

九十一學年度 微機電系統工程系(所) _____ 組碩士班研究生招生考試

科目 普通化學 科號 2204 共 / 頁第 / 頁 *請在試卷【答案卷】內作答

- (a) Perform the following calculation and round the answer to the correct number of significant figures:
 $4.18 - 58.16 \times (3.38 - 3.01)$
 (b) Give dimensions in meter for (i) nm (ii) Å.
- Say you live in a climate where the temperature ranges from -100°F to 20°F and you want to define a new temperature scale, YS (YS is the "Your Scale" temperature scale), which defines this range as 0.0°YS to 100°YS . (a) Give an equation that would allow you to convert between $^{\circ}\text{F}$ and $^{\circ}\text{YS}$. (b) Using your equation, what would be the temperature in $^{\circ}\text{F}$ if it were 60°YS ?
- Explain and give one example for each of the following species. (a) anion, (b) cation, (c) radical.
- Acetic acid contains only C, H, and O. A 4.24 mg sample of acetic acid is completely burned. It gives 6.21 mg of carbon dioxide and 2.54 mg of water. What is the mass percentage of each element in acetic acid?
- What is the wave length of light emitted when the electron in a hydrogen atom undergoes a transition from energy level $n=4$ to level $n=2$? (Hint: $R_{\text{H}} = 2.179 \times 10^{-18} \text{ J}$).
- An example of a polymerization reaction is the formation of polyethylene from ethylene molecules. (a) Draw the structure of the monomer. (b) Write the chemical equation that represents the formation of the polymer. (c) Is this reaction an addition polymerization or a condensation polymerization?
- (a) What is Raoult's law? (b) What is Henry's law? (c) What is osmotic pressure?
- The initial rate of a reaction $\text{A} + \text{B} \rightarrow \text{C}$ was determined as shown in the following table with starting concentrations of A and B.

#	[A] (M)	[B] (M)	Initial rate (M/s)
1	0.100	0.100	4.0×10^{-5}
2	0.100	0.200	4.0×10^{-5}
3	0.200	0.100	16.0×10^{-5}

- (a) What is the rate law for this reaction? (b) What is the magnitude of the rate constant? (c) Addition of a catalyst might change the rate of reaction. What is a catalyst?
- For the reaction $\text{N}_2\text{O}_4(\text{g}) \rightarrow 2\text{NO}_2(\text{g})$, $\Delta H_{\text{o}} = 58.0 \text{ kJ}$. In what direction will the equilibrium shift when (a) N_2O_4 is added; (b) volume is increased; and (c) the temperature is decreased?
- The addition of zinc metal to hydrochloric acid leads to the following reaction:
 $\text{Zn}_{(\text{s})} + 2\text{H}^+_{(\text{aq})} \rightarrow \text{Zn}^{2+}_{(\text{aq})} + \text{H}_{2(\text{g})}$. (a). What are the changes in oxidation numbers for the elements Zn and H? (b). Which element is the reductant, and which is the oxidant?