

Class: 11
Subject: Chemistry
Topic: ASK15E11HY01
No. of Questions: 30

Q1. One part of an element A combines with two parts of B (another element). Six parts of element C combine with four parts of element B. If A and C combines together, the ratio of their masses will be governed by:

- (a) law of definite proportions
- (b) law of multiple proportions
- (c) law of reciprocal proportions
- (d) law of conservation of mass

Sol. (c)

$$\frac{B}{A} = \frac{2}{1}, \frac{B}{C} = \frac{4}{6} = \frac{2}{3} \text{ from this when A combined with C the ratio is } A/C = 1/3$$

Hence (C) is correct.

Q2. In the reaction, $N_2 + 3H_2 \longrightarrow 2NH_3$, the ratio of volumes of nitrogen, hydrogen and ammonia is 1 : 3 : 2. These figures illustrate the law of:

- (a) Constant proportions
- (b) Gay-Lussac
- (c) Multiple proportions
- (d) Reciprocal proportions

Sol. (b)

The above ratio of 1 : 3 : 2 illustrates the Gay-Lussac law of combining volume.

Hence (B) is correct.

Q3. The specific heat of a metal of atomic mass 32 is likely to be:

- (a) 0.25
- (b) 0.24
- (c) 0.20
- (d) 0.15

Sol. (c)

$$\text{Specific heat} = \frac{6.4}{\text{atomicmass}} = \frac{6.4}{32} = 0.2$$

Hence (C) is correct.

Q4. The ion that is isoelectronic with CO is

- (a) CN^-
- (b) O_2^+
- (c) O_2^-
- (d) N_2^+

Sol. (a)

Both CO and CN^- have 14 electrons. Hence (A) is correct

Q5. The velocity of electron in the second orbit of He^+ will be

- (a) $2.18 \times 10^6 \text{ m/s}$
- (b) $1.09 \times 10^6 \text{ m/s}$
- (c) $4.36 \times 10^6 \text{ m/s}$
- (d) None of these

Sol. (a)

$v_n = \frac{v_0 Z}{n}$. Hence (A) is correct.

Q6. The radii of two of the first four Bohr orbits of the hydrogen atom are in the ratio 1 : 4. The energy difference between them may be

- (a) 0.85 eV
- (b) 2.55 eV
- (c) 3.40 eV
- (d) 8.20 eV

Sol. (b)

$r_n = \frac{r_0 n^2}{Z}$ and $E_n = \frac{E_0 Z^2}{n^2}$. Hence (B) is correct.

Q7. Which of the following iso electronic ions has the lowest ionization enthalpy?

- (a) K^+
- (b) Ca^{2+}
- (c) Cl^-
- (d) S^{2-}

Sol. (d)

S^{2-} has the largest size and hence the lowest I.E.

Hence (D) is correct.

Q8. The order of which the following oxides are arranged according to decreasing basic nature

- (a) Na_2O , MgO , Al_2O_3 , CuO
- (b) CuO , Al_2O_3 , MgO , Na_2O
- (c) Al_2O_3 , CuO , MgO , Na_2O
- (d) CuO , MgO , Na_2O , Al_2O_3

Sol. (a)

As we move from left to right in a period, the basic character of the oxides of s- and p- block elements decreases while their acidic character increase. The basic character of oxides of transition elements is however lower than alkali and alkaline earth metal. Thus Na_2O is most basic followed by MgO and Al_2O_3 while CuO is least basic.

Hence (A) is correct

Q9. The heaviest element amongst the following is

- (a) U
- (b) Ra
- (c) Pb
- (d) Hg

Sol. (a)

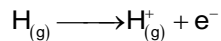
Uranium is the heaviest element among the following.

Hence (A) is correct.

Q10. The ionization of hydrogen atom would give rise to

- (a) hydride ion
- (b) hydronium ion
- (c) proton
- (d) hydroxyl ion

Sol. (c)



Whereas (A) is H^- , (B) H_3O^+ and (D) is OH^- .

Hence (C) is correct

Q11. Which is true about the electronegativity order of the following elements?

- (a) $\text{P} > \text{Si}$
- (b) $\text{C} > \text{N}$
- (c) $\text{Br} > \text{Cl}$
- (d) $\text{Sr} > \text{Ca}$

Sol. (a)

Electronegativity of P(2.1) is greater than Si (1.8).

Hence (A) is correct

Q12. Which of the following statement is/are not true for σ -bond.

1. It is formed by the overlapping of $s-s$ or $s-p$ orbitals
 2. It is weaker than pi bond
 3. It is formed when π -bond exists already.
 4. It is resulted from partial overlapping of or
- (a) 1, 2, 3, 4
 - (b) 2, 3 and 4
 - (c) 2 and 4
 - (d) 1, 2 and 4

Sol. (b)

Q13. Which of the following molecule has trigonal planer geometry?

- (a) CO_2
- (b) PCl_5
- (c) BF_3
- (d) H_2O

Sol. (a)

BF_3 has trigonal planer geometry (sp^2 - hybridized Boron).

Hence (A) is correct.

Q14. Out of the three molecules XeF_4 , SF_4 and SiF_4 one which has tetrahedral structures is

- (a) All of three
- (b) Only SiF_4
- (c) Both SF_4 and XeF_4
- (d) Only SF_4 and XeF_4

Sol. (b)

Hybridization of $\text{XeF}_4 = sp^3d^2$, $\text{SF}_4 = sp^3d$, $\text{SiF}_4 = sp^3$

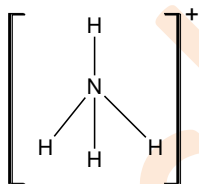
Hence (B) is correct.

Q15. When NH_3 is treated with HCl , state of hybridisation on central nitrogen

- (a) Changes from sp^3 to sp^2
- (b) Remains unchanged
- (c) Changes from sp^3 to sp^3d
- (d) Changes from sp^3 to sp

Sol. (b)

On NH_4^+ state of hybridisation on central nitrogen atom is sp^3 as in NH_3 .



Hence (B) is the correct answer.

Q16. At which of the four conditions, the density of nitrogen will be the largest?

- (a) STP
- (b) 273 K and 2 atm
- (c)) 546 K and 1 atm
- (d) 546 K and 2 atm

Sol. (b)

Density of a gas is given $\rho = \frac{PM}{RT}$. Obviously the choice that has greater $\frac{P}{T}$ would have greater density.

Hence, (B) is correct.

Q17. A certain gas diffuses from two different vessels A and B. The vessel A has a circular orifice while vessel B has a square orifice of length equal to the radius of the orifice of vessel A. The ratio of the rates of diffusion of the gas from vessel A to vessel B, assuming same temperature and pressure is;

- (a) π
- (b) $1/\pi$
- (c) 1 : 1
- (d) 2 : 1

Sol. (a)
The rate of diffusion is directly proportional to the area of orifice.

$$\therefore d_A \propto \pi r^2$$

$$d_B \propto r^2$$

$$\therefore \frac{d_A}{d_B} = \pi$$

Q18. The behaviour of a real gas is usually depicted by plotting compressibility factor Z versus P at a constant temperature. At high temperature and high pressure, Z is usually more than one. This fact can be explained by van der Waal's equation when

- (a) the constant 'a' is negligible and not 'b'
- (b) the constant 'b' is negligible and not 'a'
- (c) both constants 'a' and 'b' are negligible
- (d) both the constants 'a' and 'b' are not negligible.

Sol. (a)

$$\left(P + \frac{n^2 a}{V^2} \right) (V - nb) = nRT$$

At low pressures, 'b' can be ignored as the volume of the gas is very high. At high temperatures 'a' can be ignored as the pressure of the gas is high.

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

$$PV - Pb = RT \Rightarrow PV = RT + Pb$$

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

Hence, **(A)** is correct.

Q19 Given that $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow \text{H}_2\text{O}(\text{g})$, $\Delta H = -115.4$ kcal the bond energy of H-H and O = O bond respectively is 104 kcal and 119 kcal, then the O-H bond energy in water vapour is

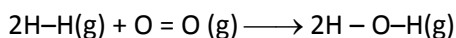
- (a) 110.6 kcal / mol
- (b) -110.6 kcal
- (c) 105 kcal / mol
- (d) None

Sol (a)

We know that heat of reaction

$$\Delta H = \Sigma \text{B.E. (reactant)} - \Sigma \text{B.E (product)}$$

For the reaction,



$$\Delta H = -115.4 \text{ kcal, B.E. of H-H} = 104 \text{ kcal}$$

$$\text{B.E. of O=O} = 119 \text{ kcal}$$

Since one H₂O molecule contains two O-H bonds

$$-115.4 = (2 \times 104) + 119 - 4 (\text{O-H}) \text{ bond energy}$$

$$\therefore 4 (\text{O-H}) \text{ bond energy} = (2 \times 104) + 119 + 115.4$$

$$\text{i.e., O-H bond energy} = \frac{(2 \times 104) + 119 + 115.4}{4} = 110.6 \text{ kcal mol}^{-1}$$

Hence, **(A)** is correct.

Q20. In a reversible adiabatic change ΔS is

- (a) Infinity
- (b) zero
- (c) equal to $C_v dT$
- (d) equal to $nR \ln V_2/V_1$

Sol. (b)

Q21. At constant temperature and pressure which one of the following statements is correct for the reaction? $\text{CO(g)} + 1/2\text{O}_2(\text{g}) \longrightarrow \text{CO}_2(\text{g})$

- (a) $\Delta H = \Delta E$
- (b) $\Delta H < \Delta E$
- (c) $\Delta H > \Delta E$
- (d) ΔH is independent physical state of reactant

Sol. (b)

Q22. The velocity of electron in the ground state hydrogen atom is $2.18 \times 10^6 \text{ ms}^{-1}$. Its. Velocity in the second orbit would be

- (a) $1.09 \times 10^6 \text{ ms}^{-1}$
- (b) $4.38 \times 10^6 \text{ ms}^{-1}$
- (c) $5.5 \times 10^5 \text{ ms}^{-1}$
- (d) $8.76 \times 10^6 \text{ ms}^{-1}$

Sol. (a)

We know that velocity of electron in nth Bohr's orbit is given by

$$v_n = 2.18 \times 10^6 \text{ m/s}$$

For H, $Z = 1$

$$Qv_1 = m/s$$

$$Qv_2 = \frac{m}{s} = 1.09 \times 10^6 \text{ m/s}$$

Q23. For the reaction, $\text{C}_7\text{H}_8(\text{l}) + 9\text{O}_2(\text{g}) \rightarrow 7\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{l})$, the calculated heat of reaction is 232 kJ/mol and observed heat of reaction is 50.4 kJ/mol, then the resonance energy is

- (a) -182.2 kJ/mol
- (b) $+182.2 \text{ kJ/mol}$
- (c) 172 kJ/mol
- (d) None

Sol. (a)

As we know that,

$$\text{Resonance energy} = \Delta H^\circ (\text{observed}) - \Delta H^\circ (\text{calculated})$$

$$= (50.4 - 232.6) \text{ kJ/mol}$$

$$= -182.2 \text{ kJ mol}^{-1}$$

Q24. Which of the following is the strongest acid?

- (a) HClO_4
- (b) HBrO_4
- (c) HIO_4
- (d) HNO_3

Sol. (a)

The acidic character of oxy acids decreases down the group and increases along the period. Also acidity increases with increase in oxidation number of central atom.

Hence, **(A)** is correct.

Q25. Reaction between iron and steam is reversible if it is carried out $3\text{Fe} + 4\text{H}_2\text{O} \rightleftharpoons \text{Fe}_3\text{O}_4 + 4\text{H}_2$

- (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.

Q26. Which salt undergoes hydrolysis?

- (a) CH_3COONa
- (b) KNO_3
- (c) NaCl
- (d) K_2SO_4

Sol. (a)

Salt of strong acid and strong base does not undergo hydrolysis.

Hence, **(A)** is correct.

Q27. For the reaction $\text{PCl}_{3(g)} + \text{Cl}_{2(g)} \rightleftharpoons \text{PCl}_{5(g)}$ 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)

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

Q28. If the degree of ionization of water be 1.8×10^{-9} at 298K. Its ionization constant will be

- (a) 1.8×10^{-16}

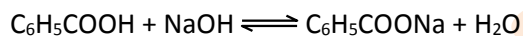
- (b) 1×10^{-14}
- (c) 1×10^{-16}
- (d) 1.67×10^{-14}

Sol. (a)

Q29. 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) $3.2 \times 10^{-}$
- (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

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

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

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

Q30. The equilibrium constant for the reaction, $\text{N}_{2(\text{g})} + \text{O}_{2(\text{g})} \rightleftharpoons 2\text{NO}$ is 4×10^{-4} at 2000K. 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