SAFE HANDS & IIT-ian's PACE

FINAL MOCK TEST # 07 (NEET) SOLUTIONS

1. (b)

Sol. Since the particle is moving in horizontal circle, centripetal force,

$$F = \frac{mv^2}{r} = \frac{k}{r^2}$$

$$mv^2 \frac{k}{r} \qquad \text{.....(i)}$$

Kinetic energy of the particle,

$$k = \frac{1}{2}mv^2 = \frac{k}{2r} \qquad \text{(using (i))}$$

$$\text{As } F = \frac{-du}{dr}$$

$\therefore$ potential energy,

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

$$\therefore \text{ total energy } = K + U = \frac{k}{2r} - \frac{k}{r} = \frac{-k}{2r}$$

2. (d)

Sol. $X = 3YZ^2$

$$\therefore [Y] = \frac{[X]}{[Z^2]} = \frac{[M^{-1}L^{-2}T^4A^2]}{[MT^{-2}A^{-1}]^2} = [M^{-3}L^{-2}T^8A^4].$$

3. (c)

Sol. Actual mass = $\frac{9.30+10.60}{2} = \frac{19.90}{2} = 9.95$ g

4. (a)

Sol. $v_{AE} = 100\hat{i} + 240\hat{j}$

$v_{AE} = \sqrt{(240)^2 + 100^2} = 260 ms^{-1}$;

$\phi = \tan^{-1}(100/240) = 23^0$ E of N.

5. (c)

Sol. $\tau = \frac{dL}{dt} = \frac{d}{dt}(I\omega) = \frac{d}{dt}(2.5 \times 40t^2) = 200t$

6. (a)

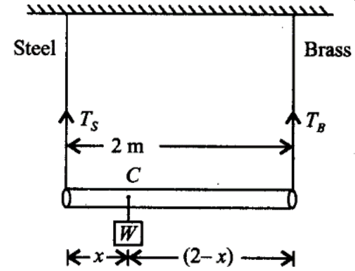
Sol. Tension in rotating ring is $T = \mu v^2$

7. (c)

Sol. As piece is removed from quadrant I, therefore the centre of mass of the square plate is shifted to opposite of quadrant I i.e, quadrant III.

8. (a)

Sol. The situation is as shown in the figure.



Let a weight W be suspended at a distance x from steel wire. Let T_S and T_B be tensions in the steel and brass wires respectively.

$$\therefore \text{ Stress in steel wire} = \frac{T_S}{A_S}$$

$$\text{Stress in brass wire } = \frac{T_B}{A_B}$$

For equal stress in both the wires

$$\frac{T_S}{A_S} = \frac{T_B}{A_B}$$

$$\frac{T_S}{T_B} = \frac{A_S}{A_B} = \frac{0.1 cm^2}{0.2 cm^2} = \frac{1}{2} \qquad \text{....(i)}$$

For the rotational equilibrium of the rod.

$$T_S x = T_B(2 - x)$$

$$\frac{2-x}{x} = \frac{T_S}{T_B} = \frac{1}{2} \qquad \text{[Using (i)]}$$

$$4 - 2x = x \text{ or } 3x = 4 \text{ or } x = \frac{4}{3} m$$

9. (d)

Sol. For adiabatic process

$P \propto T^{\frac{\gamma}{\gamma-1}}$ & as in question

$P \propto T^3$

$$\therefore \frac{\gamma}{\gamma - 1} = 3$$

$\therefore$ $\boxed{\gamma = \frac{3}{2}}$

10. (c)

Sol. As $P \propto V$

$\therefore PV^{-1}$= constant

Also, $C = C_V - \frac{R}{x-1} = \frac{5}{2}R - \frac{R}{-1-1} = 3R$

But as rms speed is doubled therefore temperature becomes four times.

Hence, $Q = nC\Delta T = n \times 3R \times 3T_i = 9\ nRT_i$

$= 9\ P_1V_1$

11. (a)

Sol. $V = 10^{-3}\,m^3$, $N = 3.0 \times 10^{22}$, $m = 5.3 \times 10^{-26}\,kg$,

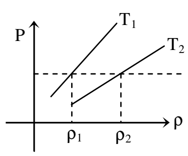
$v_{rms} = 400\ m/s$

$$P = \frac{1}{3}\frac{mN}{V}v_{rms}^2 = \frac{1}{3} \times \frac{5.3\times10^{-26}\times3.0\times10^{22}}{10^{-3}}(400)^2.$$

$= 8.48\times10^4\ N/m^2$

12. (a)

Sol. $P = \frac{\rho RT}{M_w}$, P = constant



$T \propto \frac{1}{\rho}$ or $\rho_2 > \rho_1$ or $\boxed{T_1 > T_2}$

13. (d)

Sol. $\lambda = v/n = \frac{10}{100} = 0.1\,m = 10\,cm$

Phase difference = $\frac{2\pi}{\lambda}$ × path difference $= \frac{2\pi}{10} \times 2.5$

$= \frac{\pi}{2}$

14. (d)

Sol. $A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos(\phi_1 - \phi_2)}$

$A_{min} = A_1 - A_2$ When $\phi_1 - \phi_2 = \pi, 3\pi$.......

and $A_{max} = A_1 + A_2$ when $\phi_1 - \phi_2 = 0, 2\pi$,.......

Thus $A \geq A_1 - A_2$ $A \leq A_1 + A_2$.

15. (c)

Sol. Potential energy of the body at a distance $4R_e$ from the surface of earth

$$U = -\frac{mgR_e}{1 + h/R_e} = -\frac{mgR_e}{1+4} = -\frac{mgR_e}{5}$$

[As $h = 4R_e$ (given)]

So minimum energy required to escape the body will be $\frac{mgR_e}{5}$.

16. (d)

Sol. When we move from the centre to the circumference the velocity of liquid goes on decreasing and finally becomes zero

17. (b)

Sol. If $l_1 = nl_2$ then $k_1 = \frac{(n+1)k}{n} = \frac{3}{2}k$ [As n = 2]

18. (d)

Sol. Let the displacement of the block at instant of time t be

$x = A\cos(\omega t + \phi)$

At $t = 0$ $x = x_0$

$\therefore x_0 = A\cos\phi$

Velocity $v = \frac{dx}{dt} = -A\omega\sin(\omega t + \phi)$

At $t = 0, v = -v_0$

$\therefore -v_0 = -A\omega\sin\phi$

Or $A\sin\phi = \frac{v_0}{\omega}$ …… (i)

Squaring and adding (i) and (ii), we get

$$A^2(\sin^2\phi + \cos^2\phi) = \frac{v_0^2}{\omega^2} + x_0^2$$

$$A = \sqrt{\frac{v_0^2}{\omega^2} + x_0^2}$$

19. (d)

Sol. $v\frac{dv}{dx} = -\alpha v$

or $\int_{v_0}^{0} dx = -\alpha \int_{0}^{x_0} dx$

or x-0 = $\frac{v_0}{\alpha}.\frac{dv}{dt} = -\alpha v$

or $\int_{v_0}^{v} \frac{dv}{v} = -\alpha \int_0^t dt$ or $v = v_0 e^{-\alpha t}$

$\therefore$ v = 0 for t $\to \infty$.

20. (b)

Sol. $\vec{A} - 2\vec{B} + 3\vec{C} = (2\hat{i} + \hat{j}) - 2(3\hat{j} - \hat{k}) + 3(6\hat{i} - 2\hat{k})$

$= 2\hat{i} + \hat{j} - 6\hat{j} + 2\hat{k} + 18\hat{i} - 6\hat{k}$

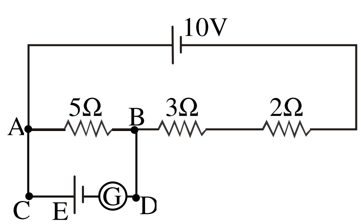
$= 20\hat{i} - 5\hat{j} - 4\hat{k}$

21. (d)

Sol. The time period of simple harmonic motion does not depend on amplitude, energy or the phase constant.

22. (c)

Sol.



No current flows through the galvanometer if $V_C - V_D$ $= V_A - V_B$

E = IR $\Rightarrow$ E = 1 × 5 $\Rightarrow$ E = 5V

23. (b)

Sol. $I = \frac{M}{V} = \frac{M}{\text{mass/density}}$, given mass = 1gm = $10^{-3}kg$, and

density $= 5\,gm/cm^3 = \frac{5\times 10^{-3}kg}{(10^{-2})^3 m^3} = 5\times 10^3 kg/m^3$

Hence $I = \frac{6\times 10^{-7}\times 5\times 10^3}{10^{-3}} = 3$

24. (b)

Sol. At t = 1 sec, i = 2 + 3 × 1 = 5A and $|e| = L\frac{di}{dt}$

$\Rightarrow 9\times 10^{-6} = L\times\frac{d}{dt}(2+3t) \Rightarrow L = 3\times 10^{-3}$ H

So energy $U = \frac{1}{2}Li^2 = \frac{1}{2}(3\times 10^{-3})\times(5)^2 = 37.5$ mJ.

25. (b)

Sol. Here L = 100 mH $= 100\times 10^3$ H

$I = 1A$

As $U = \frac{1}{2}LI^2 = \frac{1}{2}\times(100\times 10^{-3})\times 1^2 = 0.05J$

26. (d)

Sol. Below resonant frequency the current leads the applied e.m.f., at resonance it is in phase with applied e.m.f. and above resonance frequency it lags the applied e.m.f., Hence (D) is correct.

27. (d)

Sol. The core of a transformer is laminated to reduce eddy current.

28. (c)

Sol. $m = \frac{f}{f-u} = \frac{-f}{-f+\frac{3f}{2}} = -2$

29. (c)

Sol. Sum of three non coplanar vectors cannot be zero

30. (a)

Sol. Here $\lambda = 600nm$

$\Delta\lambda = 600.1nm - 600nm = 0.1nm$

As $\frac{V_s}{c} = \frac{\Delta\lambda}{\lambda}$

$\therefore v_s = \frac{\Delta\lambda}{\lambda} c = \frac{0.1 nm}{600 nm} \times 3\times10^8 s^{-1}$

$= 50\times10^3 ms^{-1} = 50 kms^{-1}$

31. (b)

Sol. Fresnel distance $z_F = \frac{a^2}{\lambda} = \frac{(4\times10^{-3})^2}{500\times10^{-9}}$

$= \frac{4\times4\times10^{-6}}{5\times10^{-7}}$

$\therefore z_F = 32\,m$

32. (a)

Sol. $\lambda_{min} = \frac{12375}{40\times10^3} = 0.309\,\mathring{A} \approx 0.31\,\mathring{A}$

33. (a)

Sol. K.E. = P.E. = qV

$2eV = \frac{K(Ze)(2e)}{d} = qV$

$\therefore d = \frac{9\times10^9\times Z\times e\times 2e}{2eV}$

$\therefore d = \frac{9\times10^9\times1.6\times10^{-19}\times Z}{V}$

$d = 14.4\times10^{-10}\left(\frac{Z}{V}\right) m$

34. (c)

Sol. $r \propto n^2$

35. (d)

Sol. $10.2 Z^2 = 40.8 \Rightarrow Z = 2$

$13.6 Z^2 = ? = 13.6\times4 = 54.4$ eV

36. (a)

Sol. P(survival) = $\frac{N_t}{N_0} = \frac{N_0 e^{-\lambda t}}{N_0} = e^{-\lambda t}$

for t = 1/λ, P(survival) = 1/e

37. (c)

Sol. After three half lives, the fraction of un decayed nuclei

$= \left(\frac{1}{2}\right)^3 = \frac{1}{8}$

∴ Time taken for the sample to decay by $(1-1/8)^{th}$ or $\frac{7^{th}}{8}$ of initial value

$= 3T_{1/2} = 3\times20 = 60\,s$

38. (d)

Sol. F = $F = \sqrt{F^2 + F^2 + 2F^2\cos\theta}$ or

$\cos\theta = -1/2$; $\theta = 120^0$

39. (b)

Sol. A ground receiver in line- of sight communication cannot receiver direct waves due to curvature of earth

40. (d)

Sol. As volume of the bubble $V = \frac{4}{3}\pi R^3$

$\Rightarrow R = \left(\frac{3}{4\pi}\right)^{1/3} V^{1/3} \Rightarrow R^2 = \left(\frac{3}{4\pi}\right)^{2/3} V^{2/3}$

$\Rightarrow R^2 \propto V^{2/3}$

Work done in blowing a soap bubble $W = 8\pi R^2 T$

$\Rightarrow W \propto R^2 \propto V^{2/3}$

$\therefore \frac{W_2}{W_1} = \left(\frac{V_2}{V_1}\right)^{2/3} = \left(\frac{2V}{V}\right)^{2/3}$

$= (2)^{2/3} = (4)^{1/3} \Rightarrow W_2 = \sqrt[3]{4}\,W$

41. (d)

Sol. $\frac{dT}{dt} = \frac{\sigma A}{mc}(T^4 - T_0^4)$. If the liquids put in exactly similar calorimeters and identical surrounding then we can consider T_0 and A constant then

$\frac{dT}{dt} \propto \frac{(T^4 - T_0^4)}{mc}$ ……(i)

If we consider that equal masses of liquid (m) are taken at the same temperature then $\frac{dT}{dt} \propto \frac{1}{c}$

So for same rate of cooling c should be equal which is not possible because liquids are of different nature.

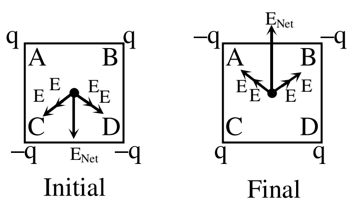
Again from (i) equation $\frac{dT}{dt} \propto \frac{(T^4 - T_0^4)}{mc} \Rightarrow$

$\frac{dT}{dt} \propto \frac{(T^4 - T_0^4)}{V\rho c}$

Now if we consider that equal volume of liquid (V) are taken at the same temperature then $\frac{dT}{dt} \propto \frac{1}{\rho c}$.

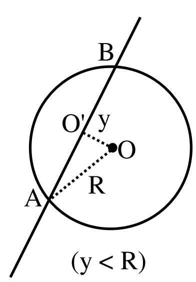
So for same rate of cooling multiplication of $\rho \times c$ for two liquid of different nature can be possible. So option (d) may be correct.

42. (c)



43. (c)

Electric flux $\oint_S \vec{E}.\vec{dS} = \frac{q_{in}}{\varepsilon_0}$ q_{in} is the charge enclosed by the Gaussian-surface which, in the present case, is the surface of given sphere. As shown, length AB of the line lies inside the sphere.



In $\Delta OO'A$ $R^2 = y^2 + (O'A)^2$

$\therefore O'A = \sqrt{R^2 - y^2}$

and $AB = 2\sqrt{R^2 - y^2}$

Charge on length AB = $2\sqrt{R^2 - y^2} \times \lambda$

$\therefore$ electric flux = $\oint_S \vec{E}.\vec{dS} = \frac{2\lambda\sqrt{R^2 - y^2}}{\varepsilon_0}$

44. (a)

$E = \frac{3000}{3} = 10^3$, $E = \frac{dV}{dr}$, $dV = 10$ V

45. (d)

$E = \frac{2K\lambda}{r}$, $dV = -Edr$, $V = -\int_a^b E\ dr$ $V_{ab} \propto \log\left(\frac{b}{a}\right)$

46. (c)
Sol. $KF + HF \rightarrow KHF_2 \rightleftharpoons K^+ + HF_2^-$

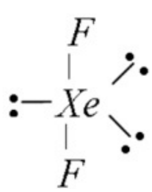
47. (a)
Sol. Li is a more reducing agent compare to other element.

48. (a)
Sol. $2Na + 2HOH \rightarrow 2NaOH + H_2 \uparrow$
$2K + 2HOH \rightarrow 2KOH + H_2 \uparrow$

49. (d)
Sol. All the noble gases are monoatomic, colourless and odourless gases. Their monoatomic nature is due to the stable outer configuration ns^2np^6 of their atoms. As a result, they do not enter into chemical combination even amongst themselves.

50. (b)
Sol. An oxygen-helium mixture is used artificial respiration in deep sea diving instead of air because nitrogen present in air dissolves in blood under high pressure when sea diver goes into deep sea. When he comes to the surface, nitrogen bubbles out of the blood due to decrease in pressure, causing pains. This disease is called "bends".

51. (d)
Sol. XeF_2 has sp^3d –hybridization with linear shape.



52. (d)
Sol. Amphoteric substance can react with both acid and base.

53. (c)
Sol. $Co + NaOH \xrightarrow{200\,°C} \underset{\text{Sod. formate}}{HCOONa}$.

54. (b)
Sol. When hydrogen peroxide react with PbS then they form $PbSO_4$.

55. (a)
Sol. $\underset{(S)}{2KNO_3} \xrightarrow{\Delta} \underset{(S)}{2KNO_2} + O_2$

56. (b)
Sol. $6KOH + 3Cl_2 \rightarrow 5KCl + KClO_3 + 3H_2O$.

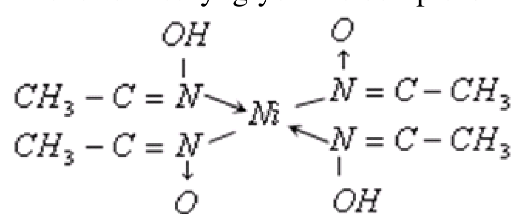
57. (d)
Sol. Transition elements form co-ordinate compounds because of
(i) High nuclear charge
(ii) Small size
(iii) Vacant d-orbital

58. (b)
Sol. They are inert towards many common reagents.

59. (b)
Sol. Maximum oxidation state = 6
Maximum no. of e^- in last shell = 6
Group is VI-B.

60. (c)
Sol. Ag belongs to second (4d) transition series remaining all are in first transition series.

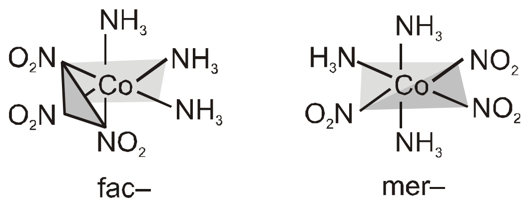
61. (b)
Sol. Ni reacts with dimethylglyoxime to give red ppt. of nickel-dimethyl glyoxime complex.



62. (d)
Sol. $(CH_3CH_2)_3Al + TiCl_4$ is the Ziegler-Natta catalyst.

63. (b)
Sol. $\ddot{N}H_2 - CH_2 - CH_2 - NH_2$. It contains two donor atoms i.e. nitrogen. So it is a bidentate ligand

64. (b)
Sol. $[Co(NH_3)_3(NO_3)_3]$ exists in following to isomeric forms.



65. (a)
Sol. CN^- and NO_2^- are ambidentate ligands.

66. (b)
Sol. K_2 $[PtCl_6]$; Platinum is in + 4 oxidation state. Atomic number of Pt = 78..
So EAN Pt(IV) = 78 – 4 + 12 = 86

67. (c)
Sol. Anhydrous binary compound will have all water molecules in coordination sphere so its formula will be $[Co(H_2O)_4Cl_2]Cl$. Two Cl^- will have dual behaviour i.e. they will act as primary valency as well as the secondary valency and third Cl^- will satisfy only primary valency.

68. (b)
Sol. Reduction with carbon is called smelting
$Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$

69. (a)
Sol. A mixture of Al powder and metallic oxide $(Cr_2O_3, Mn_3O_4$ etc) is called thermite.

70. (c)
Sol. Zone refining is employed for preparing extremely pure metals.
It is based on the principle that when a molten solution of the impure metal is allowed to cool the pure metal crystallises out while the impurities remain in the melt. Ex : Semiconductors like Si, Ge and Ga are purified by this method.

71. (b)
Sol. Sulphide ores are concentrated by froth floatation process.

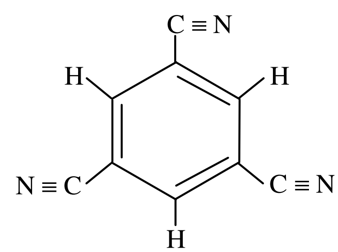
72. (b)
Sol. O_2^{2-} is least stable.

73. (d)
Sol. Hydrogen bonding will be maximum in F-H bond due to greater electronegativity difference.

74. (b)
Sol. H – F has highest boiling point because it has hydrogen bonding.

75. (b)
Sol. In electrovalent crystal has cation and anion are attached by electrostatic forces.

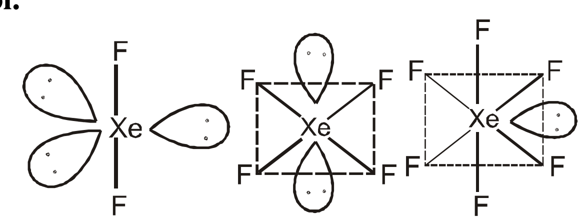
76. (c)
Sol.



Total no. of π bonds = 9

77. (b)
Sol. Alcohol involves H bonding ; also molar wt. of CH_4 > mol of H_2. Greater is molar wt. of covalent compound, higher is its b.p.

78. (a)
Sol.



79. (d)
Sol. $CH_3^+ = 6 + 3 - 1 = 8e^-$,
$H_3O^+ = 3 + 8 - 1 = 10e^-$,
$NH_3 = 7 + 3 = 10e^-$, $CH_3^- = 6 + 3 + 1 = 10e^-$

80. (a)
Sol. $E = -\frac{2.172 \times 10^{-18}}{n^2} = \frac{-2.172 \times 10^{-18}}{2^2}$
$= -5.42 \times 10^{-19} J$.

81. (d)

Sol. Most probable velocity : mean velocity : V_{rms}

$= \sqrt{\frac{2RT}{M}} : \sqrt{\frac{8RT}{\pi M}} : \sqrt{\frac{3RT}{M}} = \sqrt{2} : \sqrt{\frac{8}{\pi}} : \sqrt{3}$

82. (c)

Sol. $-W = +2.303\, nRT \log \frac{p_1}{p_2}$

$-W = 2.303 \times 1 \times 2 \times 300 \log \frac{10}{1} = 1381.8\, cal.$

83. (c)

Sol. Here $\Delta n = 0$ so, $\Delta E = \Delta H$.

84. (d)

Sol. $C_2H_5I + 2Na + IC_2H_5 \xrightarrow[\text{Ether}]{\text{Dry}} \underset{\text{Butane}}{C_2H_5 - C_2H_5} + 2NaI$

85. (c)

Sol. $\underset{\text{Aluminium carbide}}{Al_4C_3} + 6H_2O \rightarrow \underset{\text{Methane}}{3CH_4} + 2Al_2O_3$

86. (a)

Sol.

$C_2H_5O\boxed{H + CH_3} - Mg - Br \rightarrow CH_4 + Mg\begin{matrix} \diagup Br \\ \diagdown OC_2H_5 \end{matrix}$

87. (b)

Sol. $\underset{\text{Propanoicacid}}{CH_3 - CH_2 - COOH} + 6HI \xrightarrow{\text{Red P}}$

$\underset{\text{Propane}}{CH_3 - CH_2 - CH_3} + 2H_2O + 3I_2$

88. (c)

Sol. $R - CH = CH - R \xrightarrow[\text{room temp.}]{\text{dil. aqueous } KMnO_4} \underset{\text{(Alcohol)}}{R - \underset{OH}{CH} - \underset{OH}{CH} - R}$

$R - CH = CH - R \xrightarrow[\text{heat}]{\text{Conc } KMnO_4} R - COOH + R - COOH.$

89. (c)

Sol.

$>C = C< \xrightarrow[H]{\text{Hydrogenat ion}} >C - C<$

90. (c)

Sol. Prevent action of water and salt.

91- d

92- c

93- c

94- c

95- b

96- c

97- b

98- d

99- d

100- c

101- b

102- b

103- c

104- c

105- d

106- c

107- c

108- b

109- a

110- b

111- c

112- a

113- c

114- d

115- b

116- c

117- a

118- a

119- c

120- a

121- d
122- a
123- c
124- d
125- b
126- b
127- a
128- d
129- a
130- d
131- c
132- c
133- a
134- b
135- b
136- b
137- c
138- a
139- c
140- c
141- a
142- b
143- d
144- a
145- a
146- b
147- a
148- a
149- c
150- c
151- c
152- c
153- c
154- d
155- c
156- c
157- b
158- c
159- a
160- b
161- c
162- b
163- c
164- b
165- c
166- c
167- c
168- d
169- b
170- b
171- d
172- b
173- c
174- d
175- c
176- a
177- b
178- b
179- c
180- c