19-1

淡江大學 104 學年度碩士班招生考試試題

系別：化學學系　　科目：普通化學

考試日期：3 月 8 日(星期日) 第 2 節　　本試題共 10 大題，2 頁

本試題雙面印刷

請按題目順序作答，列出詳細計算步驟，共計 10 題，每題 10%

1. The following table describes 4 atoms. (a) Which two atoms have about the same mass? (b) Are atom A and B isotopes? A and C? A and D? B and C?

	Atom A	Atom B	Atom C	Atom D
Number of protons	17	18	18	17
Number of neutrons	18	17	18	17
Number of electrons	17	18	18	17

2. (a) Explain what is meant by the term *quantum*. (b) Which atom absorbs more energy, one in which an electron moves from the second shell to the third shell or an otherwise identical atom in which an electron moves from the first to the third shell?

3. Use the VSEPR (valence shell electron pair repulsion) theory to predict the shape of each of the following molecules. (a) H_2Se, (b) PH_3, (c) SiH_4, (d) BCl_3 and (e) XeF_6.

4. Write a formula to match the name or a name to match the formula of the following binary ionic compounds. (a) copper (I) oxide, (b) iron (II) bromide, (c) calcium chloride, (d) LiF and (e) NaI.

5. In the following reaction in the aqueous solution, identify (a) which of the reactants is the acid and which is the base, (b) the conjugate base of the acid, and (c) the conjugate acid of the base.

$$HNO_{3\,(aq)} + NH_{3\,(aq)} \rightarrow NO_3^-{}_{(aq)} + NH_4^+{}_{(aq)}$$

6. The *pOH* is related to $[OH^-]$ just as pH is related to $[H^+]$. (a) What is the pOH of a solution that has a hydroxide ion concentration of 1.0×10^{-3} M? (b) What is the pH of a 0.01 M KOH solution?

7. When expose in air containing hydrogen sulfide, lead-based paints turn black because the Pb^{2+} ions react with the (H_2S). This has caused the darkening of old oil-based paintings. Hydrogen peroxide lightens the paints by oxidizing the black sulfide (S^{2-}) to white sulfates (SO_4^{2-}). (a) Write the equation for the darkening reaction. (b) Write the equation for this reaction that lightens the paints.

8. Three 2.00-L flasks, labeled X, Y and Z, each at 760 mmHg and 20 °C, contain neon (Ne, Flask X), argon (Ar, Flask Y), and krypton (Kr, Flask Z). (a) Which flask holds the most atoms of gas? (b) In which flask does the gas has the greatest density? (c) If flask X is heated and flask Y is

背面尚有試題

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cooled, which of the flask will have the highest pressure?

9. Coal is mostly carbon. Burning 1 mole (12.0 g) of carbon to form carbon dioxide releases 393 kJ of energy. Refer to the energy released by fission of 1.00 mole of U-235 (1.8×10^{10} kJ). What is the equivalent mass of the amount of carbon dioxide produced, in metric tons ($= 10^3$ kg)? (Use 16.0 g for 1 mole of oxygen atom. 此題必須有計算過程。)

10. The contribution of the combustion of various fuels to the buildup of CO_2 in the atmosphere can be assessed in different ways. One way relates the mass of CO_2 formed to the mass of fuel burned; another relates the mass of CO_2 to the quantity of heat evolved in the combustion. Which of the three fuels, C(graphite), $CH_{4(g)}$, and $C_4H_{10(g)}$ produces the smallest mass of CO_2 (a) per gram of fuel and (b) per kJ of heat evolved? The heat released per mole of each substance is C(graphite), 393.5 kJ; $CH_{4(g)}$, 803 kJ; and $C_4H_{10(g)}$ 2877 kJ. (Use 1.00 g for 1 mole of hydrogen atom. 此題必須有計算過程。)