

Class: 11
Subject: Chemistry
Topic: ASK15E11UT04
No. of Questions: 30

Q1. Find the weight of KOH in its 50 milli equivalents

- (a) 1.6 g
- (b) 2.2 g
- (c) 2.8 g
- (d) 4.8 g

Sol. (c)

$$\ominus \text{Meq} = \frac{\text{weight}}{\text{Eq.wt.}} \times 1000 \Rightarrow 50 = \frac{\text{weight}}{56} \times 1000$$

\therefore Weight of KOH = 2.80 g

Q2. Reaction between iron and steam is reversible if it is carried out



- (a) at constant T
- (b) at constant P
- (c) in an open vessel
- (d) in a closed vessel

Sol. (d)

In open vessel H_2 gas will escape.

Q3. If the degree of ionization of water be 1.8×10^{-9} at 298K. Its ionization constant will be

- (a) 1.8×10^{-16}
- (b) 1×10^{-14}
- (c) 1×10^{-16}
- (d) 1.67×10^{-14}

Sol. (a)

$$K_a = \frac{K_w}{[H_2O]} = \frac{10^{-14}}{55.5} = 1.8 \times 10^{-16}$$

Q4. The number of neutrons in a drop of water (20 drops = 1mL) at 4°C

- (a) 6.023×10^{22}
- (b) 1.338×10^{22}
- (c) 6.023×10^{22}
- (d) 7.338×10^{22}

Sol. (b)

Mass of a drop of water = $0.05 \times 1 \text{ g} = 0.05 \text{ g}$

$$\text{No. of moles of water} = \frac{0.05}{18}$$

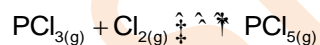
$$\text{No. of water molecules} = \frac{0.05}{18} \times 6.023 \times 10^{23}$$

1 water molecule contain 8 neutrons

$$\therefore \frac{0.05}{18} \times 6.023 \times 10^{23} \text{ molecule certain } \frac{0.05 \times 8}{18} \times 6.023 \times 10^{23} \text{ neutrons}$$

$$= 0.1338 \times 10^{23} = 1.338 \times 10^{22}$$

Q5. For the reaction



The value of K_c at 250°C is 26. The value of K_p at this temperature will be

- (a) 0.61
- (b) 0.57
- (c) 0.83
- (d) 0.46

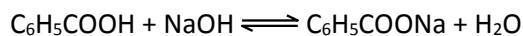
Sol. (a)

$$K_p = K_c (RT)^{\Delta n} = 26 \times (0.082 \times 523)^{-1} = 0.61$$

Q6. When a solution of benzoic acid was titrated with NaOH the pH of the solution when half the acid neutralized was 4.2. Dissociation constant of the acid is

- (a) 6.31×10^{-5}
- (b) 3.2×10^{-5}
- (c) 8.7×10^{-8}
- (d) 6.42×10^{-4}

Sol. (a)



After 0.5 0.5

neutralization

It is a buffer solution of weak acid and its salt

$$\text{pH} = \text{pK}_a + \log \frac{[\text{salt}]}{[\text{acid}]}$$

$$\text{pK}_a = 4.2$$

$$\text{K}_a = 6.31 \times 10^{-5}$$

- Q7. Weight of 1 atom of an element is 6.644×10^{-23} g. What is number of atoms of element in 40 kg of it?
- (a) 10^3 g atom
 - (b) 10^2 g atom
 - (c) 10^4 g atom
 - (d) 10 g atom

Sol. (a)

Weight of Avogadro number (N) of atoms of the element

$$= 6.644 \times 10^{-23} \times 6.023 \times 10^{23} = 40 \text{ g}$$

40 g = weight of 1g atom

$$\therefore 40 \times 10^3 \text{ g} = \text{weight of } 10^3 \text{ g atom}$$

- Q8. In a reversible reaction, two substances are in equilibrium. If the concentration of each one is doubled, the equilibrium constant will be
- (a) Reduced to half, its original value

- (b) becomes (original)/4
- (c) doubled
- (d) constant

Sol. (d)

K_c or K_p do not depend on concentration, but only on temperature.

Q9. 10^{-2} mole of NaOH was added to 10 litre of water. The pH will change by

- (a) 4
- (b) 3
- (c) 11
- (d) 7

Sol. (a)

Old pH = 7

$$\text{New } [\text{OH}^-] = 10^{-2} \times \frac{1}{10} = 10^{-3}$$

New pH = 11

Change in pH = 4

Q10. A compound contains 3.2% of oxygen. The minimum mol wt. of the compound is

- (a) 300
- (b) 440
- (c) 350
- (d) 500

Sol. (d)

The compound must contain at least one oxygen atom.

So, a minimum of 1 g atom of oxygen will be present in 1 g molecule i.e., 1 mole of the compound.

If M is the mol.wt. of the compound then since 16 is the atomic mass of oxygen so minimum of 16 g of oxygen will be present in M g of the compound

$$\text{Thus, \% of oxygen} = \frac{16}{M} \times 100$$

$$\text{or } 3.2 = \frac{16 \times 100}{M} \quad \text{or } M = 500$$

Q11. The equilibrium constant for the reaction,



In presence of a catalyst, equilibrium is attained ten times faster. Therefore, the equilibrium constant, in presence of the catalyst at 2000K is

- (a) 40×10^{-4}
- (b) 4×10^{-4}
- (c) 4×10^{-5}
- (d) difficulty to compute

Sol. (b)

Equilibrium is constant at constant temperature for a reaction

Q12. If an aqueous solution at 25°C has twice as many OH^- ion as pure water its pOH will be

- (a) 6.699
- (b) 7.307
- (c) 7
- (d) 6.98

Sol. (a)

$$[\text{OH}^-] = 2 \times 10^{-7}$$

$$\text{pOH} = 14 - \text{pH} \text{ or } -\log [\text{OH}^-]$$

Q13. No. of oxalic acid molecules in 100 ml of 0.02 N oxalic acid are

- (a) 6.023×10^{20}

- (b) 6.023×10^{21}
- (c) 6.023×10^{22}
- (d) 6.023×10^{23}

Sol. (a)

Normality = Molarity \times Valence factor

$$\therefore \text{Molarity} = \frac{\text{Normality}}{\text{Valence factor}}$$

$$\text{Valence factor for oxalic acid} = \frac{\text{mol. wt. of oxalic acid}}{\text{Eq. wt. of oxalic acid}}$$

$$\text{Molarity} = \frac{02}{2} = 0.01$$

$$\text{Number of millimoles} = 0.01 \times 100$$

$$\text{Number of moles} = 0.001$$

$$\therefore \text{No. of oxalic acid molecules} = 0.001 \times 6.023 \times 10^{23} = 6.023 \times 10^{20}$$

Q14. 64g of HI are present in a 2 litre vessel. The active mass of HI is:

- (a) 0.5
- (b) 0.25
- (c) 1
- (d) none

Sol. (b)

Molecular mass of HI = 128

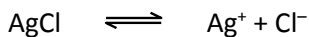
$$[\text{HI}] = [\text{H}] = \frac{64}{128} \times \frac{1}{2} = 0.25$$

Q15. Solubility of AgCl in water, 0.01M CaCl₂, 0.01M NaCl and 0.05M AgNO₃ are S₁, S₂, S₃ and S₄ respectively then.

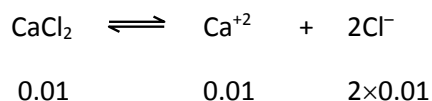
- (a) S₁ < S₂ < S₃ < S₄
- (b) S₁ > S₃ > S₂ > S₄

- (c) $S_1 > S_2 = S_3 > S_4$
(d) $S_1 > S_3 > S_4 < S_2$

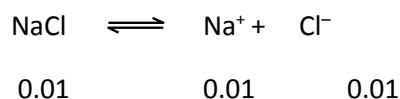
Sol. (b)



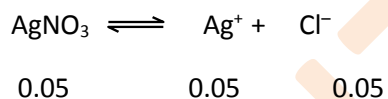
In CaCl_2



In NaCl



In AgNO_3

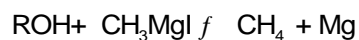


common ion effect is maximum in AgNO_3

So, $S_1 > S_3 > S_2 > S_4$

- Q16. 112 ml of a gas is produced at S.T.P. by the action of 4.12 mg of alcohol ROH with CH_3MgI . The molecular mass of alcohol is
- (a) 32 g
(b) 41.2 g
(c) 82.4 g
(d) 156 g

Sol. (c)



1 mole 1 mole

So the gas produced is CH_4 .

1 mole CH_4 will be produced from 1 mole of alcohol

∴ 22.4 lit CH₄ will be produced by mol.wt. of alcohol

112 ml CH₄ is produced from 4.12 mg of alcohol

∴ 22400 ml CH₄ is produced from $\frac{412 \times 22400}{112}$ mg = 82400 mg = 82.4 g

So Mol.wt.of alcohol = 82.4 g

Q17. For which of the following K_p may be equal to 0.5 atm

- (a) 2HI \rightleftharpoons H₂ + I₂
- (b) PCl₅ \rightleftharpoons PCl₃ + Cl₂
- (c) N₂ + 3H₂ \rightleftharpoons 2NH₃
- (d) 2NO₂ \rightleftharpoons N₂O₄

Sol. (b)

For K_p = 0.5 atm

Δn = 1 (since the unit is atm)

and PCl₅ \rightleftharpoons PCl₃ + Cl₂

Δn = 1

Q18. What would be the pH of an ammonia solution if that of an acetic acid solution of equal strength is 3.2? Assume dissociation constant for NH₃ & acetic acid are equal.

- (a) 3.2
- (b) 6.4
- (c) 9.6
- (d) 10.8

Sol. (d)

pH of CH₃COOH = pOH of NH₃ solution Q K_a = K_b

∴ pH of NH₃ solution = 14 – 3.2 = 10.8

Q19. If 0.5 mole of BaCl₂ is mixed with 0.2 mol of Na₃PO₄, the maximum amount of Ba₃(PO₄)₂ that can be formed is:

Q21. pH of $\text{Ba}(\text{OH})_2$ solution is 12. Its solubility product is

- (a) 10^{-6}M^3
- (b) $4 \times 10^{-6}\text{M}^3$
- (c) $0.5 \times 10^{-7}\text{M}^3$
- (d) $5 \times 10^{-7}\text{M}^3$

Sol. (d)

Since $\text{pH} = 12 \therefore \text{pOH} = 14 - 12 = 2$

$$\therefore [\text{OH}^-] = 10^{-2}\text{M}$$

We know $\text{Ba}(\text{OH})_2 \rightleftharpoons \text{Ba}^{++} + 2\text{OH}^-$

$$\therefore [\text{Ba}^{++}] = \frac{10^{-2}}{2} \text{M}$$

$$\therefore K_{\text{SP}} = [\text{Ba}^{++}] [\text{OH}^-]^2 = \left(\frac{10^{-2}}{2}\right) \times (10^{-2})^2 = 5 \times 10^{-7}\text{M}^3$$

Q22. A 10.0 g sample of a mixture of calcium chloride and sodium chloride is treated with Na_2CO_3 to precipitate the calcium as calcium carbonate. This CaCO_3 is heated to convert all the calcium to CaO and the final mass of CaO is 1.62 gms. The % by mass of CaCl_2 in the original mixture is

- (a) 15.2%
- (b) 32.1%
- (c) 21.8%
- (d) 11.07%

Sol. (b)

$$\text{Moles of CaO} = \frac{1.62}{56}$$

$$\Rightarrow \text{Moles of CaCl}_2 = \frac{1.62}{56}$$

$$\Rightarrow \text{Mass of CaCl}_2 = \frac{1.62}{56} \times 111 = 3.21 \text{ gm} \Rightarrow \% = \frac{3.21}{10} \times 100 = 32.1\%$$

Q23. If pressure is applied to the following equilibrium, liquid \rightleftharpoons vapours the boiling point of liquid

- (a) will increase
- (b) will decrease
- (c) may increase or decrease
- (d) will not change

Sol. (a)

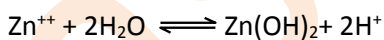
Boiling point of a liquid is the temperature at which vapour pressure became equal to atm pressure. If the pressure is applied to the above equilibrium the reaction will go to the backward direction, i.e. vapour pressure decrease hence the boiling point increase.

Q24. The hydrolysis constant for $ZnCl_2$ will be

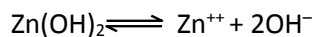
- (a) $K_h = \frac{K_w}{K_b}$
- (b) $K_h = \frac{K_w^2}{K_b}$
- (c) $K_h = \frac{K_w^2}{K_b^2}$
- (d) $K_h = \frac{K_b}{K_w^2}$

Where K_b is effective dissociation constant of base Zn^{++}

Sol. (b)



$$\therefore K_h = \frac{[Zn(OH)_2] [H^+]^2}{[Zn^{++}]} \quad \dots (1)$$



$$\therefore K_b = \frac{[Zn^{++}] [OH^-]^2}{[Zn(OH)_2]}, \quad K_w = [H^+] [OH^-]$$

$$\therefore \frac{K_w^2}{K_b} = K_h$$

Q25. Equal volumes of 1 M each of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ are used to oxidise Fe(II) solution in acidic medium. The amount of Fe oxidized will be

- (a) more with KMnO_4
- (b) equal with both oxidizing agents
- (c) more with $\text{K}_2\text{Cr}_2\text{O}_7$
- (d) cannot be determined

Sol. (c)

The 'n' factor of KMnO_4 is 5 while that of $\text{K}_2\text{Cr}_2\text{O}_7$ is 6. So for the same number of moles, $\text{K}_2\text{Cr}_2\text{O}_7$ will have greater equivalence than KMnO_4 .

Q26. For the reaction $\text{A}_{(g)} + \text{B}_{(g)} \rightleftharpoons 3\text{C}_{(g)}$ at 250°C , a 3 litre vessel contains 1, 2, 4 mole of A, B and C respectively. If K_c for the reaction is 10, the reaction will proceed in

- (a) Forward direction
- (b) Backward direction
- (c) In either direction
- (d) In equilibrium

Sol. (b)

$$Q = \frac{[\text{C}]^3}{[\text{A}][\text{B}]} = \frac{4^3 \times 3 \times 3}{3^3 \times 1 \times 2} = 10.66$$

$$\Theta [\text{C}] = \frac{4}{3}$$

$$[\text{A}] = \frac{1}{3} \Rightarrow [\text{B}] = \left(\frac{2}{3}\right) \Theta K_c = 10, \text{ and } Q > K_c$$

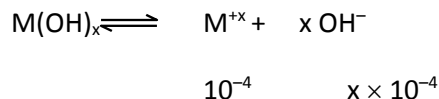
\therefore reaction will proceed in backward direction

Q27. M(OH)_x has $K_{\text{SP}} 4 \times 10^{-12}$ and solubility 10^{-4}M . Then the value of x is

- (a) 1
- (b) 2
- (c) 3
- (d) -4

Sol. (b)

$M(OH)_x$ will ionize in the way



$$\therefore K_{sp} = [M^{+x}] [OH^-]^x \therefore (10^{-4}) (x \times 10^{-4})^x = 4 \times 10^{-12}$$

by inspection we get this relation will hold good when $x = 2$

Q28. How many millilitre of 0.5 M H_2SO_4 are needed to dissolve 0.5 g of Cu(II) carbonate?

- (a) 6.01
- (b) 4.5
- (c) 8.1
- (d) 11.1

Sol. (c)

$$0.5 \times 2 \times V = \frac{0.5 \times 2 \times 1000}{123.5} \text{ (Eq. wt. of } CuCO_3 = \frac{M}{2} \text{)}$$

$$V = 8.097 = 8.1$$

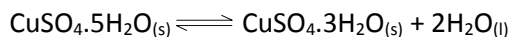
Q29. If $CuSO_4 \cdot 5H_2O_{(s)} \rightleftharpoons CuSO_4 \cdot 3H_2O_{(s)} + 2H_2O_{(l)}$ $K_p = 1.086 \times 10^{-4} \text{ atm}^2$ at $25^\circ C$. The efflorescent nature of $CuSO_4 \cdot 5H_2O$ can be noticed when vapour pressure of H_2O in atmosphere is

- (a) $> 7.29 \text{ mm}$
- (b) $< 7.92 \text{ mm}$
- (c) $\geq 7.92 \text{ mm}$
- (d) None

Sol. (b)

An efflorescent salt is one that loses H_2O to atmosphere.

For the reaction



$$K_p = (p'_{\text{H}_2\text{O}})^2 = 1.086 \times 10^{-4}$$

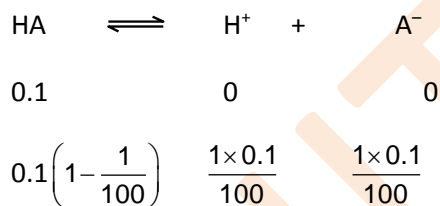
$$p'_{\text{H}_2\text{O}} = 1.042 \times 10^{-2} \text{ atm} = 7.92 \text{ mm}$$

⊙ If $p'_{\text{H}_2\text{O}}$ at $25^\circ\text{C} < 7.92 \text{ mm}$ only then, reaction will proceed in forward direction.

Q30. The pH of an aqueous solution of 0.1M solution of a weak monoprotic acid which is 1% ionised is

- (a) 1
- (b) 2
- (c) 3
- (d) 11

Sol. (c)



$$[\text{H}^+] = 10^{-3} \therefore \text{pH} = 3$$