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## UTS-NEET TEST SERIES HINTS & SOLUTION

TEST - 02, 04-03-2017 TEST- 02 CODE -B ACD040317

### [PHYSICS]

1. (C) Since there is no external force the mass move due to mutual attraction.

The COM remains at same position

2. (D)  $m_1d = m_2x$

$$x = \frac{m_1d}{m_2}$$

3. (A) Internal forces do not effect motion of COM. Reason correct explanation

$$4. (A) X = \frac{\frac{1}{2}(0) + \frac{3}{2}(0) + 1(4)}{\frac{1}{2} + \frac{3}{2} + 1} = \frac{4}{3}$$

$$Y = \frac{\frac{1}{2}(0) + \frac{3}{2}(3) + 1(0)}{\frac{1}{2} + \frac{3}{2} + 1} = \frac{3}{2}$$

5. (B) CM of bricks, above each brick must not be beyond its edge.

$$X_{cm} = L$$

$$X_1 = a + \frac{L}{2}, X_2 = 2a + \frac{L}{2}, X_3 = 3a + \frac{L}{2}$$

$$X_{cm} = \frac{m_1x_1 + m_2x_2 + m_3x_3}{m_1 + m_2 + m_3}$$

$$L = \frac{6a + \frac{3L}{2}}{3}$$

$$a = \frac{L}{4}$$

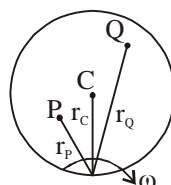
6. (D)

7. (A)  $V_p = \omega r_p$

$$V_c = \omega r_c$$

$$V_q = \omega r_q$$

$$V_q > V_c > V_p$$



8. (D)  $\theta_1 = \frac{1}{2}\alpha t^2$

$$50 = \frac{1}{2}\alpha(2)^2$$

$$Q_2 = \frac{1}{2}\alpha(4)^2$$

Divide both  $\theta_2 = 200$

In next 2 sec  $= \theta_2 - \theta_1$

$$= 150$$

9. (B)  $T = m\omega^2 = 0.1 \times 1.25 \times (2)^2 = 0.5 \text{ N}$

10. (B)  $I = \frac{2}{5}mR^2 = \frac{2}{5}D \frac{4}{3}\pi R^2 R^2$

$$I = \frac{8}{15}\pi DR^5$$

11. (A)  $I = 4 \times m \left( \frac{L}{\sqrt{2}} \right)^2 = 2mL^2$

$$4mK^2 = 2mL^2$$

$$K = \frac{L}{\sqrt{2}}$$

12. (C)  $I = \frac{2}{5}mR^2 + mR^2 = \frac{7}{5}mR^2$

$$mK^2 = \frac{7}{5}mR^2$$

$$K = \sqrt{\frac{7}{5}}R$$

13. (D)  $I_1\omega_1 = I_2\omega_2$  Angular momentum conservation

$$mK^2\omega = m \left( \frac{312}{4} \right)^2 \omega_2$$

$$\omega_2 = \frac{16\omega}{9}$$



14. (D)  $T = \frac{mv^2}{R} + mg$   
 $= \frac{m}{R}(5gR) + mg = 6mg$

15. (B)  $L = \sqrt{2I(KE)}$   
 $= \sqrt{2 \times \frac{mR^2}{2} \times 8} = 4 \text{ J-s}$

16. (B) Torque is same  
 $\tau = I\alpha$   
 $\alpha$  inversely proportional to I.  
 $I_1 > I_2, \therefore \alpha_1 < \alpha_2$

17. (D) Angular momentum conservation  
 $I_1\omega_1 = I_2\omega_2$   
 $I\omega = (I + mR^2)\omega_2$   
 $\omega_2 = \frac{I\omega}{I + mR^2}$

18. (B)  $V = \sqrt{5gL}$   
 $V \propto \sqrt{2}$   
 Speed becomes  $\frac{V}{2}$

19. (A)  $\frac{1}{2}mv^2 = 250$

20. (D) At lowest position

$$\frac{mu^2}{R} = T - mg$$

$$\frac{mu^2}{R} = 3mg - mg$$

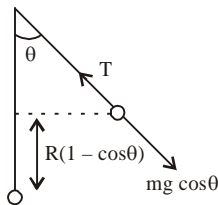
$$u = \sqrt{2gR}$$

At angle  $\theta$  with vertical

$$\frac{1}{2}mu^2 = \frac{1}{2}mv^2 + mgR(1 - \cos\theta)$$

For  $V = 0$

$$\theta = 90^\circ$$



21. (C) A black hole has very large mass in neraly zero volume.

22. (C)  $g = \frac{GM}{r^2}$

23. (A)  $\frac{R_A}{R_B} = r, \quad \frac{g_A}{g_B} = x$

$$V_e = \sqrt{2gR}$$

$$\frac{V_A}{V_B} = \sqrt{rx}$$

24. (B) Escape velocity is independent of the mass to be projected

25. (A) Satellite should be imported energy equal to Binding energy

$$|BE| = \frac{GMm}{2r}$$

26. (C)  $\frac{mv^2}{r} = \frac{Gm^2}{(2r)^2}$

$$V = \sqrt{\frac{Gm}{4r}}$$



27. (A)  $F = \frac{Gm^2}{r^2} = \frac{G\left(\rho \frac{4}{3}\pi r^3\right)^2}{r^2} \propto r^4$

28. (A)  $g_{\text{eff}} = g - R\omega^3$  at the equator  
 For  $g_{\text{eff}} = 0$

$$\omega = \sqrt{\frac{g}{R}}$$

$$\frac{\omega}{\omega_0} = \frac{\sqrt{\frac{g}{R}}}{\left(\frac{2\pi}{T}\right)} = \frac{\sqrt{\frac{9.8}{6.4 \times 10^6}}}{\left(\frac{2\pi}{24 \times 60 \times 60}\right)}$$

= nearly 17 times

29. (C)  $Y = \frac{FL}{A\Delta L}$

$$\frac{\Delta l}{F} = \frac{L}{YA}$$

slope  $\propto L$

Longest wire is C

30. (A)  $\frac{du}{dv} = \frac{1}{2} \times \text{stress} \times \text{strain}$

$$= \frac{1}{2} \times S \times \frac{S}{Y} = \frac{S^2}{2Y}$$

31. (A) Strain =  $\frac{\Delta L}{L} = \frac{0.01}{100} = 10^{-4}$

32. (C)  $F = \frac{YA}{L} \Delta L = 10^4 \text{ N}$

33. (B)  $h = \frac{2T \cos \theta}{r\rho g}$

Since  $\theta > 90^\circ$ ,  $\cos \theta$  is negative  
 hence mercury descends in capillary tube

34. (C)  $F = T \times L$

$$F = T(2\pi R + 2\pi r)$$

35. (B)  $\frac{4}{3}\pi R^3 = n\frac{4}{3}\pi r^3$

$$R = n^{1/3}r$$

$$\text{Energy required} = Tn 4\pi r^2 - T 4\pi R^2$$

$$= 4\pi TR^2 (n^{1/3} - 1)$$

36. (B)  $W = T(A_2 - A_1)$

$$T = \frac{6 \times 10^{-4}}{2(110 - 60) \times 10^{-4}} = 6 \times 10^{-2} \text{ N/m}$$

37. (D) When the coin is on block it displaces water equal to its weight but when it falls in water it displaces water equal to its volume.

38. (C)

 39. (B)  $AV = \text{constant}$ 

$$P + \frac{1}{2}\rho V^2 + \rho gh = \text{constant}$$

Area, velocity &amp; h are same for.

 Cross-section corresponding to A and C. Hence  $P_A = P_C$ 

40. (A) At greater depth, pressure is greater hence viscosity is higher

41. (C) Standard curve

42. (D)  $A_1 V_1 = A_2 V_2$

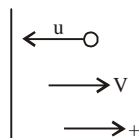
$$\pi(2)^2 5 = \pi(1)^2 V_2$$

$$V_2 = 20 \text{ m/s}$$

 43. (C)  $\Delta P = mv - (-mu)$ 

$$\Delta P = m(u + v)$$

away from wall since it is positive



44. (A) Momentum conservation

$$64 \times 5.4 - 32 \times 1.8 = 96 V$$

$$V = 3 \text{ km/hr}$$

 45. (A)  $m_1 u_1 = m_2 u_2$ 

$$0.02 \times 100 = 8u_2$$

$$u_2 = 0.25 \text{ m/s}$$

### [CHEMISTRY]

 46. (A)  $P_{N_2} = 500 - 23 = 477 \text{ milibar}$ 

$$P_{N_2} \text{ after compression } 2 \times 477 = 954 \text{ m bar}$$

$$\text{Total pressure} = 954 + 23 = 977 \text{ m bar}$$

47. (B)

48. (C)  $\left(P + \frac{a^2}{v^2}\right)(v - b) = RT$

 At high pressure neglect  $\frac{a^2}{V^2}$ 

$$\Rightarrow P(V - b) = RT$$

$$PV - Pb = RT$$

$$\frac{PV}{RT} - \frac{Pb}{RT} = 1$$

$$\Rightarrow \frac{PV}{RT} = 1 + \frac{Pb}{RT}$$

49. (D)

50. (B)  $V_{\text{ave, CH}_4} = V_{\text{ave, O}_2}$

$$\sqrt{\frac{8RT}{16}} = \sqrt{\frac{8R \times 300}{32}}$$

$$\sqrt{T} = \sqrt{150}$$

$$T = 150 \text{ K}$$

51. (B)

52. (A)

53. (C)  $\frac{K.E_1}{K.E_2} = \frac{M_2}{M_1}$

54. (C)  $P = \frac{nRT}{V}$

 55. (A)  $\Delta G = \Delta H - T\Delta S$ 

$$0 = 179.1 \times 10^3 - T \times 160$$

$$T = \frac{179.1 \times 10^3}{160}$$

$$= 1118 \text{ K}$$

 56. (D)  $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$ 

$$x_{N_2O_4} = \frac{1 - 0.5}{1 + 0.5} \quad x_{NO_2} = \frac{2 \times 0.5}{1 + 0.5}$$

$$P_{N_2O_4} = \frac{0.5}{1.5} \times 1 \text{ atm} \quad P_{NO_2} = \frac{1}{1.5} \times 1 \text{ atm}$$

$$K_p = \frac{(P_{NO_2})^2}{P_{N_2O_4}} = \frac{1.5}{(1.5)^2 (0.5)} = 1.33 \text{ atm}$$

 since  $\Delta_r G^\circ = -RT \ln K_p$ 

$$\Delta_r G^\circ = (-8.314 \text{ J.K}^{-1} \text{ mol}^{-1}) \times (2.303) \times (0.1239) \times 333$$

$$= -763.8 \text{ K.J mol}^{-1}$$

57. (B)

58. (C)  $V_2 = \frac{nRT}{P} = 249 \text{ L}$

$$W = P\Delta V = 1 \times (249 - 10) = 239 \text{ L bar}$$

 59. (A)  $W = -P(V_2 - V_1)$ 

$$= -P \left( \frac{nRT_2}{P} - \frac{nRT_1}{P} \right)$$

60. (B)

61. (B)

62. (A)  $n = \frac{1000 \times 1}{500} = 2 \text{ moles}$

$$2 \text{ moles} = 2.72 \text{ K.cal}$$

$$\therefore \Delta H_N = 13.6 - 2.72 = 10.98 \text{ k.cal/mole}$$

63. (D)  $9\text{gm H}_2\text{O} = 0.5 \text{ moles}$   
 0.5 moles require 142.5 kJ heat to decompose  $\text{H}_2\text{O}$   
 $\Rightarrow 1 \text{ moles require} = 142.5 \times 2 = 185 \text{ kJ}$   
 $\Rightarrow$  Enthalpy of formation of water is  $-185 \text{ kJ}$

64. (B)

65. (C)

66. (A)

67. (A)

68. (C)  $\text{C(S)} + \text{CO}_2(\text{g}) \rightleftharpoons 2\text{CO}(\text{g})$

1                      0

$1 - \frac{1}{2}$                        $2 \times \frac{1}{2}$

$$\Rightarrow K_p = \frac{(p_{\text{CO}})^2}{(p_{\text{CO}_2})}$$

$$\Rightarrow \frac{(X_{\text{CO}} P_T)^2}{(X_{\text{CO}_2} P_T)}$$

$$\Rightarrow \frac{(X_{\text{CO}})^2}{(X_{\text{CO}_2})} \times P_T$$

$$\Rightarrow \frac{\left(\frac{1}{1.5}\right)^2}{\frac{0.5}{1.5}} \times 12$$

$$\Rightarrow \frac{1}{1.5 \times 0.5} \times 12$$

$$\Rightarrow 16$$

69. (A)  $\text{S}_8 \rightleftharpoons 4\text{S}_2$

1                      0

$1 - 0.29$                        $4 \times 0.29$

$$K_p = \frac{1.81}{0.71} = 2.55 \text{ atm}^3$$

70. (C) If 10% of  $\text{PCl}_5$  dissociated

$\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$   
 100-10                      10                      10  
 90                              10                      10

partial pressure

$\frac{90}{110} \times 4$                        $\frac{10}{110} \times 4$                        $\frac{10}{110} \times 4$

$$\therefore K_p = \frac{1}{99}$$

If 20% of  $\text{PCl}_5$  dissociated

$\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$   
 100-20                      20                      20  
 80                              20                      20

partial pressure

$\frac{80}{120} \times 4$                        $\frac{20}{120} \times 4$                        $\frac{20}{120} \times 4$

$$\therefore K_p = \frac{1}{24} P \text{ But } K_p = \frac{1}{99}; \therefore P = \frac{24}{99} = 0.96$$

71. (A)  $\text{A} + \text{B} \rightleftharpoons 3\text{C}$

mole                      1    2                      4

vol.                        3    3                      3

conc                       $\frac{1}{3}$      $\frac{2}{3}$                        $\frac{4}{3}$

$$Q = \frac{\left(\frac{4}{3}\right)^3}{\frac{1}{3} \times \frac{2}{3}}$$

$$\Rightarrow \frac{64}{6} = 10.6$$

$$\Rightarrow Q > K$$

$\Rightarrow$  Reaction will go in backward direction

72. (B)  $\text{N}_2\text{O}_4 \rightleftharpoons 2\text{NO}_2$

wt.                        9.2                      0

mole                       $\frac{9.2}{92}$                       0

conc.                       $\frac{0.10}{1}$                       0

At eq.  $0.10 - \frac{0.10}{2}$                       0.10

$$\Rightarrow K_{\text{eq}} = \frac{(0.1)^2}{0.05}$$

$$\Rightarrow \frac{0.01}{0.05} = 0.2$$

73. (C)

74. (B)

75. (A) Concentration of  $\text{Ag}^+$  in  $\text{AgBr}$  ( $K_{\text{sp}} = 5 \times 10^{-13}$ ) is minimum,

$$K_{\text{sp}} = [\text{Ag}^+][\text{Br}^-]$$

$$[\text{Br}^-] = \frac{K_{\text{sp}}}{[\text{Ag}^+]}$$

76. mili moles of  $\text{HCl} = 40 \times 0.1 \Rightarrow 4$

milimoles of  $\text{NaOH} = 10 \times 0.45 = 4.5$

$\Rightarrow$  milimoles of  $\text{OH}^-$  will left 0.5

$\Rightarrow \text{pOH} = -\log 10^{-2} = 2$

$\Rightarrow \text{pH} = 12$

77. (D) Buffer capacity

$$= \frac{\text{No. of moles of acid or base added per litre}}{\text{change in pH}}$$

$$= \frac{0.2 \times 10}{1000} \times \frac{1000}{250} = 0.4$$

$$(6.34 - 6.32)$$

78. (D)  $M_1V_1 = M_2V_2$   
 $10^{-3} \times 5 = 10^{-2} \times V_2$

$$\frac{10^{-3} \times 5}{10^{-1}} = V_2$$

$$5 \times 10^{-2} = V_2$$

$$\Rightarrow \text{volume evaporated} = 5 - 5 \times 10^{-2} = 4.95$$

79. (D) For  $Mg(OH)_2$  not to be precipitated

$$[OH^-] < \left[ \frac{K_{sp}(Mg(OH)_2)}{[Mg^{2+}]} \right]^{1/2}$$

$$[OH^-] < \left[ \frac{1.2 \times 10^{-11} M^3}{0.10 M} \right]^{1/2} < 1.035 \times 10^{-5} M$$

$$pOH < 4.36, pH > 14 - 4.36 = 9.04$$

80. (D)  $K_{sp} = x^2$  (CuS)

$$K_{sp} = x^3$$
 (AgS)

$$K_{sp} = x^2$$
 (HgS)

x of  $Ag_2S$  is maximum, so its solubility in water is maximum.

81. (A) Given that concentration of solution = 0.1

$$\text{Degree of ionisation} = 2\% = \frac{2 \times 0.1}{100} = 0.02$$

$$\text{Ionic product of water} = 1 \times 10^{-14}$$

concentration of  $[H^+] =$  concentration of solution  $\times$  degree of ionisation

$$= .1 \times 0.2 = 2 \times 10^{-3} M$$

$$[OH^-] = \frac{\text{Ionic product of water}}{[H^+]}$$

$$= \frac{1 \times 10^{-14}}{2 \times 10^{-3}} = 0.5 \times 10^{-11} = 5 \times 10^{-12} M$$

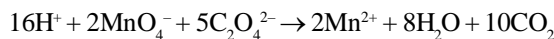
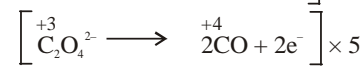
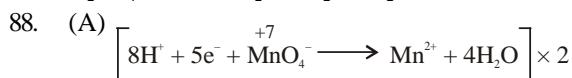
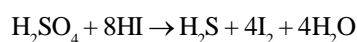
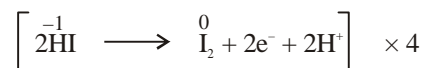
82. (A)

83. (B)

84. (B)

85. (D)

86. (B)



89. (A)

90. (C)