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CEE 312

ASSIGNMENT #2

14

5-2

$$4.5\% \approx 45 \text{ kg/m}^3$$

density of water 1000 kg/m^3

$$\therefore 0.045 \times 1000 \frac{\text{kg}}{\text{m}^3} = 45 \text{ kg/m}^3$$

5-4

$$\frac{5.25}{100} \times 1000 \frac{\text{kg}}{\text{m}^3} \times 10^6 \frac{\text{mg}}{\text{kg}} \frac{\text{m}^3}{1000 \text{L}}$$

$$= 52,500 \text{ mg/L}$$

5-6 10 ppb Arsenic = $\frac{10 \text{ g As}}{1000 \text{L}} \times \frac{10^3 \text{ mg}}{\text{g}} \times \frac{10^3 \text{ kg (water density)}}{\text{m}^3} \times 10^3 \text{ g} = 0.01 \text{ mg/L}$

1000L kg 10⁹ g water g m³

4.

	GFE (Kcal/mole)
Fe ⁺²	-20.30
CrO ₄ ²⁻	-173.9
H ⁺	0
Fe ⁺³	-2.52
Cr ⁺³	-51.5
H ₂ O	-56.690

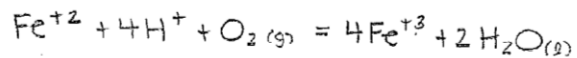
ΣP - ΣR

$$[3(-2.52) + (-51.5) + 4(-56.69)] - [3(-20.3) + (-173.9)]$$

$$= \boxed{-51.02 \text{ Kcal}}$$

∴ this reaction can occur

5.



Using the Gibbs Free energy values prove that this reaction is feasible in nature, the bacteria use carbon dioxide as a carbon source.

	<u>GFE (Kcal/mole)</u>
Fe ⁺²	-20,30
H ⁺	0
O ₂	0
Fe ⁺³	-2,52
H ₂ O	-56,69

$$[4(-2,52) + 2(-56,69)] - [(20,30) + 4(0) + 0]$$

$$= \boxed{-103,16 \text{ Kcal}} \quad \therefore \text{this reaction can occur}$$

Please note that the above equation was not balanced and the correct method is to balance the equation first and then work out the free energy.

6.

From plot $\ln \mu = \ln A - \frac{E_a}{R} \cdot \frac{1}{T}$

$$\text{slope} = m = \frac{E_a}{R}$$

$$\text{or } E_a = m \cdot R = 8719^\circ\text{K} \cdot \frac{1,987 \text{ cal}}{\text{mol}^\circ\text{K}}$$

$$\times 2 = 17324,9 \frac{\text{cal}}{\text{mole}}$$

$$\ln A = 23,579$$

$$A = 1,74 \times 10^{10}$$

Units of A are the same as u 1/hr

Units of E_a are cal/mole