Quiz 13.1 – Saturation and Concentration

Name: *Key*

Question 1

Fish require the right amount of dissolved oxygen to survive. If an arctic fish swims into tropical waters, will it suffer from oxygen deprivation or from oxygen poisoning?

Oxygen ~~poisoning~~ Deprivation!

Question 2

The Henry's law constant for Oxygen is $0.0013 \frac{M}{atm}$. In Cedar City the atmospheric pressure is about $0.82\ atm$ and the atmosphere is about 21% oxygen. What is the molar concentration of oxygen in your glass of water in Cedar City?

$$P_{O_2} = 0.21 \cdot 0.82\,atm = 0.172\,atm \qquad [O_2] = 0.172\,atm \cdot 0.0013 \frac{M}{atm} = 2.2 \cdot 10^{-4}$$

Question 3

A can of soda will begin to bubble as soon as you open it. Describe the state of the soda as soon as it is open, in terms of saturation, and explain why the bubbles are appearing.

The soda is supersaturated. Bubbles appear as dissolved CO_2 escapes to the gas phase.

Question 4

A mixture contains $12.5\ g$ of ethanol (C_2H_5OH) in $85.0\ g$ of water. Give the concentration in units of:

- $\frac{g}{g}$: $\dfrac{12.5\,g}{85\,g} = 0.147\ g/g$ –or– $14.7\ g/_{100\,g}$

- % by Mass: $\dfrac{12.5\,g}{12.5\,g + 85.0\,g} \cdot 100\% = 12.8\%$

- Molality:
$$\frac{12.5\,g\ EtOH\ |\ 1\,mol}{|\ 46.07\,g} = 0.2713\ moles \qquad \frac{0.2713\ moles}{0.0850\ kg} = 3.19\ m$$

- $X_{C_2H_5OH}$:
$$\frac{85.0\,g\ H_2O\ |\ 1\,mol}{|\ 18.015\,g} = 4.718\ moles \qquad \frac{0.2713\ moles}{0.2713\ moles + 4.718\ moles} = 0.0544$$

- X_{H_2O}:
$$\frac{4.718\ moles}{0.2713\ moles + 4.718\ moles} = 0.946$$