

元智大學 107 學年度 轉學考 招生試題卷

系(所)別：化學工程與材料科學學系學士班 組別：化學工程與材料科學學系 2 年級 科目：普通化學

用紙第 1 頁共 2 頁

●不可使用電子計算機

5 points each, total 100 points

- Which one of these elements is a liquid at room temperature?
A) bromine B) chlorine C) fluorine D) iodine E) selenium
- Based on the following options, select the substance with hydrogen in the +1 oxidation state.
A) KH B) CH₄ C) H₂ D) AlH₃ E) SrH₂
- Based on the solubility rules, which one of the following should be *soluble* in water?
A) (NH₄)₃PO₄ B) Ca₃(PO₄)₂ C) AlPO₄ D) Ag₃PO₄ E) Mg₃(PO₄)₂
- Which of the following substances is a peroxide?
A) KO₂ B) Na₂O₂ C) CO₂ D) CaO E) Al₂O₃
- What is the chemical formula of the salt produced by the neutralization of potassium hydroxide with sulfuric acid?
A) KSO₃ B) K₂(SO₄)₃ C) K₂SO₄ D) K(SO₄)₂ E) KSO₄
- Which of the following choices is/are covalent oxides?
I. SrO II. SiO₂ III. SO₂
A) I only B) II only C) III only D) I and II E) II and III
- The mechanism for the decomposition of ozone in the presence of a reactive chlorine atom is shown below Which of the following species is an intermediate?
$$\text{O}_3 + (\text{UV light}) \rightarrow \text{O} + \text{O}_2$$
$$\text{Cl} + \text{O}_3 \rightarrow \text{ClO} + \text{O}_2$$
$$\text{ClO} + \text{O} \rightarrow \text{Cl} + \text{O}_2$$

A) Cl B) ClO C) O₃ D) O₂ E) UV light
- Complete and balance the following redox equation. The sum of the smallest whole-number coefficients is
$$\text{MnO}_4^- + \text{H}^+ + \text{Br}^- \rightarrow \text{Mn}^{2+} + \text{Br}_2 + \text{H}_2\text{O} \quad (\text{acidic solution})$$

A) 6 B) 17 C) 21 D) 29 E) 41
- Which of these species has the highest entropy (S) at 25°C?
A) CO(g) B) CH₄(g) C) NaCl(s) D) H₂O(l) E) Fe(s)

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用紙第 2 頁共 2 頁

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10. The standard free energy of formation of gaseous hydrogen iodide is 1.30 kJ/mol at 25°C. Find K_p for the reaction $\text{H}_2(\text{g}) + \text{I}_2(\text{s}) \rightleftharpoons 2\text{HI}(\text{g})$ at this temperature.
A) 7.0 B) 71 C) 1.0 D) 2.4 E) 2.9
11. Which of the following is the most acidic solution?
A) 0.10 M CH_3COOH and 0.10 M CH_3COONa ; B) 0.10 M CH_3COOH
C) 0.10 M HNO_2 ; D) 0.10 M HNO_2 and 0.10 M NaNO_2 ; E) 0.10 M CH_3COONa
12. Which of the following does not fit the definition of a Brønsted Acid?
A) H_3PO_4 B) H_2PO_4^- C) H_2O D) NH_4^+ E) CO_2
13. Which of the following is not a conjugate acid-base pair?
A) H_2O and OH^- ; B) H_2O and H_3O^+ ; C) H_3O^+ and OH^-
D) HO_2^- and H_2O_2 ; E) O_2^{2-} and HO_2^-
14. Which one of the following substances should exhibit hydrogen bonding in the liquid state?
A) PH_3 B) H_2 C) H_2S D) CH_4 E) NH_3
15. Which of the following liquids would have the highest viscosity at 25°C?
A) CH_3OCH_3 B) CH_2Cl_2 C) $\text{C}_2\text{H}_5\text{OH}$ D) CH_3Br E) $\text{HOCH}_2\text{CH}_2\text{OH}$
16. Which one of the following compounds utilizes both ionic and covalent bonding?
A) Na_2SO_4 B) AlCl_3 C) PO_4^{3-} D) NH_4^+ E) CaO
17. The Lewis dot symbol for the calcium ion is
A) $:\text{Ca}:^{2+}$ B) $-\text{Ca}-$ C) $:\ddot{\text{Ca}}:^{2+}$ D) Ca^{2+} E) Ca
18. Which of the following elements is found as a monatomic species in its most stable form?
A) sulfur B) oxygen C) hydrogen D) argon E) phosphorus
19. How many electrons does a sulfur atom need to fill its outermost s and p subshells?
A) 6 B) 8 C) 4 D) 2 E) 1
20. Place the following elements in order of increasing atomic radius. P, Ba and Cl
A) $\text{Ba} < \text{P} < \text{Cl}$ B) $\text{P} < \text{Cl} < \text{Ba}$ C) $\text{Cl} < \text{P} < \text{Ba}$ D) $\text{Cl} < \text{Ba} < \text{P}$ E) $\text{Ba} < \text{Cl} < \text{P}$