(1)

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5-2 4.5% ≈ 45 kg/m³

density of water 1000 kg/m³ +1

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

5-4 $\frac{5.25}{100} \times 1000 \frac{kg}{m^3} \times 10^6 \frac{mg}{kg} \frac{m^3}{1000L}$

$= 52,500 \ mg/L$ +1

5-6 10 ppb Arsenic = $\frac{10 \text{ g As}}{10^9 \text{ g water}} * \frac{10^3 \text{ mg}}{\text{g}} * \frac{10^3 \text{ kg (water density)}}{\text{m}^3} * \frac{\text{m}^3}{10^3 \text{ g}}$ = **0.01 mg/L**

1000L kg

4.

	GFE (kcal/mole)
Fe^{+2}	-20.30
CrO_4^{2-}	-173.9
H^+	0
Fe^{+3}	-2.52
Cr^{+3}	-51.5
H_2O	-56.690

$\Sigma P - \Sigma R$

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

$= \boxed{-51.02 \text{ Kcal}}$ ∴ this reaction can occur

5.

$$Fe^{+2} + 4H^{+} + O_{2(g)} = 4Fe^{+3} + 2H_2O_{(l)}$$

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

	GFE (Kcal/mole)
Fe^{+2}	-20,30
H^{+}	0
O_2	0
Fe^{+3}	-2,52
H_2O	-56,69

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

$= \boxed{-103.16 \text{ Kcal}}$ ∴ 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 $\ln \mu = \ln A - \frac{Ea}{R} \cdot \frac{1}{T}$

Slope $= m = \frac{Ea}{R}$,

or $Ea = m \cdot R = 8719°K \cdot \frac{1.987 cal}{mol°K}$

$\times 2 = 17324.9 \frac{cal}{mole}$

$\ln A = 23.579$

$A = 1.74 \times 10^{10}$

Units of A are the same as u 1/hr

Units of Ea are cal/mole