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NEET FRESH 2023-24

Mark	Group		Date : 08/01/2024
720	PCB	PCB EXAM - 64	Time : 3:20 Hours

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PHYSICS

SECTION - A (35 Questions)

01. **(1)**
02. **(3)**
03. **(4)** $\Delta Q_{given} = \Delta Q_{taken}$

$$mC(2T - T_1) = \frac{m}{2} \times 2C \times (T_1 - T) \Rightarrow T_1 = \frac{3}{2}T.$$

04. **(4)** Fahrenheit has 180 divisions, Celsius & Kelvin have 100 and Reumur has 80 divisions.
05. **(4)** From Stefan's law, energy radiated by sun per second $E = \sigma A T^4$;

$\therefore A \propto R^2$ $\therefore E \propto R^2 T^4$

$$\therefore \frac{E_2}{E_1} = \frac{R_2^2 T_2^4}{R_1^2 T_1^4}$$

put $R_2 = 2R, R_1 = R ; T_2 = 2T, T_1 = T$

$$\Rightarrow \frac{E_2}{E_1} = \frac{(2R)^2 (2T)^4}{R^2 T^4} = 64.$$

06. **(1)** Change in temp. is equal in Kelvin and °C.
07. **(2)** $t = \frac{P_t - P_0}{P_{100} - P_0} \times 100 = \frac{70-50}{90-50} \times 100 = 50°C.$
08. **(3)**
09. **(1)** Let the temperature of the mixture be t^0C, Heat lost = Heat gain

$0.1 \times 10^3 \times (80° - t) = 0.3 \times 10^3 \times (t - 60°)$

$$\frac{1}{3} = \frac{t-60}{80-t} \Rightarrow 80 - t = 3t - 180$$

$$4t = 180 + 80 \Rightarrow t = \frac{260}{4} = 65^0\text{C}$$

10. **(1)** Same amount of heat is supplied to copper and water so, $m_c s_c \Delta T_c = m_w s_w \Delta T_w$

$$\Delta T_w = \frac{50 \times 10^{-3} \times 420 \times 10}{10 \times 10^{-3} \times 4200} = 5°C$$

11. **(1)** $E = \sigma A T^4$

As surface area A and surface temperature T are constant so $E_1 = E_2$.

12. **(1)** Steam at 100°C contains extra 540 cal/gm energy as compared to water at 100°C. So it's more dangerous to burn with steam than water.
13. **(4)**
14. **(2)** Liquid will over flow if $(\Delta V)_l > (\Delta V)_g$

$V\gamma\Delta\theta > V(3\alpha)\Delta\theta$

$\gamma > 3\alpha$

15. **(1)** Change in length in both rods are same

i.e. $\Delta l_1 = \Delta l_2$

$$l\alpha_1\Delta\theta_1 = l\alpha_2\Delta\theta_2 \Rightarrow \frac{\alpha_1}{\alpha_2} = \frac{\Delta\theta_2}{\Delta\theta_1} \left(\because \frac{\alpha_1}{\alpha_2} = \frac{4}{3}\right)$$

$$\Rightarrow \frac{4}{3} = \frac{T-30}{180-30} \Rightarrow T = 230°\text{C}.$$

16. **(1)** On heating every single linear dimension increases so in both the cases radius will increas by equal amount

$\Delta R = R_0 \alpha \Delta t$

So both will expand same.

17. **(4)** $ms_A(30-26) = ms_B(26-20)$

$$\frac{s_A}{s_B} = \frac{6}{4} = \frac{3}{2}$$

18. **(1)** Heat required by ice to convert totally into water at 100°C,

$Q_1 = 1 \times 80 + 1 \times 1 \times 100 = 180$ cal

Heat supplied by steam if it was to condense totally and convert into water at 100°C,

$Q_2 = 1 \times 540 = 540$ cal

As $Q_2 > Q_1$, entire steam will not condense and final temperature = 100°C

Both water and steam will together in equilibrium at 100°C.

19. **(1)** $ms\Delta\theta = m'L$

$80 \times 1 \times (30 - 0) = m' \times 80 \Rightarrow m' = 30$g

20. **(2)** $i \propto \frac{1}{R} \Rightarrow i \propto \frac{1}{l/KA}$ $i \propto \frac{A}{l} \Rightarrow i \propto \frac{\pi r^2}{l}$

So for option (2) i is maximum.

21. **(1)** The cavity inside the sphere expands in the same way as a solid sphere of the size of cavity would expand.
22. **(4)** $\frac{K_{Fe} A(100-\theta)}{d} = \frac{K_{Ag} A(\theta - 0)}{d}$

$$\frac{K_{Fe}}{K_{Ag}} = \frac{\theta - 0}{(100-\theta)} \Rightarrow \frac{1}{11} = \frac{\theta}{(100-\theta)}$$

$$\therefore \theta = \frac{100}{12} = 8.3°\text{C}.$$

23. **(2)** Given $R_1 = R_2$

$$\Rightarrow \frac{1}{K_1} \times \frac{l_1}{A} = \frac{1}{K_2} \times \frac{l_2}{A} \Rightarrow \frac{l_1}{l_2} = \frac{K_1}{K_2} = \frac{5}{3}.$$

24. **(1)** From Stefan's law, the energy radiated per second is given by $E = e\sigma T^4 A$;

Here, T = temperature of the body

A = Surface area of the body

For same material e is same. σ is Stefan's constant.

Let T_1 and T_2 be the temperature of two spheres. A_1 and A_2 be the are of two spheres.

$$\therefore \frac{E_1}{E_2}=\frac{T_1^4A_1}{T_2^4A_2}=\frac{T_1^4 4\pi r_1^2}{T_2^4 4\pi r_2^2}=\frac{(4000)^4\times1^2}{(2000)^4\times4^2}=\frac{1}{1}.$$

25. **(2)** As $Q\propto T^4$

So $\frac{Q_1}{Q_2}=\left(\frac{T_1}{T_2}\right)^4 \Rightarrow \frac{2\times10^5}{32\times10^5}=\left(\frac{127+273}{T}\right)^4$

$\Rightarrow \frac{1}{2}=\frac{400}{T}\Rightarrow T=800K\Rightarrow 800-273=527°C.$

26. **(1)** Let L_1' and L_2' be the lengths of the wire when temperature is changed by ΔT°C.

At T°C, $L_{eq}=L_1+L_2$

At $T+\Delta$°C $L_{eq}'=L_1'+L_2'$

$\therefore L_{eq}(1+\alpha_{eq}\Delta T)=L_1(1+\alpha_1\Delta T)+L_2(1+\alpha_2\Delta T)$

$[\because L'=L(1+\alpha\Delta T)]$

$\Rightarrow (L_1+L_2)(1+\alpha_{eq}\Delta T)=L_1+L_2+L_1\alpha_1\Delta T+L_2\alpha_2\Delta T$

$\Rightarrow \alpha_{eq}=\frac{L_1\alpha_1+L_2\alpha_2}{L_1+L_2}.$

27. **(2)** For difference of lengths to be constant $\ell_1\alpha_1=\ell_2\alpha_2$

$\alpha_2=\frac{\ell_1\alpha_1}{\ell_2}=\frac{120\times3\times10^{-5}}{180}=2\times10^{-5}/°C$

28. **(2)** Heat required from raising the temperature of a body through 1°C is called its thermal capacity.

29. **(1)** As the coefficient of thermal expansion of the brass is greater than steel. Hence, the length of brass strip will be more than steel strip. Therefore, brass strip will be on convex side.

30. **(1)** $\Delta T=120-20=100°C$, $A=400\ cm^2$

$\gamma=3\times10^{-4}/°C$ $\alpha=\frac{\gamma}{3}=10^{-4}/°C$

$\beta=2\alpha=2\times10^{-4}/°C$

$\Delta A=A\beta\Delta T=400\times2\times10^{-4}\times100=8cm^2$

Final area = $A+\Delta A=400+8=408cm^2$.

31. **(2)** $\frac{dQ}{dt}=\frac{dQ_1}{dt}+\frac{dQ_2}{dt}$

$\frac{K(A_1+A_2)(\theta_1-\theta_2)}{d}=\frac{K_1A_1(\theta_1-\theta_2)}{d}+\frac{K_2A_2(\theta_1-\theta_2)}{d}$

$\therefore K=\frac{K_1A_1+K_2A_2}{A_1+A_2}.$

32. **(1)** $\Delta U=\Delta Q=mc\Delta T$

$=\frac{100}{1000}\times4184(50-30)\approx8.4kJ.$

33. **(2)** Original value of circumference, $l=2\pi R$

$\therefore \Delta l=l\alpha\theta=(2\pi R)\alpha\theta$

34. **(1)** $\rho_{200}=\rho_0(1-\gamma_m\Delta T)$

$=13.6(1-0.18\times10^{-3}\times200)=13.11g/cc.$

35. **(1)** Let Q be the temperature at a distance x from hot end of bar. Let Q is the temperature of hot end.

The heat flow rate is given by $\frac{dQ}{dt}=\frac{kA(\theta_1-\theta)}{x}$

$\Rightarrow(\theta_1-\theta)=\frac{x}{kA}\frac{dQ}{dt}\Rightarrow\theta=\theta_1-\frac{x}{kA}\frac{dQ}{dt}$

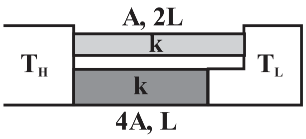
Thus, the graph of Q versus x is a straight line with a positive intercept and a negative slope.

The above equation can be graphically represented by option (1).

Section - B (Attempt Any 10 Questions)

36. **(4)** As temperature difference is same

$\Rightarrow$ rods are connected in parallel with different length as shown in figure.



$\Delta T_1=\Delta T_2$

$i_1R_1=i_2R_2\Rightarrow\frac{i_1}{i_2}=\frac{R_2}{R_1}\Rightarrow\frac{l_2}{l_1}\times\frac{A_1}{A_2}$

$\Rightarrow\frac{i_1}{i_2}=\frac{1}{2}\times\frac{1}{4}=\frac{1}{8}.$

37. **(1)** $\frac{x-20}{150-20}=\frac{C-0}{100-0}$

$\Rightarrow\frac{x-20}{130}=\frac{C}{100}=\frac{60}{100}$

$\Rightarrow x=\frac{60}{100}\times130+20=98°C.$

38. **(2)** Let x be the temperature measured by faulty thermometer

$\therefore \frac{C-0}{100}=\frac{x\text{-lower fixed point}}{\text{No. of divisions between the two fixed points}}$

$\Rightarrow\frac{C}{100-0}=\frac{59-5}{95-5}\Rightarrow\frac{C}{100}=\frac{54}{90}\Rightarrow C=60°C.$

39. **(3)** $\frac{\Delta\theta}{\Delta t} = -k(\bar{\theta} - \theta_0)$

$$\frac{50-40}{5} = -k\left(\frac{50+40}{2} - 20\right)$$

$$2 = -k \times 25 \Rightarrow k = -\frac{2}{25}$$

$$\frac{40-30}{t} = -k\left(\frac{40+30}{2} - 20\right)$$

$$\frac{10}{t} = \frac{2}{25}(15) \Rightarrow t = \frac{25}{3}\text{ min}.$$

40. **(2)** Here, temperature of liquid = $\frac{2}{5}$ of distance between lower and upper fixed points

$$= \frac{2}{5} \times 100 = 40°C$$

On Kelvin scale, $T_K = 273.15 + 40$
$= 313.15\ K.$

41. **(2)** By Newton's law of cooling

$$\frac{\theta_1 - \theta_2}{t} = -K\left[\frac{\theta_1 + \theta_2}{2} - \theta_0\right]$$

where θ_0 is the temperature of surrounding.

Now, hot water cools from 60°C to 50°C in 10 minutes,

$$\frac{60-50}{10} = -K\left[\frac{60+50}{2} - \theta_0\right] \text{ ....(i)}$$

Again, it cools from 50°C to 42°C in next 10 min.

$$\frac{50-42}{10} = -K\left[\frac{50+42}{2} - \theta_0\right] \text{ ....(ii)}$$

Dividing equations (i) by (ii) we get

$$\frac{1}{0.8} = \frac{55-\theta_0}{46-\theta_0} \Rightarrow \frac{10}{8} = \frac{55-\theta_0}{46-\theta_0}$$

$$460 - 10\theta_0 = 440 - 8\theta_0 \Rightarrow 2\theta_0 = 20 \Rightarrow \theta_0 = 10°C.$$

42. **(3)** Let T be the final equal temperature,
Heat lost by coffee = Heat gained by the cup
Using, Q = $ms\,\Delta T$,
$0.3 \times 4080 \times (70 - T) = 0.12 \times s_{cup} \times (T - 20)$

$$\Rightarrow 0.3 \times 4080 \times (70 - T) = 0.12 \times 1020 \times (T - 20)$$

$$\Rightarrow 4 \times 70 - 4T = 0.4T - 8$$

$$\Rightarrow T = \frac{288}{4.4} = 65.5°C$$

43. **(1)** $-M.S = K(\theta - \theta_0)$

$\therefore\ \theta - \theta_0 = Ae^{-Kt}$

Temperature reduced exponentially.

44. **(1)** If temperature of surrounding is considered, then net loss of energy of a body by radiation :

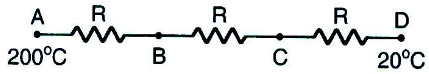
$$Q = A_e\sigma(T^4 - T_0^4) \text{ or } Q \propto (T^4 - T_0^4)$$

$$\frac{Q_1}{Q_2} = \frac{T_1^4 - T_0^4}{T_2^4 - T_0^4} = \frac{(273+327)^4 - (273+27)^4}{(273+427)^4 - (273+27)^4}$$

$$\frac{Q_1}{Q_2} = \frac{(600)^4 - (300)^4}{(700)^4 - (300)^4}$$

45. **(4)** Let m gram of ice is added.
From principal of calorimeter
heat gained (by ice) = heat lost (by water)
$m \times 2.1 \times [0 - (-20)] + (m - 20) \times 334$
$= 50 \times 4.2 \times (40 - 0)$
$376m = 8400 + 6680$ $\therefore\ m = 40.1.$

46. **(3)** Equivalent electrical circuit, will be as shown in figure.



Temperature difference between A and D is 180°C, which is equally distributed in all the rods. Therefore, temperature difference between A and B will be 60°C, or temperature of B should be 140°C.

47. **(4)** According to principal of calorimetry,
Heat lost = Heat gain
100 × 0.1 (T – 75) = 100 × 0.1 × (75 – 30) + 170 × 1 × (75 – 30)
10T –750 = 450 + 7650 = 8100
⇒ T – 75 = 810 ⇒ T = 885°C.

48. **(1)** As $R_T = \frac{1}{K}\frac{l}{A}$ and we know under balanced condition for a Wheatstones bridge

$$\frac{R_1}{R_2} = \frac{R_3}{R_4} \Rightarrow \frac{K_2}{K_1} = \frac{K_4}{K_3} \Rightarrow K_2K_3 = K_1K_4.$$

49. **(4)**

50. **(1)** The kinetic energy of the bullet will be utilized to heat the bullet

$$\frac{1}{2}m\upsilon^2 = (ms\Delta\theta)J$$

$$\frac{1}{2} \times 2 \times 10^{-3} \times (200)^2 = 2 \times 0.03 \times \Delta\theta \times 4.2$$

$$\Delta\theta = 158°C.$$

CHEMISTRY

SECTION - A (35 Questions)

51. **(2)**

$M_2S \rightarrow 2M^+ + S^{-2}$

$\therefore K_{sp} = (2S)^2 \times S$

$4S^3 \Rightarrow 4 \times (3\times10^{-6})^3$

$\Rightarrow 4 \times (3\times10^{-6})^3$

$= 1.08 \times 10^{-16}$

52. **(2)**

$CH_3COONH_4 \rightarrow$ is a salt of CH_3COOH and NH_4OH having almost same value of Ka & Kb, hence the p^H of salt is nearly equal to "7".

53. **(4)**

Acidic strength $\propto$ degree of ionisation ($\propto$) $\propto$ dissociation constant (Ka) $\propto \frac{1}{pKa}$

54. **(3)**

For weak acid and conjugate base.

$K_a \times K_b = k_w \Rightarrow 10^{-5} \times k_b = 10^{-14}$

$\therefore k_b = \frac{10^{-14}}{10^{-5}} = 10^{-9}$

$\therefore pK_b = -\log 10^{-9} = \boxed{9}$

55. **(1)**

7.005

56. **(4)**

Concept of dissociation constants weak acid & their dissociation in water i.e. aqueous medium.

57. **(2)**

Due to common ion effect dissociation of CH_3COOH decreases which decreases $[H^+]$ in solution.

$\therefore$ pH of solution increases.

58. **(1)**

$[H^+] = \propto c = \sqrt{ka \times c} \Rightarrow \sqrt{1.6\times10^{-5}\times0.01} = \sqrt{16\times10^{-8}}$

$\Rightarrow \sqrt{16\times10^{-8}} \Rightarrow 4\times10^{-4}$

$\therefore p^H = -\log[H^+] \Rightarrow -\log(4\times10^{-4}) \Rightarrow \boxed{3.4}$

59. **(2)**

$BaSO_4 \longleftrightarrow Ba^+ + SO_4^{-2} \Rightarrow K_{sp} = S^2$

$\therefore S = \sqrt{K_{sp}} = \sqrt{1\times10^{-10}} = 1\times10^{-5} mol\,L^{-1}$

$\Rightarrow$ 0.5 gm $BaSO_4$

$\Rightarrow$ 0.0021 mol $\Rightarrow 2.1\times10^{-3}$ mole

$\therefore$ Volume required is

$$= \frac{2.1\times10^{-3}\text{mole}}{1\times10^{-5}\text{ mole}} = 210L \cong 214L$$

60. **(3)**

Concept of salt hydrolysis.

61. **(1)**

Consider common ion effect $\Rightarrow$ common ion decreases solubility.

62. **(3)**

i) pH of CH_3COOH sol^n = 1/2 (pKa – log c)

$\Rightarrow \frac{1}{2}(4.74 - \log 0.01)$

$\Rightarrow \frac{1}{2}(4.74 + 2) \Rightarrow \frac{1}{2}\times6.74$

$pH \Rightarrow 3.37$

ii) pH of buffer sol^n =

$pKa + \log\frac{0.01}{0.01} \Rightarrow pKa \Rightarrow 4.74$

$\therefore$ change in pH = 4.74 – 3.37

$\boxed{=1.37}$

63. **(3)**

10^{-12}

64. **(4)**

Sodium cyanide: Anionic hydrolysis, generates hydroxide ion

65. **(1)**

$p^H = 7$, Hence there is no change in p^H on dilution of solution

66. **(2)**

pka = 4.77, pkb = 3.27

$\therefore p^H$ of sald $= 7 + \left(\frac{pKa - pKb}{2}\right)$

$\Rightarrow 7 + 0.75$

$\boxed{7.75}$

67. **(4)**

If Assertion is wrong & Reason are true statements, then mark (4)

68. **(1)**

If both Assertion & Reason are true and the Reason is the correct explanation of the Assertion, then mark (1)

69. **(3)**

$H_2O \rightarrow \overline{O}H + H^+$, $HF \rightarrow F^- + H^+$

conjugate base conjugate base

70. **(3)**

Excess of solution of weak base in solution of strong acid of same concentration gives basic buffer.

71. **(1)**

$$\text{Solubility of AB} = \sqrt{K_{sp}} = 2\times10^{-10}$$

$$\text{Solubility of } A_2B \ \sqrt[3]{\frac{K_{sp}}{4}} = 2\times10^{-4}$$

$$\text{Solubility of } AB_3 = \left[\frac{K_{sp}}{27}\right]^{1/4} = 10^{-8}$$

72. **(3)**

For salt of weak acid and weak base

$$K_h = \frac{K_w}{K_a \times K_b}$$

73. **(3)**

$$NaCl_{(s)} \rightleftharpoons Na^+_{(aq.)} + Cl^-_{(aq.)}$$

$$HCl \rightleftharpoons H^+ + Cl^-$$

The increase in $[Cl^-]$ brings in an increase in $[Na^+]$ $[Cl^-]$ which will lead for backward reaction because K_{sp} of

$$NaCl = [Na^+][Cl^-].$$

74. **(3)**

As the solution is acidic, pH < 7. This is because $[H^+]$ from H_2O $[10^{-7}]$ cannot be neglected in comparison to 10^{-8}.

75. **(3)**

$$BaSO_4 \rightleftharpoons Ba^{2+} + SO_4^{2-}$$

$$\therefore \quad K_{sp} = [Ba^{2+}]\times[SO_4^{2-}]$$

$$4\times10^{-10} = [1\times10^{-4}]\times[SO_4^{2-}]$$

$$[SO_4^{2-}] = \frac{4\times10^{-10}}{1\times10^{-4}} = 4\times10^{-6}\ M$$

76. **(2)**

CH_3COOH is a weak acid, conjugate base of weak acid is strong base.

$$CH_3COOH \underset{}{\overset{H_2O}{\rightleftharpoons}} \underset{\text{Conjugate base}}{CH_3COO^-} + H^+$$

77. **(3)**

Strong electrolyte added into solution of weak electrolyte containing common ion shows common ion effect.

$NH_4OH + NH_4Cl \rightarrow$ common ion effect

weak strong

78. **(3)**

$\Rightarrow$ HCl is a strong acid.

79. **(4)**

For $Ag_2S \Rightarrow$

$$Ag_2S \longleftrightarrow 2Ag^+ + S^{2-}$$

$$\therefore Ksp = [Ag^+]^2[s^{-2}]$$

$$= [S]^2[S]$$

After add4 g 0.1 s^{2-} ions

$$Ksp = [s]^2[s+0.1]$$

but $s <<< 0.1$

$$\therefore\ Ksp = [S]^2[0.1]$$

$$\therefore S = \sqrt{\frac{Ksp}{0.1}} = \left(\frac{10^{-51}}{0.1}\right)^{1/2} = \boxed{10^{-25}M}$$

80. **(2)**

$$pH = 5 \Rightarrow [H^+] = 1\times10^{-5},$$

$$C = 0.005m = 5\times10^{-3}.$$

$$\therefore \alpha = \frac{[H^+]}{C} = \frac{1\times10^{-5}}{5\times10^{-3}} = 2\times10^{-3}$$

$$\therefore \%\ \alpha = 2\times10^{-3}\times100 = 2\times10^{-1}$$

$$\therefore \boxed{\alpha = 0.2\%}$$

81. **(2)**

$[H^+]$ of water increases with increase in temperature hence p^H decreases.

On addition of acid in water $[H^+]$ increases hence pH decreases.

82. **(2)**
Higher is K_{sp} value, higher is the solubility.

83. **(1)**
$p^H = 1 \therefore [H^+] = 1 \times 10^{-1} \Rightarrow$ volume is 12
$p^H = 2 \therefore [H^+] = 1 \times 10^{-2} \Rightarrow$ volume must be 10 L
$\therefore$ Change in volume $\Delta V = 10L - 1L$
$\boxed{\Delta V = 9L}$

84. **(2)**
Less value of pH $\Rightarrow$ stronger is the acid

85. **(2)**
$ZnCl_2$ is the salt of weak base and strong acid, Hence pH of it's solution is acidic which is less than given salts.

SECTION - B (Attempt Any 10 Questions)

86. **(3)**
$pH10 \Rightarrow pOH = 10^4 = 1 \Rightarrow [\bar{O}H] = 10^{-4}$
$pH\ 12 \Rightarrow pOH = 10^2 \Rightarrow [\bar{O}H] = 10^{-2}$
equal volumes of both sol^n are mixed, hence $[\bar{O}H]$ in resultant sol^n is,
$$[\bar{O}H] = \frac{[1\times10^{-4}]+[100\times10^{-4}]}{2} = \frac{101\times10^{-4}}{2}$$
$[\bar{O}H] = 50.5\times10^{-4} \Rightarrow 5.05\times10^{-3}$
$\therefore pOH - \log(5.05 \times 10^{-3}) = 2.3$
$\therefore pH = 14 - 2.3 = 11.7$

87. **(3)**
P-2, Q-1, R-4, S-3

88. **(4)**
i) moles of $[H^+]$ in HCl
$$\Rightarrow \frac{0.05\times20}{1000} = \frac{1}{1000} = 1\times10^{-3}\ (20\,ml)$$
ii) moles of $[\bar{O}H]$ in $Ba(OH)_2$
$$\Rightarrow \frac{2\times0.1\times30}{1000} = \frac{6}{1000} = 6\times10^{-3}\ (30\,ml)$$
$\therefore [\bar{O}H] \Rightarrow (6-1)\times10^{-3} = 5\times10^{-3}$ in 50 ml sol^n.
$$\therefore M = \frac{5\times10^{-3}\times1000}{50} = \frac{5}{50} = \boxed{0.1M}$$

89. **(4)**
Le the solubility of $Ni(OH)_2$ is s
$$\underset{s}{Ni(OH)_2} \rightleftharpoons \underset{s}{Ni^{2+}} \quad \underset{2s}{2OH^-}$$
$$\underset{0.1}{NaOH} \rightarrow \underset{0.1}{Na} + \underset{0.1}{OH^-}$$
As K_{sp} is small $2s << 0.10$
therefore $(0.10 + 2s) \approx 0.10$
so Total $[OH]^- = 0.10$
Ionic product $= [Ni^{2+}][OH^-]^2$
$2 \times 10^{-15} = s(0.10)^2$
$s = 2 \times 10^{-13}$ M

90. **(4)**
(IV) gp. the S^{2-} concentration increase when added the
NH_4OH because
$$NH_4OH \rightleftharpoons NH_4^+ + OH^-$$
$$H_2S \rightleftharpoons 2H^+ + S^{2-}$$
$$OH^- + H^+ \rightleftharpoons H_2O$$
So that S^{2-} is increased.

91. **(3)**
Species which can donate and accept a proton $(H)^+$ act as pronsted acid as well as base.
ii) $HSO_4^- + H^+ \rightarrow H_2SO_4, HSO_4^{-1} \rightarrow SO_4^{-2} + H^+$
iii) $NH_3 + H^+ \rightarrow \overset{+}{N}H_4, \overset{-}{N}H_3 \rightarrow \overset{-}{N}H_2 + H^+$

92. **(1)**
Hydrolysis constant of salt of weak base strong acid is
$$(NH_4Cl)K_h = \frac{K_w}{K_b} \Rightarrow \frac{1\times10^{-14}}{1.77\times10^{-5}} = 0.565\times10^{-9}$$
$\therefore \boxed{K_h = 5.65\times10^{-10}}$

93. **(3)**

i) moles of $[H^+]$ in

$$HCl = \frac{0.2\times75}{1000} = \frac{15}{1000} = 1.5\times10^{-2}\ (75ml)$$

ii) moles of $[\overline{O}H]$ in

$$NaOH = \frac{0.2\times25}{1000} = \frac{5}{1000} = 5\times10^{-3} = 0.5\times10^{-2}\ (25\,ml)$$

$$\therefore [H^+] = (1.5\times10^{-2}) - (0.5\times10^{-2})$$

$$\Rightarrow (1.5-0.5)\times10^{-2}$$

$$\Rightarrow 1\times10^{-2} \text{ in } (100\ ml)$$

$$\therefore [H^+] = \frac{1\times10^{-2}\times1000}{100} = 1\times10^{-1}$$

$$\therefore p^H = -\log[H^+] \Rightarrow \log 1\times10^{-1} = 1$$

$$\therefore p^H = -\log[H^+] \Rightarrow -\log 1\times10^{-1} = 1$$

$$\boxed{p^H = 1}$$

94. **(4)**

PF_3 has lone pair at "P" atom

Hence PF_3 is lewis base.

95. **(3)**

Given, $K_b = 1.8\times10^{-5}$

$$pOH = pK_b + \log\frac{[salt]}{[base]}$$

$$= 4.74 + \log\frac{0.20}{0.30}$$

$$= 4.74 + (0.301 - 0.477)$$

$$= 4.56$$

$$\therefore pH + pOH = 14$$

$$\therefore pH = 14 - 4.56 = 9.44$$

96. **(1)**

pH of $Ba(OH)_2 = 12$

pH = 12

So, pOH = 2

$[OH^-] = 10^{-2}$

$$Ba(OH)_2 \rightleftharpoons \underset{S}{Ba^{2+}} + \underset{2S}{2OH^-}$$

As, $2S = 10^{-2}$

$S = 5\times10^{-3}$ M

$K_{sp} = [5\times10^{-3}][10^{-2}]^2$

$K_{sp} = 5\times10^{-7}\ M^3$

97. **(3)**

For water

$$H_2O \longleftrightarrow H^+ + \overline{O}H$$

$$[H_2O] = 1L = 1000gm = 55.5\ moles$$

$$\therefore K_a = \frac{[H^+][\overline{O}H]}{[H_2O]} \Rightarrow \frac{k_w}{55.5} \Rightarrow \frac{10^{-12}}{55.5} = \boxed{1.8\times10^{-14}}$$

98. **(4)**

$$A_3B_2 \rightleftarrows \underset{(3S)^3}{[A^{+2}]^3}\ \underset{(2S)^2}{[B^{3-}]^2}$$

$$\therefore K_{sp} = 108S^5$$

Ratio of B^{3-} ions concentration to K_{sp}.

$$\frac{[B^{3-}]}{K_{sp}} = \frac{2S}{108S^5} = \frac{1}{54S^4}$$

$$\text{But } S = \frac{X}{M} \Rightarrow \boxed{\frac{M^4}{54\times X^4}}$$

99. **(3)**

$Ag_2S > CuS > HgS$

100. **(1)**

i) moles of $[H^+]$ in

$$HCl = \frac{0.33\times30}{1000} = 9.9\times10^{-3} = 1\times10^{-2}$$

ii) moles of $[H^+]$ in

$$HNO_3 = \frac{0.5\times20}{1000} = 10\times10^{-3} = 1\times10^{-2}$$

iii) moles of $[\overline{O}H]$ in

$$NaOH = \frac{0.25\times40}{1000} = 10\times10^{-3} = 1\times10^{-2}$$

$\therefore$ moles of $[H^+]$ in overall sol^n are $= 1\times10^{-2}$

$\therefore\ p^H = -\log[H^+] = -\log 10^{-2} = 2$