

八十六學年度轉學生入學考試

科目 普通化學 (化學, 生科) 共 6 頁第 1 頁 *請在試卷【答案卷】內作答

1. A sample of N_2 gas effuses through a tiny hole in 38 sec. what is the molar mass of a gas that requires 64 sec to effuse under identical conditions? (10%)
2. In three different experiments the following results were obtained for the reaction



$[A]_0/M$	$t_{1/2}/\text{min}$
1.00	50
2.00	25
0.5	100

where $[A]_0$ is the initial concentration of the reactant and $t_{1/2}$ is the half-life of the reaction.

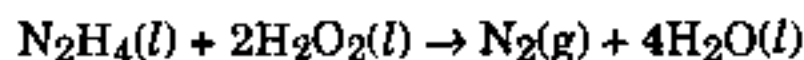
Write the rate equation for this reaction and indicate the value of k . (10%)

3. Draw structural formula for all the isomers of dibromobenzene and predict which one has the largest dipole moment. (6%)
4. Use *spdf* AO notation to write out the complete electron configuration of following atoms
 - (a) Br (2%)
 - (b) S (2%)
 - (c) Si (2%)
5. Based on the MO theory, predict the bond order of the following species
 - (a) O_2^+ (2%)
 - (b) C_2 (2%)
 - (c) He_2^+ (2%)
 - (d) CN^- (2%)

八 十 六 學 年 度 轉 學 生 入 學 考 試

科目 普通化學（化學，生科）共 6 頁第 2 頁 *請在試卷【答案卷】內作答

6. Determine ΔH for the reaction



from the following data



(10%)

7-31 選擇題，每題二分

7. How many different first ionization energies are there for a phosphorus atom in its ground state?
A. 1 B. 3 C. 4 D. 5
E. none of the above
8. Consider the reaction, $2\text{H}_2\text{S} + \text{O}_2 \rightarrow 2\text{H}_2\text{O} + 2\text{S}$. Which of the following is the change in the oxidation number of sulfur?
A. $-2 \rightarrow 0$ B. $+2 \rightarrow -2$ C. $0 \rightarrow -2$ D. $+4 \rightarrow +2$
E. none of the above
9. The name of the anion, ClO_4^- , is
A. chlorate ion B. chloride ion C. hypochlorite ion
D. hypochlorate ion E. none of the above
10. Carbon dioxide when dissolved in water undergoes a chemical reaction. Which of the following is false?
A. The product of the reaction is a weak diprotic acid.
B. Some hydrogen carbonate ions are formed.
C. Some carbonate ions are formed.
D. The production of hydroxide ions is important.
E. none of the above
11. Under which condition is a reaction always exothermic?

八十六學年度轉學生入學考試

科目 普通化學（化學，生科）共 6 頁第 3 頁 *請在試卷【答案卷】內作答

- A. $\Delta G = 0$ B. $\Delta S = +$ C. $\Delta G = +$ D. $\Delta G = -$
E. none of the above

12. Which of the following compounds is water soluble?
A. magnesium carbonate B. barium sulfate
C. strontium nitrate D. strontium carbonate
E. none of the above
13. Write an equation for the reaction of iron(II) oxide with aluminum. If 4 moles of aluminum react, how many moles of iron are produced?
A. 2 B. 4 C. 6 D. 8 E. none of the above
14. Consider a pure substance when both the solid and liquid phases are in equilibrium. Which of the following statements is true?
A. ΔG for the ongoing processes is positive.
B. The entropy of the sample is increasing.
C. The entropy of the sample is decreasing.
D. ΔG will become negative for melting if the temperature is increased.
E. none of the above
15. Potassium exists in the solid state as a body-centered cubic structure. How many potassium atoms are in a unit cell?
A. 4 B. 3 C. 2 D. 1 E. 5
16. The K_a of hydrocyanic acid, HCN, is 4.9×10^{-10} . What is the pH of a 0.50 M aqueous solution of HCN?
A. 4.8 B. 6.3 C. 9.2 D. 12.6 E. none of the above
17. The value of ΔG for a gas phase reaction is 22 kJ. Which of the following is true?
A. Q is smaller than the K_p . B. The reaction is spontaneous.
C. Q is equal to K_p . D. Q is larger than K_p . E. none of the above

八十六學年度轉學生入學考試

科目 普通化學(化學, 生科) 共 6 頁第 4 頁 *請在試卷【答案卷】內作答

18. ΔG for a redox reaction is positive, and all of the reactants and products are in their standard states. Which of the following is true?
 A. Q is equal to 1. B. The reaction is spontaneous to the right.
 C. E (volts) for the reaction is negative.
 D. The reaction is in equilibrium. E. none of the above
19. How many Faradays of electrons are required to plate out 5.00 g of gold from an aqueous solution of Au^{3+} ?
 A. 1.70 Faradays B. 7.6×10^{-2} Faradays C. 2.5×10^{-2} Faradays
 D. 2.65 Faradays E. none of the above
20. Consider the reaction, $\text{CO}_{(g)} + 2\text{H}_{2(g)} \rightarrow \text{CH}_3\text{OH}_{(g)} + 91\text{kJ}$. This reaction is usually carried out at a reasonably high temperature, 250°C , in order to
 A. shift the position of the equilibrium to the right
 B. shift the position of the equilibrium to the left
 C. make the reaction proceed at a reasonable rate
 D. keep the carbon monoxide in the vapor phase
 E. none of the above
21. The simplest aromatic carboxylic acid is
 A. propanoic acid B. sulfuric acid C. phenolic acid
 D. benzoic acid E. none of the above
22. Consider the reaction, $\text{CH}_3\text{CH}_2\text{Br}(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{CH}_3\text{CH}_2\text{OH}(\text{aq}) + \text{Br}^-(\text{aq})$. If the rate of formation of ethanol is 2.25 mol h^{-1} , what is the rate of disappearance of hydroxide ion?
 A. 0.44 mol h^{-1} B. 1.13 mol h^{-1} C. 4.50 mol h^{-1}
 D. -2.25 mol h^{-1} E. none of the above
23. Which of the following is a catalyst in a living system?
 A. CO_2 B. Pb^{2+} C. Zn D. catalase
 E. none of the above

八十六學年度轉學生入學考試

科目 普通化學（化學，生科）共 6 頁第 5 頁 *請在試卷【答案卷】內作答

24. Which of the following is an appropriate term to describe the mechanism by which chlorine atoms destroy the ozone in the atmosphere?
A. oxidation B. reduction C. monomolecular D. chain reaction
E. none of the above
25. Which of the following is not classified as a nutrient?
A. protein B. fat C. vitamins D. carbohydrates
E. none of the above
26. Hydrogen bonding between DNA strands occurs between pairs of nitrogen bases. Which of the following is a pair of nitrogen bases where hydrogen bonding in DNA is important?
A. guanine-guanine B. adenine-cytosine C. guanine-adenine
D. adenine-thymine E. none of the above
27. The mass defect for an iron-56 nucleus is 0.52872 u. What is the binding energy for this nucleus? ($1 \text{ u} = 1.66 \times 10^{-24} \text{ g}$)
A. $7.9 \times 10^{-11} \text{ J}$ B. $5.3 \times 10^{-11} \text{ J}$ C. $4.6 \times 10^{-11} \text{ J}$
D. $2.8 \times 10^{-11} \text{ J}$ E. none of the above
28. Which of the following is false?
A. The earth is the only planet in our solar system that has water in the liquid state.
B. Sedimentary rock is formed at the bottom of the ocean.
C. Salt deposits form as isolated sea water evaporates.
D. Most of the chloride ions in the oceans came from volcanic eruptions.
E. none of the above
29. Which of the following is false?
A. Zeolites are useful as water softeners.
B. Ions become trapped in the cavities and tunnels of the zeolites.

八 十 六 學 年 度 轉 學 生 入 學 考 試

科目 普通化學（化學，生科） 共 6 頁第 6 頁 *請在試卷【答案卷】內作答

- C. When hard water is passed over a zeolite structure, sodium ions present may be exchanged for other ions.
 - D. Used up zeolite water softeners may be reused after being treated with a concentrated saltwater solution.
 - E. none of the above
30. Which of the following statements about p-n junctions is true?
- A. They conduct large amounts of current in either direction.
 - B. They do not conduct electricity.
 - C. They conduct current from the p-side to the n-side.
 - D. They conduct electricity from the n-side to the p-side.
 - E. none of the above
31. Which of the classes is appropriate for the silicon atom in silicon dioxide?
- A. AX_3
 - B. AX_4E
 - C. AX_2
 - D. AX_3E
 - E. none of the above