

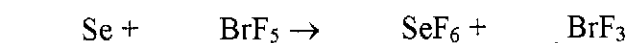
九十七學年度 國立中正大學化學暨生物化學系
大學入學甄試化學性向測驗 試題

選擇題（單選）；成績滿分 = 100分

考試日期：04/19/2008 星期六

1. The solubility of butanol, $\text{CH}_3(\text{CH}_2)_3\text{OH}$, is 9.0 g per 0.10 L. What is the molarity (M) of the solution?
(Atomic weights: C = 12.01, O = 16.00, H = 1.008).
(A) 0.90 (B) 0.090 (C) 1.5 (D) 0.12 (E) 1.2
2. The density of a 64.0% by weight aqueous solution of glycerol ($\text{C}_3\text{H}_8\text{O}_3$) is 1.1663 g/cm^3 . What is the molarity (M) of the compound?
(Atomic weights: C = 12.01, H = 1.008, O = 16.00).
(A) 7.51 (B) 8.62 (C) 8.41 (D) 7.82 (E) 8.11
3. How many grams of KOH are required to prepare 250.0 mL of a 0.50 M KOH solution?
(Atomic weights: K = 39.1, O = 16.00, H = 1.008).
(A) 7.0 (B) 14 (C) 12 (D) 10 (E) 8.0
4. What volume (mL) of concentrated HI (5.51 M) should be used to prepare 125.0 mL of a 0.100 M solution?
(Atomic weights: H = 1.008, I = 126.9).
(A) 2.12 (B) 2.72 (C) 2.39 (D) 2.27 (E) 2.58
5. Antimony (Atomic weight 121.75) has two naturally-occurring isotopes with isotopic weights 120.9038 and 122.9041. What is the percentage abundance of the heavier isotope?
(A) 58.35 (B) 44.25 (C) 41.65 (D) 42.30 (E) 57.25
6. Which of the following sets of quantum numbers is not allowed?
(A) $n = 3, l = 0, m_l = 0$
(B) $n = 2, l = 2, m_l = -1$
(C) $n = 2, l = 1, m_l = 0$
(D) $n = 3, l = 1, m_l = -1$
7. What is the total number of orbitals in the $n = 5$ level?
(A) 10 (B) 16 (C) 12 (D) 25 (E) 5

8. Balance the following equation. What is the coefficient of SeF_6 in the balanced equation?



(A) 2 (B) 4 (C) 1 (D) 5 (E) 3

9. Calculate the relative rate of effusion of O_2 compared to O_3 .

(Atomic weight: O = 16.00).

(A) 1.22 (B) 1.49 (C) 1.30 (D) 0.820 (E) 0.672

10. Which of the following is **NOT** a postulate of the kinetic molecular theory?

(A) The average kinetic energy of the particles is directly proportional to the absolute temperature.

(B) Gas particles have their mass concentrated in the nucleus of the atom.

(C) The forces of attraction between the particles are insignificant.

(D) The gas particles undergo elastic collisions with the container walls.

11. Which one of the following relationships when graphed gives a straight line for helium gas?

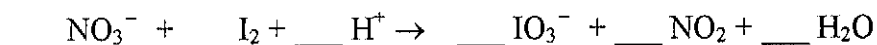
I. Kinetic Energy versus T at constant pressure and volume

II. P versus $1/V$ at constant temperature for a constant mass

III. V versus $1/T$ at constant pressure for a constant mass

(A) I & II (B) I (C) II & III (D) III (E) II

12. Balance the following equation and indicate the coefficients of I_2 and NO_2 .



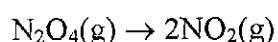
(A) 2, 4 (B) 1, 4 (C) 2, 5 (D) 1, 6 (E) 2, 6

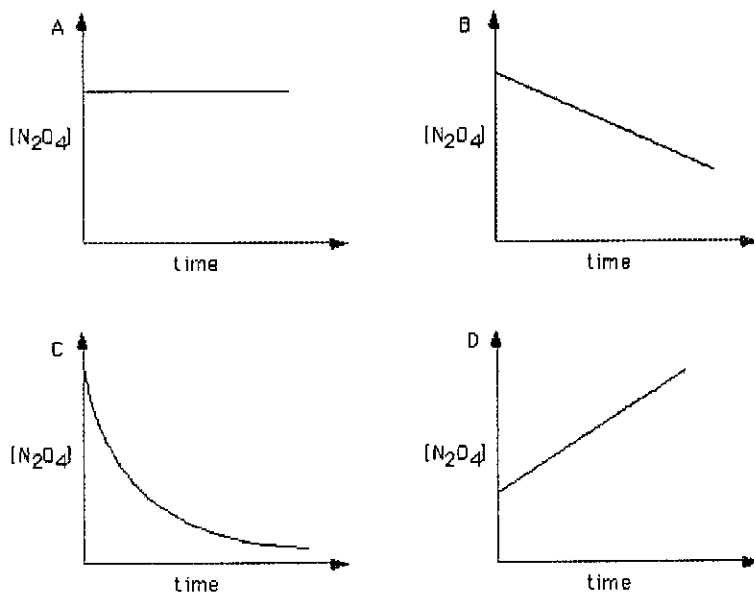
13. The density of a 0.872 M aqueous solution of K_2CrO_4 is 1.129 g/cm^3 ? What is the molality (m) of the solution?

(Atomic weights: K = 39.10, Cr = 52.00, O = 16.00).

(A) 0.872 (B) 0.232 (C) 0.909 (D) 0.0909 (E) 1.50

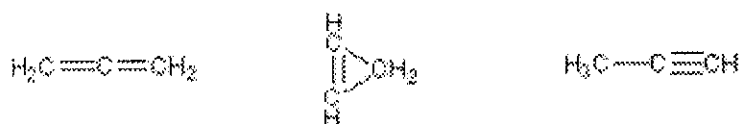
14. Which graph best describes the kinetics of the following reaction if it is first order in N_2O_4 ?





(A) Graph D (B) Graph C (C) Graph A (D) Graph B

15. Of the three isomeric C_3H_4 hydrocarbons shown below, how many can exist with all the carbon and hydrogen nuclei located in a single plane?



- (A) 0 (B) 1 (C) 2 (D) 3
16. Which of the following molecules has the shortest nitrogen to nitrogen bond?
- (A) N_2O (B) N_2H_4 (C) N_2O_4 (D) N_2
17. Given rate constant, $k = 6.2 \times 10^{-3} \text{ s}^{-1}$, for a reaction which is first order in A, what is the initial rate of the reaction (M/s) when the initial concentration of A is 0.0050 M.
- (A) 9.0×10^{-5} (B) 3.1×10^{-5} (C) 6.2×10^{-5} (D) 1.2×10^1 (E) 1.2
18. Which of the following is false?
- (A) Reaction rates depend on temperature, reactant structure, concentration of reactants and the presence of catalysts.
- (B) Catalysts shift reaction equilibrium toward the side of the products.
- (C) Activation energy is required for both exothermic and endothermic reactions.
- (D) Enzymes are catalysts in living organisms.
19. The equilibrium constant, K_c , for the following reaction at 1200°K is 5.0.
- $$CO(g) + 2 H_2(g) \rightleftharpoons CH_4(g) + H_2O(g)$$
- Given the concentrations $[CO] = 0.05 \text{ M}$, $[H_2] = 0.08 \text{ M}$, $[CH_4] = 0.04 \text{ M}$ and $[H_2O] =$

0.04 M one can conclude that:

- (A) the system is not at equilibrium and the reaction will proceed to the left.
- (B) the system is at equilibrium and no net change will occur
- (C) the system is not at equilibrium and the reaction will proceed to the right

20. What is the conjugate base of aniline, $C_6H_5NH_2$?

- (A) $C_6H_5NH^-$ (B) $C_6H_5NH_2^-$ (C) $C_6H_5NH_2^+$ (D) $C_6H_5NH_3^+$ (E) $C_6H_5NH^+$