系所組別： 生科、化工、材料、環工系

考試科目： 普通化學　　　　　　　　　　　　　　　　考試日期：0710，節次：1

※ 考生請注意：本試題 ☑可 　□不可 使用計算機

說明：答案一律寫在試卷上；請依序作答，並標明題號。

一、選擇題：（單選：1-25 每題 3 分，不倒扣，共 75 分）

1. Which of the following bonds should have the greatest ionic character?

   (A) O-F　　　　(B) N-F　　　　(C) C-F　　　　(D) B-F　　　　(E) Cl-F

2. Which of the following elements has the lowest electronegativity?

   (A) Al　　　　(B) S　　　　(C) Mg　　　　(D) In　　　　(E) Ba

3. Which ot the following species has largest H-C-H bond angle.

   (A) CH_4　　(B) CH_3 radical　(C) CH_3 cation　(D) CH_3 anion　(E) CH_2 dianion

4. A battery that cannot be recharged is a

   (A) fuel cell.　　　　(B) primary battery.　　　(C) secondary battery.

   (D) simple battery.　　(E) flow battery.

5. Which of the following compouds is possible to have optical activity?

   (A) glyceraldehyde　(B) ethylene glycol　(C) glycin　(D) glycerol　(E) glycerin

6. Which of the following ligands could participate in linkage isomerism?

   (A) NH_3　　(B) H_2O　　(C) NH_4^+　　(D) NO_2^-　　(E) ethylene diamine

7. Which of the following is not a state function?

   (A) internal energy　(B) volume　(C) work　(D) pressure　(E) enthalpy

8. Which of the following elements has the least metallic character.

   (A) Sn　　　　(B) Sr　　　　(C) Tl　　　　(D) Ge　　　　(E) Ga

9. Which of the following compounds has the highest (i.e., most negative) lattice energy.

   (A) $CaS_{(s)}$　　(B) $BaO_{(s)}$　　(C) $NaI_{(s)}$　　(D) $LiBr_{(s)}$　　(E) $MgO_{(s)}$

10. What is the molecular shape of SF_4 as predicted by the VSEPR theory?

    (A) linear　　(B) bent　　(C) see-saw　　(D) T-shaped　　(E) tetrahedral

11. Which of the following species is diamagnetic.

    (A) O_2^+　　(B) O_2^{2+}　　(C) O_2　　(D) F_2^+　　(E) N_2^-

(背面仍有題目,請繼續作答)

編號： 8

國立成功大學九十九學年度轉學生招生考試試題

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12. Which of the following atoms should have the smallest polarizability?

(A) Si   (B) S   (C) Te   (D) Bi   (E) Br

13. Colligative properties depend on

(A) the chemical properties of the solute.   (B) the chemical properties of the solvent.

(C) the masses of the individual ions.   (D) the molar mass of the solute.

(E) the number of particles dissolved.

14. Which of the following atoms has the smallest volume?

(A) Ba   (B) Cs   (C) Sr   (D) Rb   (E) I

15. Each amino acid has two functional groups in common and one of 20 other groups attached to the α-carbon. The two functional groups are

(A) carboxyl and amine.   (B) ester and amine.   (C) carboxyl and amide.

(D) alcohol and amine.   (E) carboxyl and peptide.

16. When the reaction $A \rightarrow B + C$ is studied, a plot $1/[A]_t$ vs. time gives a straight line with a positive slope. What is the order of the reaction?

(A) zero   (B) first   (C) second   (D) third   (E) one half

17. The equilibrium constant, K_p, has a value of 6.5×10^{-4} at 308 K for the reaction of nitrogen monoxide with chlorine. $2NO_{(g)} + Cl_{2(g)} \rightleftarrows 2NOCl_{(g)}$ What is the value of K_c?

(A) 2.5×10^{-7} (B) 3.7×10^{-5} (C) 6.5×10^{-4} (D) 1.6×10^{-2} (E) 1.7

18. What is the pH of a 0.0100 M sodium benzoate solution? K_b $(C_7H_5O_2^-) = 1.5 \times 10^{-10}$

(A) 0.38   (B) 5.91   (C) 8.09   (D) 9.82   (E) 13.62

19. What is the pH of a buffer that consists of 0.45 M CH_3COOH and 0.35 M CH_3COONa? $(K_a(CH_3COOH) = 1.8 \times 10^{-5})$

(A) 4.49   (B) 4.64   (C) 4.85   (D) 5.00   (E) 5.52

20. Which of the following is always true for an endothermic process?

(A) $q_{sys} > 0, \Delta S_{surr} < 0$ (B) $q_{sys} < 0, \Delta S_{surr} > 0$ (C) $w < 0$

(D) $q_{sys} > 0, \Delta S_{surr} > 0$ (E) $q_{sys} < 0, \Delta S_{surr} < 0$

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21. Which of the following statements about voltaic and electrolytic cells is correct?
    (A) The anode will definitely gain weight in a voltaic cell.
    (B) Oxidation occurs at the cathode of both cells.
    (C) The free energy change, ΔG, is negative for the voltaic cell.
    (D) The electrons in the external wire flow from cathode to anode in an electrolytic cell.
    (E) A salt bridge is required for both voltaic and electrolytic cells.

22. The process used to produce silicon with a purity of more than 99.999999% is called
    (A) zone refining.　　　　　(B) electrorefining.　　　　　(C) distillation.
    (D) sublimation.　　　　　(E) alloying.

23. The process that selectively extracts a metal from its ore, by dissolving it, is called
    (A) roasting.　(B) leaching.　(C) smelting.　(D) flotation.　(E) hydration.

24. Which of the following atoms has the biggest radius?
    (A) Ti　　　　(B) Cr　　　　(C) Fe　　　　(D) Ni　　　　(E) Zn

25. An isotope with a high value of N/Z will tend to decay through
    (A) α decay.　(B) β decay.　(C) positron decay.　(D) electron capture.　(E) γ decay.

二、非選擇題：（共 25 分，計算請列式，沒有列式僅給答案不予計分）

R = 0.08206 L atm J $K^{-1}mol^{-1}$ = 8.314 J $K^{-1}mol^{-1}$

1. When 500 J of energy is transferred as heat to 0.900 mol O_2 at 298 K and 1.00 atm at constant volume. Calculate (a) the final temperature(4%), and (b) the change in internal energy(4%)

2. (a) Draw the structure for 2-*tert*-butylpentane(4%). This name is incorrect. Give the correct systematic name(4%).

3. Give the statement of the third law of thermodynamics. (4%)

4. Construct a MO energy-level diagram for the B_2 molecule to account for its paramagnetic property. (5%)