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NEET 2023-24

Mark 720	Group PCB	PRE FINAL ROUND - 05	Date : 26/03/2024 Time : 3 :20 Hours

Answer Key Version - Q (PCB NEET 2023-24)

Physics

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Biology

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PHYSICS

SECTION - A (35 Questions)

01. **(3)** $\frac{1}{f}=\frac{1}{f_1}+\frac{1}{f_2}=\frac{P_1}{100}+\frac{P_2}{100}=\frac{1}{100}$

$\Rightarrow f=100cm.$

$\therefore$ A convergent lens of focal length 100 cm.

02. **(1)** Because value of g decreases when we move either in coal mine or at the top of mountain.

03. **(2)** In the given case, $\frac{Displacement}{Accleration}=\frac{1}{b}$

$\therefore$ Time period $T=2\pi\sqrt{\frac{Displacement}{Accleration}}=\frac{2\pi}{\sqrt{b}}.$

04. **(4)** Because to form the complete image only two rays are to be passed through the lens and moreover, since the total amount of light released by the object is not passing through the lens, therefore image is faint (intensity is decreased).

05. **(1)** $I=-\frac{dV}{dx}$. If V = 0 then gravitational field is necessarily zero.

06. **(4)** Comparing given equation with standard equation of progressive wave.

The velocity of wave

$$v=\frac{\omega(Co-efficient\ of\ t)}{k(Co-efficient\ of\ x)}=\frac{200\pi}{0.5\pi}=400\text{cm/s}.$$

07. **(1)** $_w\mu_g=\frac{1}{\sin C}$

$\Rightarrow \frac{\mu_g}{\mu_w}=\frac{5/3}{4/3}=\frac{1}{\sin C}$

$\Rightarrow \sin C=\frac{4}{5}$

$\Rightarrow C=\sin^{-1}\frac{4}{5}.$

08. **(4)** $A_{max}=\sqrt{A^2+A^2}=A\sqrt{2}$, frequency will remain same i.e ω.

09. **(4)** The velocity of light of different colours (all wavelength) is same in vacuum and $\mu\propto\frac{1}{\lambda}$.

10. **(2)** $v=\sqrt{\frac{GM}{R}}$

$\Rightarrow \frac{v_A}{v_B}=\sqrt{\frac{R_B}{R_A}}=\sqrt{\frac{R}{4R}}=\frac{1}{2}$

$\Rightarrow \frac{v_A}{v_B}=\frac{3V}{v_B}=\frac{1}{2}$

$\Rightarrow\therefore v_B=6V.$

11. **(1)** $v=n\lambda=2\times5=10\text{cm/s}.$

12. **(4)** Convex mirror always forms, virtual, erect and smaller image.

13. **(3)** Areal velocity of the planet remains constant. If the areas A and B are equal then $t_1=t_2$.

14. **(1)** When light reflects from denser surface phase change of π occurs.

15. **(3)**

$$y=a(\cos\omega t+\sin\omega t)=a\sqrt{2}\left(\frac{1}{\sqrt{2}}\cos\omega t+\frac{1}{\sqrt{2}}\sin\omega t\right)$$

$$=a\sqrt{2}[\sin45^\circ\cos\omega t+\cos45^\circ\sin\omega t]$$

$$=a\sqrt{2}\sin(\omega t+45^\circ)$$

Amplitude $=a\sqrt{2}$.

16. **(1)** According to Cauchy's formula

$$\mu=A+\frac{B}{\lambda^2}+.....$$

Therefore, as λ increases, μ decreases.

Curve A is correct.

17. **(3)** Progressive wave propagate energy while no propagation of energy takes place in stationary waves.

18. **(3)** For brightness, path difference = $n\lambda=2\lambda$.

So second is bright.

19. **(1)** Since maximum value of $\cos^2 \omega t$ is 1.

$\therefore K_{max} = K_0 \cos^2 \omega t = K_0$

Also $K_{max} = PE_{max} = K_0$.

20. **(2)** $\frac{I_{max}}{I_{min}} = 9 \Rightarrow \left(\frac{a_1 + a_2}{a_1 - a_2}\right)^2 = 9$

$\Rightarrow \frac{a_1 + a_2}{a_1 - a_2} = 3$

$\Rightarrow \frac{a_1}{a_2} = \frac{3+1}{3-1} \Rightarrow \frac{a_1}{a_2} = 2.$

$\therefore I_1 : I_2 = 4 : 1.$

21. **(3)** Here $\frac{\lambda}{2} = 5.0\text{cm} \Rightarrow \lambda = 10cm.$

Hence $n = \frac{v}{\lambda} = \frac{200}{10} = 20Hz.$

22. **(3)** At polarizing angle, the reflected and refracted rays are mutually perpendicular to each other.

23. **(1)** If $y_1 = a_1 \sin \omega t$ and $y_2 = a_2 \sin(\omega t + \pi)$

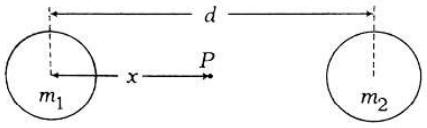
$\frac{y_1}{a_1} + \frac{y_2}{a_2} = 0$

$\Rightarrow y_2 = -\frac{a_2}{a_1} y_1$

This is the equation of straight line.

24. **(4)** The amplitude will be $A \cos 60° = A/2$.

25. **(4)**



Force will be zero at the point of zero intensity

$x = \frac{\sqrt{m_1}}{\sqrt{m_1} + \sqrt{m_2}} d = \frac{\sqrt{81M}}{\sqrt{81M} + \sqrt{M}} D = \frac{9}{10} D.$

26. **(4)** Maximum velocity $= a\omega = a\sqrt{\frac{k}{m}}$

Given that $a_1 \sqrt{\frac{k_1}{m}} = a_2 \sqrt{\frac{k_2}{m}}$

$\Rightarrow \frac{a_1}{a_2} = \sqrt{\frac{k_2}{k_1}}.$

27. **(1)** $B = \frac{\lambda D}{d}.$

28. **(2)** When a little mercury is drained off, the position of c.g. of ball falls (w.r.t. fixed and) so that effective length of pendulum increases hence T increase.

29. **(1)** k represents gravitational constant which depends only on the system of units.

30. **(1)**

31. **(4)** $RI_{air} < RI_{glass}$,

So, $v_{air} > v_{glass}$ and hence

$\lambda_{air} > \lambda_{glass}$.

32. **(3)** $y = a \sin \frac{2\pi}{T} t$

$\Rightarrow \frac{a}{\sqrt{2}} = a \sin \frac{2\pi}{T} t$

$\Rightarrow \sin \frac{2\pi}{T} t = \frac{1}{\sqrt{2}} = \sin \frac{\pi}{4}$

$\Rightarrow \frac{2\pi}{T} t = \frac{\pi}{4} \Rightarrow t = \frac{T}{8}.$

33. **(2)** $v = \sqrt{\frac{GM}{r}}$, if $r_1 > r_2$ then $v_1 < v_2$.

Orbital speed of satellite does not depends upon the mass of the satellite.

34. **(3)** Small and erect image is formed only by convex mirror. Plane mirror from images equal to object and concave mirror from image bigger than object.

35. **(1)** Intensity

$= \frac{\text{Power}}{\text{Area}} = \frac{4}{4\pi \times (200)^2}$

$= 7.9 \times 10^{-6} W/m^2.$

SECTION - B (Attempt Any 10 Questions)

36. **(4)** Magnification of a compound microscope is given by $m = -\frac{v_o}{u_o} \times \frac{D}{u_e} \Rightarrow |m| = m_o \times m_e.$

37. **(1)** Gravitational potential at mid point

$V = \frac{-GM_1}{d/2} + \frac{-GM_2}{d/2}$

Now, $PE = m \times V = \frac{-2Gm}{d}(M_1 + M_2)$

[m = mass of particle]

so, for projecting particle from mid point to infinity

$KE = PE \Rightarrow \frac{1}{2}mv^2 = \frac{2Gm}{d}(M_1 + M_2)$

$\Rightarrow v = 2\sqrt{\frac{G}{d}(M_1 + M_2)}.$

38. **(3)** A slit would give divergent, a biprism would give double, a glass slab would give a parallel wave front. Edge is downward.

39. **(1)** Comparing given equation with standard equation

$y = 2a \sin\frac{2\pi x}{\lambda}\cos\frac{2\pi vt}{\lambda}$

gives us $\frac{2\pi}{\lambda} = \frac{\pi}{15}$

$\Rightarrow \lambda = 30.$

Distance between nearest node and antinodes

$= \frac{\lambda}{4} = \frac{30}{4} = 7.5.$

40. **(4)** Distance between the first dark fringes on either side of central maxima = width of central maxima

$= \frac{2\lambda D}{d} = \frac{2 \times 600 \times 10^{-9} \times 2}{1 \times 10^{-3}} = 2.4mm.$

41. **(1)** The time interval between successive maximum intensities will be $\frac{1}{n_1 - n_2} = \frac{1}{454 - 450} = \frac{1}{4}\text{sec}.$

42. **(1)** For second dark fringe $d \sin\theta = 2\lambda$

$\Rightarrow 24 \times 10^{-5} \times 10^{-2} \times \sin 30 = 2\lambda$

$\Rightarrow \lambda = 6 \times 10^{-7} m = 6000\mathring{A}.$

43. **(1)** $v_{max} = a\omega$

$= a \times 2\pi n = 0.1 \times 2\pi \times 300$

$= 60\pi \text{cm/s}.$

44. **(1)** Potential at the given point = Potential at the point due to the shell + Potential due to the particle

$= -\frac{GM}{a} - \frac{2GM}{a} = -\frac{3GM}{a}.$

45. **(4)** Acceleration $= -\omega^2 y.$

So, $F = -m\omega^2 y$, y is sinusoidal function.

So F will be also sinusoidal function with phase difference π.

46. **(3)** For lens, let image distance is v, then $\frac{1}{v} - \frac{1}{-20} = \frac{1}{15} \Rightarrow v = 60\text{cm}$. Since object coincides image, centre of curvature of mirror must coincides with image of convex less so that rays fall normally on mirror and then return along their original path $R = 60 - 5 = 55$ cm.

47. **(3)** First overtone of closed organ pipe $n_1 = \frac{3v}{4L_1}$

Third overtone of open organ pipe $n_2 = \frac{4v}{4L_2}$

$n_1 = n_2 (Given)$

$\Rightarrow \frac{3v}{4L_1} = \frac{4v}{2L_2} \Rightarrow \frac{L_1}{L_2} = \frac{3}{8}.$

48. **(4)** $g = \frac{4}{3}\pi\rho GR$

$\therefore \frac{g_1}{g_2} = \frac{R_1\rho_1}{R_2\rho_2}.$

49. **(1)** $\delta = i + e - A$

$\delta_{min} = 60°,$

when $i = e \Rightarrow 60° = 2i - A = 2(60°) - A$

$\Rightarrow A = 60°$

$\mu = \frac{\sin\left(\frac{A + \delta_{min}}{2}\right)}{\sin\left(\frac{A}{2}\right)} = \frac{\sin\left(\frac{60 + 60}{2}\right)}{\sin\left(\frac{60}{2}\right)} = \sqrt{3}.$

50. **(3)**

CHEMISTRY

SECTION - A (35 Questions)

51. **(4)** Statement-I is incorrect and Statement-II is correct.

52. **(1)** The green colour appears due to the formation of Cr^{3+} ion.

$$Cr_2O_7^{2-} + 3SO_3^{2-} + 8H^+ \rightarrow 3SO_4^{2-} + 2Cr^{3+} + 4H_2O$$

53. **(3)** Ac(89) = [Rn] [$6d^1$] [$7s^2$]

54. **(1)** H_3PO_2

55. **(3)** $R - CN + H_2O \xrightarrow{H^+}$

56. **(4)** (1)-(iv); (2)-(i); (3)-(ii); (4)-(iii)

57. **(4)** As addition of more F_2 favours the backword reaction i.e formation of ClF_3.

58. **(1)** Anion carrying a higher charge and smaller size is associated with greater lattice and hydration energy. On the basis of elecronic configuration Cu^+ should be more stable because it has completely filled orbitals. But the lattice and hydration energy factors dominate and as a result Cu^{2+} is more stable.

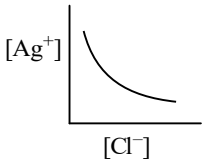
59. **(4)** In covalent compounds fluorine can form only single bond while oxygen forms double bond.

60. **(1)** With Hinsberg reagent, primary amine forms n-alkyl benzene sulphonamide soluble in alkali.

61. **(4)** (1)-(iii); (2)-(iv); (3)-(ii); (4)-(i)

62. **(4)** Statement-I is incorrect and Statement-II is correct.

63. **(4)**



64. **(3)** Cu (Z = 29)

65. **(1)** Chlorodiaquatriamminecobalt (III) chloride is

$[CoCl(NH_3)_3(H_2O)_2]Cl_2$

66. **(3)** Only 1° amides undergo Hofmann bromamide reaction. Since $CH_3CONHCH_3$ is a 2° amine, therefore, it does not undergo Hofmann bromamide reaction.

67. **(4)** $(CH_3)_3N$

68. **(2)** (1)-(i); (2)-(ii); (3)-(iii); (4)-(iv)

69. **(3)** H^+ ion concentration remains constant.

70. **(1)** In complex $K_4[Fe(CN)_6]$ the Fe obey EAN rule strictly. As in this complex EAN of Fe is 36, which corresponds to the atomic number of krypton.

Hence, according to sidwich the complex will be stable.

71. **(3)** $[Cr(SCN)_2(NH_3)_4]^+$ shows linkage, geometrical and optical isomerism. Hence produces maximum no. of isomers.

72. **(4)** Ethanamine

73. **(2)** Primary amine and secondary amine.

74. **(4)**

$$A_2B_3 \rightleftharpoons 2A^{+3} + 3B^{-2}$$
$$2S \quad 3S$$

$Ksp = [A^{+3}]2\ [B^{-2}]^3 = (2S)^2\ (3S)^3$

$Ksp = 108\ S^5$

75. **(2)** $[Cr(C_2O_4)_3]^{3-}$

76. **(2)** As in $[NiCl_4]^{-2}$ Chloride ion being a weak ligand is not able to pair the electrons in d orbital.

77. **(1)** The octahedral coordination compounds of the type Ma_3B_3 exhibit fac-mer isomerism.

78. **(3)** Coordination isomerism occurs when cationic and anionic complexes of different metal ions are present in a salt. The two isomers differ in the distribution of ligands in cation and anion e.g.,

$[Co(NH_3)_6]\ [Cr(CN)_6]$ is an isomer of $[Co(EN)_6\ [Cr(NH_3)_6]$.

79 **(1)** Cr^{3+} has d^3 configuration and forms an octahedral inner orbitals complex, therefore the set of degenerate orbitals are (d_{xy}, d_{yz} and d_{xz}) and ($d_{x^2-y^2}$ and d_{z^2}).

80. **(1)** Wilkinson catalyst: $[Rh(PPh)_3Cl]$

Chlorophyll: $C_{55}H_{72}O_5N_4Mg$

Vitamin B_{12} contains Co.

Carbonic anhydrase contains a Zn ion.

81. **(4)** Sc^{3+} (Z = 18) $1s^2, 2s^2p^6, 3s^2p^6d^0, 4s^0$; no unpaired electron.

Cu^+ (Z = 28): $1s^2, 2s^2p^6, 3s^2p^6d^{10}, 4s^0$; no unpaired electron.

Ni^{2+} (Z = 26): $1s^2, 2s^2p^6, 3s^2p^6d^8, 4s^0$; unpaired electrons are present.

Ti^{3+} (Z = 19) : $1s^2, 2s^2p^6, 3s^2p^6d^1, 4s^o$; unpaired electron is present

Co^{2+} (Z = 25): $1s^2, 2s^2p^6, 3s^2p^6d^7, 4s^0$; unpaired electrons are present

So from the given options the only correct combination is Ni^{2+} and Ti^{3+}.

82. **(4)** Mischmetal is an alloy which contains rare earth elements (94-95%) iron (5%) and traces of sulphur, carbon, silicon, calcium and aluminium. It is used in gas lighters, tracer bullets and shells.

83. **(1)** Benzylamine

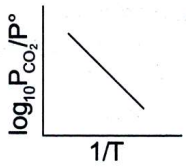
84. **(1)** Chloroform or trihalogenated methane (CHX_3) when heated with a primary amine, and alcoholic caustic potash give carbylamine (isocyanides) which have a very unpleasant smell.

$$CHX_3 + RNH_2 + 3KOH \rightarrow RNC + 3KX + 3H_2O$$

85. **(4)** $Q_c < K_c$ then reaction move in direction of products.

SECTION - B (Attempt Any 10 Questions)

86. **(2)**



87. **(1)** (1 + a) = D/d

When a = 0, D/d = 1

When 'a' increases, (1 + a) increases, so D/d also increases.

88. **(3)** Oxidation state of Cr in CrO_4^{2-} and $Cr_2O_7^{2-}$ is +6 i.e. oxidation states are same.

89. **(2)**

$$\underset{(A)}{2MnO_2} \xrightarrow{KOH,O_2} \underset{(Green)\ (B)}{2K_2MnO_4} + 2H_2O$$

$$\underset{(C)}{K_2MnO_4} \xrightarrow{4HCl} \underset{(Purple)}{2KMnO_4} + MnO_2 + 2H_2O$$

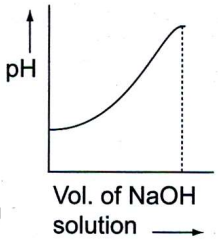
$$\underset{(A)}{2KMnO_4} \xrightarrow{H_2O,KI} 2MnO_2 + 2KOH + \underset{(D)}{KIO_3}$$

90. **(3)**

$$CH_3-CH_2COOH \xrightarrow{SOCl_2} CH_2-CH_2-\overset{O}{\overset{\|}{C}}-Cl$$

$$CH_3-CH_2-CH_2NH_2 \leftarrow CH_3-CH_2-\overset{O}{\overset{\|}{C}}-NH_2 \xleftarrow{NH_3}$$

91. **(1)**



92. **(1)** Basic character of oxide decreases from left to right in a period of periodic table.

93. **(4)** Metal carbonyl contain only σ-bonds and π-bonds.

94. **(3)** In octahedral field the crystal field splitting of d-orbitals of a metal ion depends upon the field produced by the ligands. Among the given options, the maximum splitting will occur in case of cyanide (CN^-) i.e. the magnitude of Δ_0 will be maximum in case of $[Co(CN)_6]^{3+}$.

95. **(1)** $-0.4\,\Delta_0$ and $-0.6\,\Delta_t$

96. **(1)** Δ_t is smaller as compared to Δ_0. Consequently the orbital splitting energies are not sufficiently large for forcing the pairing. Therefore, low spin configurations are rearely observed.

97. **(2)**

$$2MnO_2 + 4KOH + O_2 \rightarrow \underset{\text{Dark green}}{2K_2MnO_4} + 2H_2O$$

98. **(1)** Copper lies below hydrogen in the electrochemical series and hence does not liberate H_2 from acids.

99. **(1)** $NaNO_2$/HCl, CuCN, Sn/HCl

100. **(4)** $C_6H_5CH_2NH_2$