DPP-1 [Henry's Law]

Chapter: Solution

"Strength comes after struggle — always."

TYPE–1 : Numerical Based on Henry's Law

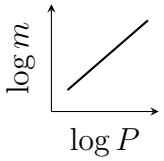
1. **Henry's law constant of CO_2 in water at 298 K is $\frac{5}{3}$ k bar. If pressure of CO_2 is 0.01 bar, find its mole fraction.**
   Ans: 6×10^{-6}
2. **Henry's law constant for dissolution of CH_4 in benzene at 298 K is 2×10^5 mm of Hg. Then solubility of CH_4 in benzene at 298 K under 760 mm of Hg is:**
   (1) 1.2×10^{-5}
   (2) 3.8×10^{-3}
   (3) 4×10^{-7}
   (4) 1×10^{-2}
3. **Henry's constant at 298 K for solubility of nitrogen gas is 1.0×10^5 atm. The mole fraction of nitrogen in air is 0.8. The moles of nitrogen from air dissolved in 10 mol of water at 298 K and 5 atm pressure is**
   (1) 4.0×10^{-6}
   (2) 4.0×10^{-5}
   (3) 4.0×10^{-4}
   (4) 5.0×10^{-4}
4. **The solubility of $N_2(g)$ in water exposed to the atmosphere, when its partial pressure is 593 mm is 5.3×10^{-4} M. Its solubility at 760 mm and at the same temperature is:**
   (a) 4.1×10^{-4} M
   (b) 6.8×10^{-4} M
   (c) 1500 M
   (d) 2400 M
5. **Henry's Law Constant for CO_2 in water is 1.67×10^8 Pa at 298K. Calculate the quantity of CO_2 in 1 L of soda water when packed under 2.5 atm CO_2 pressure at 298 K.**
   Ans: 8.3×10^{-3} mol/L or 3.65 g/L
6. **If solubility of gas 'X' is 0.5 gL^{-1} at 1 bar then its solubility at 3 bar pressure will be**
   (1) 0.5 gL^{-1}
   (2) 1.5 gL^{-1}
   (3) 3.0 gL^{-1}
   (4) 2 gL^{-1}
7. **The solubility of N_2 in water at 300 K and 500 torr partial pressure is 0.01 g L^{-1}. The solubility (in g L^{-1}) at 750 torr partial pressure is:**
   (1) 0.02

(2) 0.015
(3) 0.0075
(4) 0.005

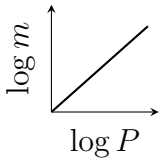
TYPE–2 : Conceptual MCQs

1. **According to Henry's law, the solubility of a gas in a given volume of liquid increases with increase in:**
   (A) Temperature
   (B) Pressure
   (C) Both (A) and (B)
   (D) None of these
2. **The solubility of a gas in a liquid is directly proportional to the partial pressure of the gas over the solution. This statement is known as:**
   (A) Raoult's law
   (B) Henry's law
   (C) Boyle's law
   (D) Charles' and Gay Lussac's Law
3. **Which of the following gas does not obey Henry's law?**
   (1) NH_3
   (2) H_2
   (3) O_2
   (4) He
4. Which of the following curves represents the Henry's law?

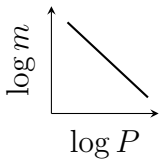
(A)



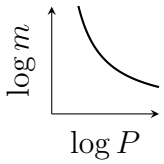
(B)



(C)



(D)



TYPE–3 : Solubility Comparison / K_H Based

1. **Among the following which gas has maximum solubility in water at constant temperature**
   (1) $H_2 (K_H = 69.16)$
   (2) $N_2 (K_H = 88.84)$
   (3) $CH_4 (K_H = 0.413)$
   (4) Ar $(K_H = 40.3)$
2. **The order of K_H values of A, B and C gases is $K_{H_A} > K_{H_B} > K_{H_C}$. Then the correct order of solubility is**
   (1) A > C > B
   (2) B > A > C
   (3) B > C > A
   (4) A > B > C
3. **Which of the following statement is/are correct?**
   (1) Higher the value of K_H, higher is the solubility
   (2) Different gases have different K_H
   (3) Mole fraction is inversely proportional to pressure
   (4) All of these
4. **Which one of the following statements regarding Henry's law is not correct?**
   (1) Different gases have different K_H values at the same temperature.
   (2) The value of K_H increases with increase of temperature.
   (3) The partial pressure of the gas is proportional to its mole fraction.
   (4) Higher the value of K_H, higher is the solubility of the gas.
5. **Which gas is most soluble in water?**
   (1) He
   (2) H_2
   (3) NH_3
   (4) CO_2
6. **Some of the following gases are soluble in water due to formation of their ions. Water insoluble gases can be:** I: CO_2; II: NH_3; III: HCl; IV: CH_4; V: H_2
   (A) I, IV, V
   (B) I, V
   (C) I, II, III
   (D) IV, V

TYPE–4 : Application Based (Scuba Divers)

1. **Which gas is mixed with oxygen by sea-divers at high underwater pressure?**
   (A) Nitrogen
   (B) Neon
   (C) Helium
   (D) Argon
2. **The tanks used by scuba divers are filled with air diluted with 11.7% He,**
   (1) 56.2% N_2 and 32.1% O_2
   (2) 56.2% O_2 and 32.1% N_2
   (3) 50.2% N_2 and 38.1% O_2
   (4) 50.2% O_2 and 38.1% N_2