1. Answer the following questions: (答題題)


(2) The range of wavelength of visible light?  (寫出可見光的波長範圍?)

(3) Compare the size of the following ions: S^{2-}, Mg^{2+}, K^+, Al^{3+}, Ca^{2+}. (比較下列各離子的半徑大小：S^{2-}, Mg^{2+}, K^+, Al^{3+}, Ca^{2+})

(4) Surface tension and viscosity of a liquid? (何謂液體的表面張力? 何謂液體的粘度?)

(5) What is the osmotic pressure of a solution? (何謂溶液的透壓? 圖解說明)

2. Perform each of the following conversions: (單位換算)

(1) $D = \frac{7.2 \text{ kg/m}^3}{?} \text{ g/mL} = \frac{? \text{ lbm/ft}^3}{(1 \text{ lbm} = 453.6 \text{ g}, 1 \text{ mL} = 1 \text{ cm}^3)}$

(2) $W = \frac{2.5 \times 10^4 \text{ mg}}{?} \text{ lbm} = \frac{? \text{ Gg}}{(1 \text{ mile} = 1760 \text{ yd}, 1 \text{ yd} = 3 \text{ ft}, 1 \text{ ft} = 12 \text{ in})}$

(3) $T = \frac{36.5 \text{ °C}}{?} \text{ K} = \frac{? \text{ °F}}{(1 \text{ ft} = 0.3048 \text{ m}, 1 \text{ in} = 2.54 \text{ cm})}$

(4) $S = \frac{80 \text{ km/hr}}{?} \text{ mile/hr} = \frac{? \text{ m/s}}{(? \text{ hr} = \text{小時}, \text{s} = \text{秒})}$

3. Give the English and Chinese names of the following metals separately: (寫出下列各式之中文與英文名稱)

(1) Cr (2) Pt (3) HCN (4) K_2SO_4 (5) FeCl_3

4. In the solid phase, the container has 1.50 moles of the gas A, at 25°C, where its pressure is 400 torr. If we add another gas B to the container, such that the gas A and gas B are mixed, let the final temperature be 50°C. If we add gas C, what is the ratio of gas A to gas B? (假設氣體 A 與 B 均符合理想氣體定律)

5. Ethylene C_2H_4 and Chlorine F_2 undergo a reaction to form dichloroethylene C_2H_4F_2: C_2H_4(g) + F_2(g) $\rightarrow$ C_2H_4F_2(g) Reaction $\Delta H = -549 \text{ kJ}$. The bond energy of the bond is given by $E_b = \frac{347 \text{ kJ/mol}}{E_b(C-C) = 614 \text{ kJ/mol}, E_b(F-F) = 154 \text{ kJ/mol}}$. Calculate the bond energy of C-F in the C_2H_4F_2 molecule.

6. If an electron in a hydrogen atom drops from n = 3 to n = 1 energy state and releases a photon. Calculate the wavelength (λ) of this photon in nm.

7. An aqueous solution of HCOOH (K_a = 1.8 \times 10^{-4}) has a pH of 2.70. Calculate the percent dissociation of formic acid.

8. For a second order reaction 2A $\rightarrow$ P, 75.0 mol% of A are reacted to form P in 36 min. (二階反應 2A $\rightarrow$ P, 常反應 36 分鐘後 75% [A] 被反應掉)

(1) What are the first and second half-lives for this reaction? (第一個與第二個半生期的時間各多少分鐘?)

(2) How long does it take for 90.0 mol% of A being reacted? (當 90% 的[A] 被反應掉時須費時多少分鐘?)

9. The concentrated acetic acid has density 1.05 g/mL and contains 99.8 wt% CH_3COOH and 0.2 wt% H_2O. Calculate molarities (M) of this acetic acid solution? (CH_3COOH: 60.0 g/mole) (濃縮醋酸水溶液密度為 1.05 g/mL, 內含純醋酸 99.8 wt%, 水 0.2 wt%, CH_3COOH 分子量 60.0 g/mole. 計算此濃縮醋酸水溶液的濃度為多少 M/mol/L?)}