}
\]

\[
n_e = \frac{1.5 \times 10^{-3} \times 400 \times 10^{-9} \times 0.1}{6.6 \times 10^{-34} \times 3 \times 10^{8}}
\]

\[
I = n_e e = 0.48 \mu A
\]

28. (2) [Wave Optics]

**Sol.**

\[
n_1 \lambda_1 = n_2 \lambda_2
\]

\[
12 \times 600 = n_2 \times 400
\]

\[
n_2 = 18
\]

29. (4) [AC]

**Sol.**

\[
i_0 = \frac{v_0}{Z},
\]

\[
Z = \sqrt{R^2 + (\omega L)^2}
\]
\[ = \sqrt{4^2 + (1000 \times 3 \times 10^{-3})^2} = 5 \ \Omega \]
\[ i_0 = \frac{4}{5} \]
\[ i_0 = 0.8A \]

30. (3) [EMW]
Sol. Cathode rays is a beam of electrons emitted from the cathode of a high-vacuum tube.

31. (2) [Ray Optics]
Sol. Total deviation \( \delta = 180^\circ \)
\[ \delta = 360^\circ - 2\theta \]
\( \theta \) is angle between two plane mirror
\[ 180 = 360 - 2\theta \]
\[ \theta = 90^\circ \]

32. (3) [Ray Optics]
Sol. Grazing angle with incident ray = 90 – 30
\[ = 60 \]
so grazing angle with reflected ray = 60º

33. (1) [Wave Optics]
Sol. \( \beta = \frac{D\lambda}{d} \)
\[ \therefore 10\beta = (5.5) \beta \]
10 \( \lambda \)
\[ \left( \frac{D}{d} \right) = 5.5 \frac{D\lambda}{d} \]
\[ \therefore \frac{\lambda}{\lambda'} = \frac{10}{5.5} = \mu \therefore \mu = 1.8 \]

34. (2) [Photoelectric effect]
Sol. \( \frac{hc}{\lambda} = \frac{1}{2}mv^2 + \phi \)
\[ \Rightarrow \phi = \frac{hc}{\lambda} - \frac{1}{2}mv^2 \]
\[ = \frac{1240}{400} - 1.68 = 1.41 \text{ eV} \]

35. (2) [Atomic Physics]
Sol. The mean ionization potential is defined as the average energy needed to produce a pair of positive and negative ions, which is the average of molecular binding energies.

36. (3) [Nuclear Physics]
Sol. Since \( \gamma \)-photons have energies of the order of MeV hence they are emitted in nuclear process because nuclear energy levels are of the order of MeV.

37. (3) [Semi conducting devices]
Sol. Here \( (A + B). C = Y \)
Output is available if A & C are available
38. (2) **[Capacitors]**  
**Sol.** By using point potential method equivalent circuit is  
\[
C_{eq} = \frac{2\varepsilon_0 A}{d}
\]

39. (1) **[Current Electricity]**  
**Sol.**  
\[
i = \frac{n(2e)}{t} = \frac{10000 \times 2 \times 1.6 \times 10^{-19}}{60} = 0.5 \times 10^{-16} \text{ A}
\]

40. (4) **[Magnetism and Matter]**  
**Sol.** From curie law \( \chi \propto \frac{1}{T} \)

41. (3) **[Current Electricity]**  
**Sol.**  
\[i = \frac{20}{4} \text{ amp.}\]

42. (2) **[Magnetic effects of Electric current]**  
**Sol.** \( D = \text{diameter} = 2r = \frac{2mv}{qB} \)  
\[D \propto \frac{m}{q}\]

Here \( \frac{m}{q} \) is maximum for C'.

43. (3) **[EMI]**  
**Sol.**  
\[F = \frac{\nu B}{(R + r)} \quad \frac{\nu B^2 \nu^2}{(R + r)} = \frac{\nu B^2 \nu^2}{(R + r)}\]

44. (2) **[EMI]**  
**Sol.**  
\[e = -\frac{d\phi}{dt} = -L \frac{dl}{dt}\]

\[\Rightarrow |e| = \frac{d\phi}{dt} = L \frac{dl}{dt} = L \text{ (slope of curve)}\]

45. (3) **[X rays]**  
**Sol.** \( V = \frac{1240}{0.01} = 124000 \text{ volt}\)

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<td>64</td>
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<td>92</td>
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<td>Sexual reproduction in flowering plants</td>
<td>XII, ploidy of syngergid and pollen grain is n, of nucellus is 2n and of endosperm is 3n, leaf cells are body cells and hence their ploidy is 2n</td>
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Six with $^{12}\text{C}$ as $^{12}\text{O}_6\text{O}_6$, $^{12}\text{O}_6\text{O}_7$, $^{12}\text{O}_7\text{O}_7$, $^{12}\text{O}_7\text{O}_8$, $^{12}\text{O}_8\text{O}_8$, $^{12}\text{O}_7\text{O}_9$ and six with $^{13}\text{C}$.

$^{2}\text{nd}$ excited state means third energy level.

$E_3 = \frac{E_1}{3^2} = -\frac{13.6}{9} = -1.51\text{ eV}$

$t = \frac{2.303\log r_0}{\lambda} \quad (\because r_0 \propto N_0)$

or $30 = \frac{2.303\log 28}{\lambda}$

$\therefore \lambda = \frac{2.303\log 2}{30} = \frac{2.303 \times 0.3010}{30}$

Now, rate $= \lambda N$
\[
\therefore 28 = \frac{2.303 \times 0.3010}{30} \times N \\
\therefore N = 1211 \text{ atoms}
\]

139
(4)
It will be safe to enter in the room when activity gets reduced by 10 times. i.e., when \( N = \frac{N_0}{10} \)

\[
\therefore \frac{N}{N_0} = \left(\frac{1}{2}\right)^n \quad \text{or} \quad \frac{1}{10} = \left(\frac{1}{2}\right)^n
\]

or \( 10 = 2^n \)

\[
\log 10 = n \log 2
\]

\[
n = \frac{1}{0.301} = 3.32 \quad t = n \times t_{1/2}
\]

\[
= 3.32 \times 30 = 99.6 \text{ days}
\]

140.
(3)
\[
\frac{\Delta T_{\text{IA}}}{\Delta T_{\text{IB}}} = \frac{2}{1} = \frac{1}{1/2}, \quad \text{i.e., B should associate to show higher } \Delta T. \]

141.
(1)
\[
\text{C.P. } \propto \frac{w}{m \times V} (1 - \alpha + x\alpha + y\alpha)
\]

or \( \text{C.P. } \propto C \times (1 - \alpha + x\alpha + y\alpha) \)

for solute \( A_xB_y ; \alpha \) is degree of ionisation. Colligative properties are osmotic pressure, lowering in vapour pressure, elevation in b.pt. depression in f.pt.

142.
(1)
\[
A_xB_y \longrightarrow xA^{y+} + yB^{y-}
\]

Before diss. \( 1 \quad 0 \quad 0 \)
After diss. \( 1 - \alpha \quad x\alpha \quad x\alpha \)
\( i = 1 - \alpha + x\alpha + y\alpha \) or \( i - 1 = \alpha(x + y - 1) \)

\[
\therefore \alpha = \frac{i - 1}{x + y - 1}
\]

143.
(4)
Energy of red P is lesser than white P and thus red P is more stable.

144.
(4)
B.E. of S = O, C \equiv C, C \equiv N and N \equiv N are 523, 839, 891 and 941 kJ mol\(^{-1}\) respectively.

145.
(2)
\[
\Delta H_{\text{combustion(carbon)}} = \Delta H_{(\text{C}(\text{s}) \rightarrow \text{C}(\text{g}))} + \Delta H_{\text{O}_2} - \Delta H_{\text{C} \equiv \text{O}}
\]

\[
= 538 \text{ kJ mol}^{-1}
\]

Resonance energy = \( \Delta H_{f(\text{experimental})} - \Delta H_{f(\text{calculated})} \)

\[
= -393 - 538 = -931 \text{ kJ mol}^{-1}
\]

\[
\Delta H_{\text{C} \equiv \text{O}} = 339 \text{ kJ mol}^{-1}
\]

\[
\Delta H_{\text{O}_2} = 498 \text{ kJ mol}^{-1}
\]

\[
\Delta H_{\text{combustion}} = -393 \text{ kJ mol}^{-1}
\]

\[
\Delta H_{(\text{C}(\text{s}) \rightarrow \text{C}(\text{g}))} = 718 \text{ kJ mol}^{-1}
\]
146. (3)
\[ K = \frac{2.303}{t} \log \frac{C_0}{C} = \frac{2.303}{2 \times 10^4} \log \frac{800}{50} \]
\[ = 1.38 \times 10^{-4} \text{ sec}^{-1} \]

147. (2)
\[ t_{1/2} = 69.3 \text{ sec} \therefore K = \frac{0.693}{69.3} = 10^{-2} \text{ sec}^{-1} \]
Now \( r = K [A] = 10^{-2} \times 0.1 = 10^{-3} \text{ M sec}^{-1} \)

148. (1)
\[ \text{pH} = -\log K_a + \log \frac{[\text{Salt}]}{[\text{Acid}]} \]

149. (1)
\[ \text{pH} = -\log K_a + \log \frac{[\text{Salt}]}{[\text{Acid}]} \]
\[ = -\log 10^{-4} + \log \frac{1}{1} = 4 \]
Since \( K_a \times K_b = 10^{-14} \)

150. (4)
\[ \lambda_C^\infty = \mu_C^\infty \times \text{faraday}; \]
\[ \lambda_a^\infty = \mu_a^\infty \times \text{faraday}; \]
Also \( \lambda_{\text{electrolyte}}^\infty = \lambda_a^\infty + \lambda_C^\infty \)

151. (1)
\[ \lambda_{\text{AgCl}}^\infty = \lambda_{\text{Ag}^+}^\infty + \lambda_{\text{Cl}^-}^\infty = \lambda_{\text{AgNO}_3}^\infty + \lambda_{\text{NaCl}}^\infty - \lambda_{\text{NaNO}_3}^\infty \]

152. (3) Theoretical

153. (1) Theoretical

154. (4) Theoretical

155. (4) Theoretical

156. (1) Theoretical

157. (1) Theoretical

158. (4) Theoretical
159. (2)
It contains Cs$^+$ and I$_3^-$ ions.

160. (4)
The reducing agent oxidises itself,

(1) $\text{H}_2\text{O}_2^{-} + 2\text{H}^+ + 2e^- \rightarrow 2\text{H}_2\text{O}^{2-}$

(2) $\text{H}_2\text{O}_2^{-} - 2e^- \rightarrow \text{O}_2^0 + 2\text{H}^+$

(3) $\text{H}_2\text{O}_2^{-} + 2e^- \rightarrow 2\text{OH}^-$

(4) $\text{H}_2\text{O}_2^{-} + 2\text{OH}^- - 2e^- \rightarrow \text{O}_2^0 + \text{H}_2\text{O}$

161. (1)

\[
\begin{align*}
\text{KIO}_4 + \text{H}_2\text{O}_2 & \rightarrow \text{KIO}_3 + \text{H}_2\text{O} + \text{O}_2 \\
\text{(Reducing agent)} \\
\text{NH}_2\text{OH} + 3\text{H}_2\text{O}_2 & \rightarrow \text{HNO}_3 + 4\text{H}_2\text{O} \\
\text{(Oxidising agent)} \\
\hline
& \text{Decrease in O.N.} \\
& \text{Increase in O.N.}
\end{align*}
\]

162. (1)
Theoretical

163. (1)
$\text{Cu} : [\text{Ar}] 3d^{10}, 4s^1; \text{Cu}^{+} : [\text{Ar}] 3d^{9}; \text{Cu}^{2+} : [\text{Ar}] 3d^9; \text{Zn} : [\text{Ar}] 3d^{10}; \text{Zn}^{+} : [\text{Ar}] 3d^{10}, 4s^1; \text{Zn}^{2+} : [\text{Ar}] 3d^{10}, 4s^2$

Removal of successive electron in Cu takes place from 4s and 3d-orbitals and thus due to change in major energy shell $\text{IP}_2$ values of Cu shows a jump. In Zn, the removal of successive electrons takes place from 4s-orbital and thus no jump in $\text{IP}_2$ values is noticed.

164. (1)
Nitric oxide is paramagnetic in the gaseous state as it has one unpaired electron in its outermost shell. The electronic configuration of NO is

\[\sigma \text{l}s^2\sigma^* \text{l}s^2 \sigma^* 2\text{s}^2\sigma^* 2\text{s}^2 \sigma^* \pi^* 2\text{p}^2 \}

However, it dimerises at low temperature to become diamagnetic.

\[2\text{NO} \rightleftharpoons \text{N}_2\text{O}_2\]

Its bond order is 2.5 and it combines with $\text{O}_2$ to give nitrogen dioxide.

165. (4)

(a) $\mu = 0$

(b) $\mu = 0$

(c) $\mu \neq 0$

(d) $\mu \neq 0$
chloro acetic anhydride or chloro ethanoic anhydride

In presence of Bulky base, Hoffman alkene is formed

Aldehydes and &-hydroxy ketones give positive Tollen’s test. Glucose has an aldehyde group and fructose is an -hydroxy ketones.

Chloroamphenicol is a broad spectrum antibiotic