

# 國立嘉義大學九十一學年度轉學生招生考試試題

科目：普通化學

(請將答案寫在答案卷上)

## 一、填充題：90分 (每格3分)

- An orange liquid is distilled, resulting in the collection of a yellow liquid and a red solid. State whether the process is a chemical or a physical change. (1)
- Name the compound: HClO (in English). (2)
- How many molecules are there in a drop of H<sub>2</sub>O, weighing 0.050g? (3)
- The formula of red copper oxide can be determined by heating the oxide in the presence of excess hydrogen. When a 1.256g sample reacts with hydrogen, 1.116g copper is obtained. What is the simplest formula of the compound? (Cu: 63.55) (4)
- Microwave ovens heat food by the energy given off by microwaves. These microwaves have a wavelength of  $5.00 \times 10^6$  nm. How much energy in kJ/mol is given off by a microwave oven. ( $h = 6.63 \times 10^{-34}$  J.s) (5)
- Calculate the molarity of solution when 5.42g Na<sub>2</sub>C<sub>2</sub>O<sub>4</sub> (FW=134.0) is added to 250mL volumetric flask and distilled water is added until the mark is reached. (6) Calculate the concentration in terms of weight percent if the density of the solution is 1.03g/mL. (7)
- Assign oxidation numbers for P in H<sub>3</sub>PO<sub>4</sub> and P<sub>4</sub>O<sub>6</sub>. (8)
- Calculate the density of air at room temperature and 1atm (suppose that air is composed of 80% N<sub>2</sub> and 20% O<sub>2</sub>). (9)
- At STP, 5.87L of a gas weighed 10.5g. Its molar mass is (10)
- At 500°C the equilibrium constant K for the reaction H<sub>2</sub>(g)+I<sub>2</sub>(g)→2HI(g) is 45.0. If 0.300 moles of H<sub>2</sub>(g) and 0.300 moles of I<sub>2</sub>(g) are placed into a 10.0-L container and allowed to react at this temperature, what is the HI molar concentration at equilibrium? (11)
- According to the Bronsted-Lowry definition, a base is (12)
- The pH of a 0.2M solution of a weak acid is 4.0. What percent of the acid is ionized? (13)
- Which of the following are state functions? Energy, work, enthalpy and heat. (14)
- What is the ground-state electronic configuration of  ${}_{26}\text{Fe}^{+3}$  ion? (15)
- Predict the bond order for O<sub>2</sub>, O<sub>2</sub><sup>+</sup>, O<sub>2</sub><sup>-</sup>. (16)
- Which of the following form network atomic solid? CO<sub>2</sub>, SiO<sub>2</sub>, CH<sub>4</sub>, CaCO<sub>3</sub>, C(diamond). (17)

- What concentration of NaCl in water is needed to produce an aqueous solution isotonic with blood ( $\pi = 7.70$ atm at 25°C)? (18)
- How many seconds must a current of 5.00A be applied to a solution of Cu<sup>2+</sup> to produce 10.5g copper metal? (Cu:63.55) (19)
- What type of radioactive decay happened in the following reaction?  ${}_{89}^{227}\text{Ac} \rightarrow {}_{90}^{227}\text{Th} + ?$  (20)
- Calculate the electrode potential for the following half-reactions: Zn electrode immersed in 0.0500M Zn<sup>+2</sup>,  $E^\circ_{\text{Zn}^{+2}/\text{Zn}} = -0.763\text{V}$  (21)
- Given CH<sub>3</sub>COOH(aq) → H<sup>+</sup>(aq) + CH<sub>3</sub>COO<sup>-</sup>(aq) at 25°C, K<sub>a</sub> for CH<sub>3</sub>COOH =  $1.8 \times 10^{-5}$ , what is  $\Delta G^\circ$  at 25°C? (22)
- A solution was prepared by dissolving 18.00g nonelectrolyte nonvolatile compound in 150.0g water. The resulting solution has a boiling point of 100.34°C. Calculate the molar mass of the compound (K<sub>b</sub> for water is 0.51°C·kg/mol). (23)
- For the reaction A+B→products, the following data were obtained:

Initial rate, M/s	$6.60 \times 10^{-3}$	$1.32 \times 10^{-2}$	$2.64 \times 10^{-2}$	$5.28 \times 10^{-2}$
[A], M	0.10	0.20	0.10	0.20
[B], M	0.10	0.10	0.20	0.20

Write the rate expression for the reaction. (24)
- A first-order reaction is 35% complete after 55 min. What is the rate constant? (25)
- List the following in order of increasing acid strength: HOI, HOCl, HOBr. (26)
- List the following species in order of increasing first ionization energy N, O, B, Al. (27)
- The following reaction takes place at 120°C. H<sub>2</sub>O(l)→H<sub>2</sub>O(g)  $\Delta H = 44.0$ kJ/mol,  $\Delta S = 0.119$ kJ/mol K. Calculate  $\Delta G$ . (28)
- For the reaction: 3H<sub>2</sub>(g)+N<sub>2</sub>(g)→2NH<sub>3</sub>(g), what is the relationship between K<sub>c</sub> and K<sub>p</sub> at temperature T? (29)
- The hybridization of the central atom, sulfur, in SF<sub>4</sub> is (30).

## 二、計算與問答題：10分 (每題5分)

- When a 1.00-g sample of C<sub>2</sub>H<sub>5</sub>OH (46.1g/mol) is burned, how much energy is released as heat?  $\Delta H_f^\circ$  for C<sub>2</sub>H<sub>5</sub>OH(l) = -278 kJ/mol,  $\Delta H_f^\circ$  for H<sub>2</sub>O(l) = -286 kJ/mol,  $\Delta H_f^\circ$  for CO<sub>2</sub>(g) = -394 kJ/mol.
- Draw the Lewis structures and tell the molecular geometry and molecular polarity for ICl<sub>3</sub>.