亞洲大學

96 學年度轉學招生考試試題紙

學系別	考試科目	考試日期	時　　間	備註
保健營養生技學系三年級	普通化學(A)	96.07.23	10:30-12:10	共 6 頁

選擇題 (共五十題，單選每題兩分)

1. Which is the electronic configuration that describes C?
   a) $1s^2, 2s^2, 2p^5$ b) $1s^2, 2s^2, 2p^6, 3s^2$ c) $1s^2, 2s^2, 2p^2$ d) $1s^2, 2s^2, 2p^6$
2. Which atom is described by the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^7$?
   a) S b) Se c) Cl d) Br
3. Which molecules contain both covalent and ionic bonds?
   CH_3OH, I ; Na_2CO_3, II ; NH_4Cl, III ; NaCl, IV
   a) I, II b) II, IV c) I, II, IV d) II, III
4. Which molecules are polar?
   NH_3, I ; CO_2, II ; H_2O, III ; CH_4 , IV ; Br_2, V
   a) I, IV b) I, III c) II, III, IV d) III, IV, V
5. According to VSEPR model, what is your prediction for the arrangement of electron pairs for CH_3^-?
   a) linear b) tetrahedral c) bent d) trigonal
6. Using the VSEPR model, predict which species have bond angles of about 109°.
   NH_3 , I ; CO_2 , II ; H_2O , III ; H_3O^+ , IV ; O_3 ,V
   a) I, III, IV b) II, III, V c) I, IV d) III, IV, V
7. Nitrogen has a negative formal charge in which of the following compounds?
   a) Na**N**H_2 b) $\mathbf{N}_2$ c) **N**H_4Cl d) HC**N**
8. The carbon has the correct orbital hybridization in which structures?
   $H_2C{=}O$, sp, (I); $H_2C{=}CH_2$, sp^2, (II); CH_4, sp^2, (III);
   $HC{\equiv}N$, sp, (IV); $O{=}C{=}O$, sp, (V)
   a) II, IV, V b) II, III, IV c) I, II, III d) I, IV, V
9. Which acid has the highest pK_a?
   a) CH_3COOH b) H_2O c) NH_4^+ d) HCl
10. Which of the following metric relationships is incorrect?
    a) 1 microliter = 10^{-6} liters; b) 1 gram = 10^3 kilograms;
    c) 10^3 milliliters = 1 liter; d) 1 gram = 10^2 centigrams;
    e) 10 decimeters = 1 meter
11. A scientist obtains the number 0.045006700 on a calculator. If this number actually has four (4) significant figures, how should it be written?
    a) 0.4567; b) 0.4501; c) 0.045; d) 0.04500; e) 0.04501
12. Using the rules of significant figures, calculate the following: 4.0021 – 0.004
    a) 3.998; b) 4; c) 3.9981; d) 4.00; e) 4.0

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13. The agreement of a particular value with the true value is called
    a) accuracy; b) error; c) precision; d) significance; e) certainty.
14. 423 Kelvin equals
    a) 150. °F; b) 273. °F; c) 696. °F; d) 150. °C; e) 696. °C
15. The state of matter for an object that has both definite volume and definite shape is
    a) solid state.; b) liquid state.; c) gaseous state.;
    d) elemental state.; e) mixed state.
16. Which of the following name(s) is(are) correct?
    1. sulfide S^{2-}
    2. ammonium chloride NH_4Cl
    3. acetic acid $HC_2H_3O_2$
    4. barium oxide BaO

    a) all; b) none; c) 1, 2; d) 3, 4; e) 1, 3, 4

17. $^{40}_{20}Ca^{2+}$ has
    a) 20 protons, 20 neutrons, and 18 electrons.
    b) 22 protons, 20 neutrons, and 20 electrons.
    c) 20 protons, 22 neutrons, and 18 electrons.
    d) 22 protons, 18 neutrons, and 18 electrons.
    e) 20 protons, 20 neutrons, and 22 electrons.
18. Which of the following are incorrectly paired?
    a) K, alkali metal
    b) Ba, alkaline earth metal
    c) O, halogen
    d) Ne, noble gas
    e) Ni, transition metal
19. Which of the following is incorrectly named?
    a) $Pb(NO_3)_2$, lead(II) nitrate
    b) NH_4ClO_4, ammonium perchlorate
    c) PO_4^{3-}, phosphate ion
    d) $Mg(OH)_2$, magnesium hydroxide
    e) NO^{3-}, nitrite ion
20. Which of the following pairs is incorrect?
    a) NH_4Br, ammonium bromide
    b) K_2CO_3, potassium carbonate
    c) $BaPO_4$, barium phosphate
    d) CuCl, copper(I) chloride
    e) MnO_2, manganese (IV) oxide

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21. Bromine exists naturally as a mixture of bromine-79 and bromine-81 isotopes. An atom of bromine-79 contains
    a) 35 protons, 44 neutrons, 35 electrons.
    b) 34 protons and 35 electrons, only.
    c) 44 protons, 44 electrons, and 35 neutrons.
    d) 35 protons, 79 neutrons, and 35 electrons.
    e) 79 protons, 79 electrons, and 35 neutrons.

22. How many moles of hydrogen sulfide are contained in a 35.0-g sample of this gas? (S = 32.1 g/mol)
    a) 2.16 mol; b) 1.03 mol; c) 7.43 mol; d) 10.4 mol; e) 6.97 mol

23. How many grams are in a 6.940-mol sample of sodium hydroxide? (Na = 23.0 g/mol)
    a) 40.00 g; b) 278.0 g; c) 169.0 g; d) 131.0 g; e) 34.20 g

24. How many atoms of hydrogen are present in 6.0 g of water?
    a) 2.0×10^{23}; b) 7.2×10^{24}; c) 1.1×10^{24};
    d) 4.0×10^{23}; e) 0.66×10^{23}

25. What is the coefficient for water when the following equation is balanced?

    $$As(OH)_3(s) + H_2SO_4(aq) \rightarrow As_2(SO_4)_3(aq) + H_2O(1)$$

    a) 1; b) 2; c) 4; d) 6; e) 12

26. Which of the following compounds has the same percent composition by mass as styrene, C8H8?
    a) acetylene, C_2H_2; b) benzene, C_6H_6 ; c)cyclobutadiene, C_4H_4 ;
    d) α-ethyl naphthalene, $C_{12}H_{12}$; e) all of these

27. A hydrocarbon (a compound consisting solely of carbon and hydrogen) is found to be 85.6% carbon by mass. What is the empirical formula for this compound?
    a) CH; b) CH_2; c) C_3H; d) C_6H; e) CH_6

28. The empirical formula of a group of compounds is CHCl. Lindane, a powerful insecticide, is a member of this group. The molar mass of lindane is 290.8. How many atoms of carbon does a molecule of lindane contain?
    a) 2; b) 3; c) 4; d) 6; e) 8

29. What is the coefficient for oxygen when the following equation is balanced?

    $$NH_3(g) + O_2(g) \rightarrow NO_2(g) + H_2O(g)$$

    a) 3; b) 6; c) 7; d) 12; e) 14

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30. Which of the following equations correctly describes the combustion of CH_4 and O_2 to produce water (H_2O) and carbon dioxide (CO_2)?
    a) $CH_4 + (1/2)O_2 \rightarrow CO_2 + H_2O$
    b) $CH_4 + O_2 \rightarrow CO_2 + 2H_2O$
    c) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
    d) $CH_4 + 3O_2 \rightarrow 2CO_2 + H_2O$

31. How many grams of H_2O will be formed when 32.0 g H_2 is mixed with 32.0 g O_2 and allowed to react to form water?
    a) 36.0 g; b) 288 g; c) 18.0 g; d) 64.0 g; e) 144 g

32. SO_2 reacts with H_2S as follows: (S = 32.1 g/mol)

    $2H_2S + SO_2 \rightarrow 3S + 2H_2O$

    When 7.50 g of H_2S reacts with 12.75 g of SO_2, which statement applies?
    a) 6.38 g of sulfur are formed.
    b) 10.6 g of sulfur are formed.
    c) 0.0216 moles of H_2S remain.
    d) 1.13 g of H_2S remain.
    e) SO_2 is the limiting reagent.

33. Iron is produced from its ore by the reactions:

    $2C(s) + O_2(g) \rightarrow 2CO(g)$

    $Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$

    How many moles of $O_2(g)$ are needed to produce 1 mole of Fe(s)?
    a) 0.5 mole O_2; b) 0.75 mole O_2; c) 1 mole O_2;
    d) 1.5 mole O_2; e) none of these

34. Equal masses (in grams) of hydrogen gas and oxygen gas are reacted to form water. Which substance is limiting?
    a) Oxygen gas is limiting.
    b) Hydrogen gas is limiting.
    c) Water is limiting.
    d) Nothing is limiting.
    e) More information is needed to answer this question.

35. How many grams of NaOH (molar mass = 40.0 g/mol) are contained in 5.0×10^2 mL of a 0.80 M sodium hydroxide solution?
    a) 16 g; b) 80. g; c) 20. g; d) 64 g; e) 410 g

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36. Which of the following is ***not*** a strong base?
    a) $Ca(OH)_2$; b) KOH; c) NH_3; d) LiOH ; e) $Sr(OH)_2$
37. Consider two organic molecules, ethanol and benzene. One dissolves in water and the other does not. Why?
    a) They have different molar masses.
    b) One is ionic, the other is not.
    c) One is an electrolyte, the other is not.
    d) Ethanol contains a polar O—H bond, and benzene does not.
    e) Two of these.

38. Which of the following salts is insoluble in water?
    a) Na_2S; b) K_3PO_4; c) $Pb(NO_3)_2$; d) $CaCl_2$
    e) All of these are soluble in water.
39. Which pair of ions would *not* be expected to form a precipitate when dilute solutions of each are mixed?

    a) Al^{3+}, S^{2-}; b) Pb^{2+}, Cl^-; c) Ba^{2+}, PO_4^{3-} ;

    d) Pb^{2+}, OH^-; e) Mg^{2+}, SO_4^{2-}

40. In which of the following does nitrogen have an oxidation state of +4?
    a) HNO_3; b) NO_2; c) N_2O; d) NH_4Cl; e) $NaNO_2$

41. In the reaction $2Ca(s) + O_2(g) \rightarrow 2CaO(s)$, which species is oxidized?

    a) O_2 ; b) O^{2-}; c) Ca; d) Ca^{2+}; e) none of these

42. How many of the following are oxidation-reduction reactions?

    $NaOH + HCl \rightarrow NaCl + H_2O$

    $Cu + 2AgNO_3 \rightarrow 2Ag + Cu(NO_3)_2$

    $Mg(OH)_2 \rightarrow MgO + H_2O$

    $N_2 + 3H_2 \rightarrow 2NH_3$

    a) 0; b) 1; c) 2; d) 3; e) 4
43. A glass column is filled with mercury and inverted in a pool of mercury. The mercury column stabilizes at a height of 735 mm above the pool of mercury. What is the pressure of the atmosphere?
    a) 0.697 atm; b) 0.735 atm; c) 0.967 atm; d) 1.03 atm; e) 194 atm

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44. A 4.40-g piece of solid CO_2 (dry ice) is allowed to sublime in a balloon. The final volume of the balloon is 1.00 L at 300. K. What is the pressure of the gas?
    a) 2.46 atm; b) 246 atm; c) 0.122 atm; d) 122 atm; e) none of these

45. Gaseous C_2H_4 reacts with O_2 according to the following equation:

    $$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(g)$$

    What volume of oxygen at STP is needed to react with 1.50 mol of C_2H_4?
    a) 4.50 L; b) 33.6 L; c) 101 L; d) 67.2 L;
    e) Not enough information is given to solve the problem.

46. What volume does 28.0 g of N_2 occupy at STP?
    a) 5.60 L; b) 11.2 L; c) 22.4 L; d) 44.8 L; e) none of these

47. Which of the following would have a higher rate of effusion than C_2H_2?
    a) N_2; b) O_2; c) Cl_2; d) CH_4; e) CO_2

48. Consider the reaction

    $$H_2(g) + (1/2)O_2(g) \rightarrow H_2O(l) \quad \Delta H° = -286 \text{ kJ}$$

    Which of the following is true?
    a) The reaction is exothermic.
    b) The reaction is endothermic.
    c) The enthalpy of the products is less than that of the reactants.
    d) Heat is absorbed by the system.
    e) Both a and c are true.

49. What is the minimum volume of a 2.00 *M* NaOH solution needed to make 150.0 mL of a 0.800 *M* NaOH solution?
    a. 375 mL; b. 150. mL; c. 120. mL; d. 90.0 mL; e. 60.0 mL

50. Which of these is a chemical property?
    a. Ice melts at 0°C.
    b. Oxygen is a gas.
    c. Helium is very nonreactive.
    d. Sodium is a soft, shiny metal.
    e. Water has a high specific heat.