SOLUTION

FINAL TEST SERIES NEET   XI (TYM) TEST-03   Date :02-02-2020

[PHYSICS]

1. (A) Unbalanced force is due to the liquid of length 2x in left column

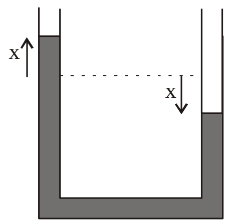
F = unbalance force

dA2La = – dA2xg

$$a = -\frac{x}{L}g$$

Compare wtih a = – ω^2x

$$T = 2\pi\sqrt{\frac{L}{g}}$$



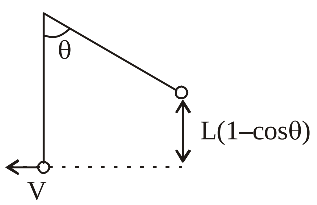
2. (D) $y_2 = a\sin\left(\omega t + \frac{\pi}{2}\right)$

$$\delta\phi = (\omega t + \phi) - \left(\omega t + \frac{\pi}{2}\right) = \phi - \frac{\pi}{2}$$

3. (D) $V = \sqrt{2gL(1-\cos\theta)}$

$$KE = \frac{1}{2}mv^2$$

= mg(1 – cos θ)



4. (A)

5. (C) Distance covered is 4A = 20 cm

6. (B) x = 2sin ωt

$$x = 2\sin\left(\frac{2\pi}{T}\frac{T}{6}\right) = \sqrt{3}cm$$

7. (A) $\text{Frequency} = \frac{1}{T}$

$$f = \frac{1}{2t} = \frac{1}{2}\sqrt{\frac{g}{2h}}$$

8. (C) $T = 2\pi\sqrt{\frac{L}{g}}$

$T_1^2 \propto L + 10$

$T_2^2 \propto L - 10$

$T^2 \propto L$

$T_1^2 + T_2^2 = 2T^2$

9. (B) Timeperiod of seconds pendulum is 2s

$$T \propto \frac{1}{\sqrt{g}}$$

$$2 \propto \frac{1}{\sqrt{g}}$$

$$T \propto \frac{1}{\sqrt{2g}}$$

Divide both $T' = \sqrt{2}s$

10. (D)

11. (B) The normal temperature of person is 37ºC

Therefore body appears equally hot & cold

12. (A) With heating the atoms vibrate about their fixed positions hence their KE increases.

13. (C) Invar has low thermal expansion

14. (B) The distance between any two points on a body always increases

15. (C) $\frac{C}{100} = \frac{F-32}{180}$

$$\frac{C}{100} = \frac{2C-32}{180}$$

C = 160ºC

16. (B) The density of the water is maximum at 4ºC

Therefore, the water in contact with bottom of the lake is at 4ºC.

17. (C) $\Delta V = V_o\gamma_a\Delta T$

$1 = 51\gamma_a 80$

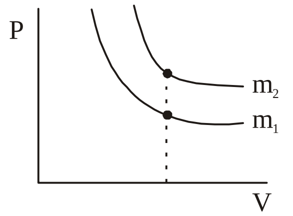
$$\gamma_a = \frac{1}{80\times 51} = 24.5\times10^{-5}\,{}^{o}C$$

$$\approx 25\times10^{-5}\,{}^{o}C$$

18. (A) $PV = \frac{m}{M}RT$

$P \propto m$ for a specific volume

$\therefore \quad m_1 < m_2$



19. (C) $P_1V_1 = P_2V_2$

$(90+10)V = 10V_2$

$V_2 = 10\,V$

20. (B) Work is a path function

21. (C) W_{net} = Area enclosed inside the curve ACBDA

22. (C) Reversible heat engine has higher or equal efficiency compared to an irreversible energy

23. (B) $Q = \Delta U + W$

$Q = U_f - U_i + W$

$-20 = U_f - 30 - 8$

$U_f = 18$ Joule

24. (C) $Q = \Delta U + W$

$80 \times 4.2 = \Delta U + 150$

$\Delta U = 186\,J$

25. (D) $M_AS_A(30-26) = M_BS_B(26-20)$

$$\frac{S_A}{S_B} = \frac{3}{2}$$

26. (A) $M_AS_A(T-75) = M_BS_B(150-T)$

$2m(3S)(T-75) = 3m(4S)(150-T)$

$T = 125°C$

27. (B) Heat required to melt ice

$Q_1 = mL = 1 \times 80 = 80$ cal

Maximum heat the water can given

$Q_2 = MC\Delta T$

$= 5 \times 1 \times 10 = 50$ cal

Therefore complete ice will not melt. and final temperature is 0ºC

28. (A) W = Area enclosed by the curve

$W = PV$

29. (C) $W = \frac{1}{2}(4)(4\times10^5) + 4\times10^5$

$= 12 \times 10^5$ J

30. (D) For momoatomic gas at constant volume

$$C_v = \frac{3R}{2}$$

31. (A) $\frac{dQ}{dt} = KA\frac{\Delta T}{L}$

$$\frac{dQ}{dt} = \frac{\Delta T}{\left(\frac{L}{KA}\right)} = \frac{\Delta T}{R}$$

$$\therefore \quad R = \frac{L}{KA}$$

32. (D)

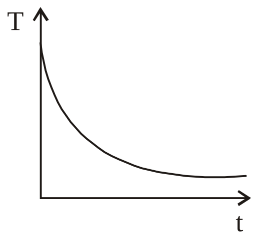
$$C_v = \frac{fR}{2} \qquad C_p = \frac{(f+2)R}{2}$$

$$\frac{C_p}{C_v} = \frac{f+2}{f} = \gamma$$

$$f = \frac{2}{\gamma - 1}$$

33. (C) $\frac{E_1}{E_2} = \frac{\sigma(600^4 - 300^4)}{\sigma(900^4 - 300^4)} = \frac{3}{16}$

34. (C) As the body cools its rate of cooling decreases



35. (C) $R_{eq} = R_1 + R_2$

$$\frac{L_1 + L_2}{K_{eq}A} = \frac{L_1}{K_1A} + \frac{L_2}{K_2A}$$

$$K_{eq} = \frac{K_1K_2(L_1+L_2)}{K_1L_2 + K_2L_1}$$

36. (C) $K_{eq} = \frac{K_1K_2(L_1+L_2)}{K_1L_2 + K_2L_1} = 1.2K$

37. (B) Point B is at its extreme position and the displacement of B is the amplitude of wave at this instant

38. (B) $\frac{V_P}{V} = \frac{A\omega}{\left(\frac{\omega}{k}\right)} = AK = a\frac{2\pi}{5}$

39. (B) Distance between node and antinode is $\frac{\lambda}{4}$

$$\frac{\pi}{18} = \frac{2\pi}{\lambda}$$

$\lambda = 36$

$$\text{Distance} = \frac{\lambda}{4} = 9$$

40. $f = \frac{V}{2L} = \frac{1}{2L}\sqrt{\frac{TL}{m}}$

$$f \propto \frac{1}{\sqrt{L}}$$

$$n \propto \frac{1}{\sqrt{L}}$$

$$n' \propto \frac{1}{\sqrt{2L}}$$

$$n' = \frac{n}{\sqrt{2}}$$

41. (B) $V = \sqrt{\frac{\gamma RT}{M}}$

$$V_N = \sqrt{\frac{\left(\frac{5}{3}\right)RT}{20}}$$

$$V_H = \sqrt{\frac{\left(\frac{4}{3}\right)RT}{18}}$$

Divide both we get ratio $\frac{3}{2\sqrt{2}}$

42. (C) $f = \frac{V}{2L}$

$$300 = \frac{330}{2L}$$

$L = 0.55\,m$

$= 55\,cm$

43. (A) $f_A = \frac{V}{4(0.15)}$, $f_B = \frac{V}{2(0.305)}$

$f_A - f_B = 6$

$$\frac{V}{0.6} - \frac{V}{0.61} = 6$$

$V = 219.6 \approx 220 m/s$

$f_A \cong 366Hz$, $f_B \cong 360Hz$

44. (D) $A_{max} = a + b$

$A_{min} = a - b$

$A_{max} - A_{min} = 2b$

45. (B)

For dopper effect in E.M. waves

$$n' \approx n\left(1 + \frac{V}{C}\right)$$

$$n' = n + \frac{nV}{C}$$

$$n' - n = \frac{nV}{C}$$

$$V = \frac{\Delta nC}{n}$$

$= 1km/s$

[CHEMISTRY]

46. (B) Heavy water is D_2O

$\Rightarrow$ Molecular weight 2 + 2 + 16

47. (A)

48. (D) Li^{+1} ion has maximum charge density, due to which larger no. of water molecules attached to the ion. Thus, the actual ionic radii of this ions in solution follows the order.

$Li^+ > Na^+ > K^+ > Rb^+$

49. (D) $L.E \propto \frac{1}{r^+ + r^-}$

$\Rightarrow$ LiF should have the largest lattic energy

50. (A)

On moving down the group due to Fajan's Rule covalant character increases hence stability of hydrides decreases

51. (C)

$CaO + H_2O \rightarrow Ca(OH)_2$

52. (D)

$$Mg_2C_3 \xrightarrow{H_2O} 2Mg(OH)_2 + CH_3 - C \equiv CH$$

53. (A)

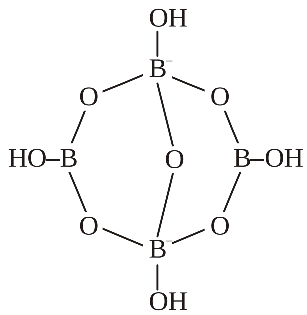
54. (B) As the bond distance between B and X decrease so back bonding between halogen and boron increase due to which lewis acidity decrease

55. (B)

Boron formula is

$Na_2[B_4O_5(OH)_4].8H_2O$

Structures



56. (D)

$$SiF_4 + H_2O \rightarrow Si(OH)_4 \xrightarrow{1000°c} SiO_2 \xrightarrow{Na_2CO_3} Na_2SiO_3$$

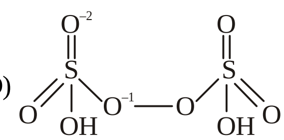
57. (B)

SiO_2 has tetrahedral polymer

58. (D)

59. (C)

PF_5 have trigonal bipyramidal structure which have a unsymmtrical structure in which equatorial lengths and axial lengths are not equal

60. (D) 

61. (C) $HClO_4$ has least oxidising power

62. (C)

63. (B)

64. Diamond crystalizes in the face centred cubic lattice.

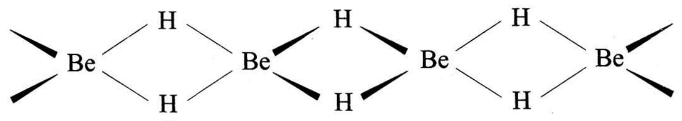
65. (A)

66. (A)

67. (C)

68. Thermal stability increases in the group

69. A

70. The structure of BeH_2 is 

71. Besides σ bond between boron and halogen atoms, there exist additional pπ-pπ bond between the two atoms resulting from back-donation of electrons from halide to boron (back bonding). The tendency to form back bonding is maximum in BF_3 and falls rapidly on passing to BCl_3 and BBr_3. The tendency to accept electron pair, therefore, increases from BF_3 to BBr_3.

72. BF_3 hydrolyses incompletely and forms fluoborates.

$$4BF_3 + 12H_2O \rightarrow 4H_3BO_3 + 12HF$$
$$12HF + 3H_3BO_3 \rightarrow 3H^+ + 3[BF_4]^- + 9H_2O$$
$$\overline{4BF_3 + 3H_2O \rightarrow H_3BO_3 + 3H^+ + 3[BF_4]^-}$$

The other halides undergo complete hydrolysis $BCl_3 + 3H_2O \rightarrow H_3BO_3 + 3HCl$

73. B

74. Answer (1)

Since Li^+ has most power of polarization among alkali metal ion hence LiCl is least ionic.

75. Answer (1)

Mg on burning forms MgO and Mg_3N_2.

76. Answer (1)

77. Answer (1)

Cl–O bond length is shortest in case of ClO_4^- because of high bond order that is 1.75.

78.

Stability increases as the basic character of the corresponding hydroxide increases, *i.e.* option (*c*) is correct.

79.

Solubility of alkali metal hydroxide increases as the size of the alkali metal increases.

80.

The ionic radii of alkali metal ions are larger than those of the corresponding alkaline earth metal ions. Also ionic radii increase down the group. Therefore, the ionic radii decrease in the order : $Na^+ > Li^+ > Mg^{2+} > Be^{2+}$, *i.e.*, option (*a*) is correct.

81.

Solubility of hydroxides of alkaline earth metals increases because both the lattice enthalpy and hydration enthalpy decrease down the group as the size of the cation increases but lattice enthalpy decreases more rapidly than the hydration enthalpy and hence the solubility increases down the group.

Among sulphates, since the size of SO_4^{2-} ion is very big as compared to the metal cation, therefore, lattice enthalpy remains almost constant but their hydration enthalpy decreases down the group. Thus, the solubility of sulphates decrease down the group.

Of course, electronegativity and ionization enthalpy both decrease down the group as the atomic size increases.

82.

Bigger the size, lower is the extent of hydration, smaller is the mass of the hydrated species and hence higher is the ionic mobility in the aqueous solution. Thus, option (*d*) is correct.

83.

84.

Reactivity of alkali metals: Li < Na < K < Rb < Cs .

Reactivity of halogens: Fe > Cl > Br > I

85.

86.

87.

The maximum covalency of Be is 4, *e.g.*, $Na_2[Be(OH)_4]$ while that of Al is 6, *e.g.*, $Na_3[AlF_6]$.