

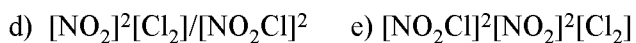
國立勤益科技大學九十六學年度四技轉學生招生考試試題					
系別	化工與材料工程系	年級別	二	考試節次	第二節
考試科目	普通化學	准考證號碼		(考生自填)	

一.選擇題：2分/題 共40分(single-choice) (K=39.1 ; Na=23 ; Ag=108 ; Fe=56 ; Al=27 ; Cl=35.5 ; S=32 ; N=14 ; F=19 ; g/mole)

- An example of a pure substance is
 - elements.
 - compounds.
 - pure water.
 - carbon dioxide.
 - all of these
- Which of the following has 61 neutrons, 47 protons, and 46 electrons?
 - ${}_{61}^{80}\text{Pm}$
 - ${}_{47}^{108}\text{Ag}^+$
 - ${}_{46}^{108}\text{Pd}^-$
 - ${}_{47}^{108}\text{Cd}^+$
 - ${}_{47}^{108}\text{Ag}$
- A gas sample is held at constant pressure. The gas occupies 3.62 L of volume when the temperature is 21.6°C. Determine the temperature at which the volume of the gas is 3.45 L.
 - 309 K
 - 281 K
 - 20.6 K
 - 294 K
 - 326 K
- A scientist obtains the number 0.045006700 on a calculator. If this number actually has four (4) significant figures, how should it be written?
 - 0.4567
 - 0.4501
 - 0.045
 - 0.04500
 - 0.04501
- Nitric acid contains what percent hydrogen by mass?
 - 20.0%
 - 10.0%
 - 4.50%
 - 1.60%
 - 3.45%
- You heat 3.970 g of a mixture of Fe_3O_4 and FeO to form 4.195 g Fe_2O_3 . The mass of oxygen reacted is
 - 0.225 g.
 - 0.475 g.
 - 1.00 g.
 - cannot be determined
 - none of these
- A substance contains 23.0 g sodium, 27.0 g aluminum, and 114 g fluorine. How many grams of sodium are there in a 120 g sample of the substance?
 - 14.0 g
 - 23.0 g
 - 16.8 g
 - 27.6 g
 - none of these
- SO_2 reacts with H_2S as follows:

$$2\text{H}_2\text{S} + \text{SO}_2 \rightarrow 3\text{S} + 2\text{H}_2\text{O}$$
 When 7.50 g of H_2S reacts with 12.75 g of SO_2 , which statement applies?
 - 6.38 g of sulfur are formed.
 - 10.6 g of sulfur are formed.
 - 0.0216 moles of H_2S remain.
 - 1.13 g of H_2S remain.
 - SO_2 is the limiting reagent.
- The net ionic equation for the reaction of aluminum sulfate and sodium hydroxide contains which of the following species?
 - $3\text{Al}^{3+}(\text{aq})$
 - $\text{OH}^-(\text{aq})$
 - $3\text{OH}^-(\text{aq})$
 - $2\text{Al}^{3+}(\text{aq})$
 - $2\text{Al}(\text{OH})_3(\text{s})$

10. How many of the following salts are expected to be insoluble in water?
- | | |
|------------------|---------------------|
| sodium sulfide | barium nitrate |
| ammonium sulfate | potassium phosphate |
- a) none b) 1 c) 2 d) 3 e) 4
11. You mix 60.0 mL of 1.0 M silver nitrate with 25.0 mL of 0.80 M sodium chloride. What mass of silver chloride should you form?
- a) 2.9 g b) 5.8 g c) 8.7 g d) 9.6 g e) none of these
12. Argon has a density of 1.78 g/L at STP. How many of the following gases have a density at STP *greater* than that of argon?
- | | | | |
|-----------------|----|-----------------|-----------------|
| Cl ₂ | He | NH ₃ | NO ₂ |
|-----------------|----|-----------------|-----------------|
- a) 0 b) 1 c) 2 d) 3 e) 4
13. Of energy, work, enthalpy, and heat, how many are state functions?
- a) 0 b) 1 c) 2 d) 3 e) 4
14. Calculate the work associated with the compression of a gas from 121 L to 80. L at a constant pressure of 11 atm.
- a) -450 L atm b) 450 L atm c) 3.7 L atm d) -3.7 L atm e) 120 L atm
15. An element has the electron configuration [Kr]4d¹⁰5s²5p². The element is a(n)
- a) nonmetal. b) transition element. c) metal. d) lanthanide. e) actinide.
16. Consider the following orderings.
- I. Al < Si < P < Cl
 - II. Be < Mg < Ca < Sr
 - III. I < Br < Cl < F
 - IV. Na⁺ < Mg²⁺ < Al³⁺ < Si⁴⁺
- Which of these give(s) a correct trend in ionization energy?
- a) III b) I, II c) I, IV d) I, III, IV e) none of them
17. Which of the following molecules contains the shortest C-C bond?
- a) C₂H₂ b) C₂H₄ c) C₂H₆ d) C₂Cl₄ e) b and d
18. As water is heated, its pH decreases. This means that
- a) the water is no longer neutral b) [H⁺] > [OH⁻] c) [OH⁻] > [H⁺]
 d) a and b are correct e) none of these
19. Calculate the molality of C₂H₅OH in a water solution that is prepared by mixing 50.0 mL of C₂H₅OH with 100.0 mL of H₂O at 20°C. The density of the C₂H₅OH is 0.789 g/mL at 20°C.
- a) 0.086 m b) 0.094 m c) 1.24 m d) 8.56 m e) none of these
20. Apply the law of mass action to determine the equilibrium expression for
- $$2\text{NO}_2\text{Cl} \rightleftharpoons 2\text{NO}_2 + \text{Cl}_2$$
- a) $2[\text{NO}_2][\text{Cl}_2]/2[\text{NO}_2\text{Cl}]$ b) $2[\text{NO}_2\text{Cl}]/2[\text{NO}_2][\text{Cl}_2]$ c) $[\text{NO}_2\text{Cl}]^2/[\text{NO}_2]^2[\text{Cl}_2]$



二. 填充： 10 分/題, 共 20 分

1. Write the names of the following compounds in english:

a) FeSO_4 _____

b) $\text{Ca}(\text{OH})_2$ _____

c) K_2CO_3 _____

d) MnO_2 _____

e) H_2SO_3 _____

2. Write the chemical formulas for the following compounds or ions.

a) Hydrobromic acid _____

b) aluminum oxide _____

c) ammonium ion _____

d) sodium bicarbonate _____

e) Tetraphosphorus decoxide _____

三. 計算 10分/題, 共40分

1. Calculate the pH of a 0.10 M acetic acid solution if 1.34 % of the CH_3COOH molecules in this solution have ionized to form H_3O^+ and CH_3COO^- ions. (10%)

2. A first-order reaction is 38.5% complete in 480 seconds.

(a) Calculate the rate constant.

(b) What is the value of the half-life. (second)

(c) How long will it take for the reaction to go to 75% completion?

3. Calculate the molar boiling point elevation constant (K_b) for water. The molar enthalpy of vaporization of water is 40.79 KJ/ mol at 100°C.

4. Predict the molecular structure from VSEPR for each of the following.

(a) SF_6 (b) NH_3 (c) SO_3 (d) H_2O (e) XeF_4

答案

一. 選擇題：2分/題

1 E 2 B 3 B 4 E 5 D
6 A 7 C 8 B 9 C 10 A
11 A 12 C 13 C 14 B 15 C
16 D 17 A 18 E 19 D 20 D

二. 填充：10分/題, 共20分

1. a) iron(II) sulfate b) calcium hydroxide c) potassium carbonate
d) manganese (IV) oxide e) sulfurous acid
2. a) HBr b) Al₂O₃ c) NH₄⁺ d) NaHCO₃ e) P₄O₁₀

三. 計算：10分/題, 共40分

1. $\text{pH} = -\log[\text{H}_3\text{O}^+] = -\log(0.00134) = -(-2.87) = \underline{2.87}$

2. a. $1.01 \times 10^{-3} \text{ sec}^{-1}$ (3%) b. 686 sec (3%) c. 1373 sec (4%)

3. $\underline{K_b} = RT^2 M_1 / \Delta_{\text{vap}} H =$
 $(8.314 \text{ J K}^{-1} \text{ mol}^{-1})(373.15 \text{ K})^2 (18.02 \times 10^{-3} \text{ Kg mol}^{-1}) / 40.79 \times 10^3 \text{ J mol}^{-1}$
 $= \underline{0.5114 \text{ K Kg/mol} = 0.5114 \text{ K m}^{-1}}$

4. a. 八面體彎曲 b. 三角錐 c. 平面三角形 d. 角形 (或彎曲) e. 平面四邊形