國立中央大學八十七學年度轉學生入學試題卷

化學系 二年級 科目: 普通化學 共一頁 第一頁

1. Answer the following questions (20% 4 points each).
(a) What is reversible process? What is Hess law?.
(b) The structure and usage of PVC.
(c) What is the steady-state approximation for determining the rate law ?
(d) Write down the major structure of DNA and protein.
(e) What is the kinetic molecular theory of gases?

2. How does hard water affect the cleaning efficiency of soap? Write a balanced equation to illustrate your answer. (10%)

3. Give the structure of each following (10%, two points each)
a. p-di-tert-butylbenzene.
b. 1-phenyl-2-butene.
c. 2,4-heptadiene.
d. cumene
e. 4-methyl-1-pentyne.

4. A chemist wishing to do an experiment requiring $^{47}Ca^{+2}$ (half life = 4.5 days) needs 5 μg of the unclide. What mass of $^{47}CaCO_3$ must be ordered if it takes 48 hours for delivery from the supplier? Assume that the atomic mass of ^{47}Ca is 47.0. (10%)

5. What are the special properties of transition metal ions.(10%)

6. A zinc-copper battery is constructed as follows at 25°C:

$$Zn \left| Zn^{+2} \text{ (0.10 M)} \right\| Cu^{+2} \text{ (2.50 M)} \left| Cu \right.$$

$$Zn^{+2} + 2e^- \longrightarrow Zn \quad \varepsilon^o = -0.76V$$

$$Cu^{+2} + 2e^- \longrightarrow Cu \quad \varepsilon^o = 0.34V$$

a. Calculated the cell potential when this battery is first connected.
b. Calculate the cell potential after 10.0 A of current has flowed for 10.0 hours. (Assume each half-cell contains 1.0 L of solution).
c. Calculate the mass of each electrode after 10.0 hours.
d. How long can this battery deliver a current of 10.0 A before it goes dead? (10%)

7. A sample of a certain monoprotic weak acid was dissolved in water and titrated with 0.125 M NaOH, requiring 16.0 mL to reach the equivalence point. During the titration, the pH after adding 2.00 mL of NaOH was 6.912. Calculate K_a for the weak acid.(10%.)

8. Write Lewis structuresand predict whether each of the folloeing is polar or nonpolar. (10%)
a. COS
b. CF_2Cl_2
c. H_2NNH_2
d. H_2CO

9. What are the bonding modes used to describe the bonding in metals, ionic compounds and covalent compounds, (10%)