

大葉大學九十學年度轉學招生考試試題紙

系 別	日\ 第二部	年 級	考 試 科 目 (中 文 名 稱)	考試日期	節次	備註
食品工程 學系	日	二	普通化學	七月 二十四日	四	可用計算機

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律准攜帶）

一、 選擇題：(90 %)

1. Which term best describes sodium chloride (NaCl)?
 a. element b. compound c. heterogeneous mixture
 d. homogeneous mixture e. allotrope
2. Which of the following is a heterogeneous mixture?
 a. diet soda b. gasoline c. sugar dissolved in water
 d. salt (NaCl) dissolved in water e. none of the above
3. Which one of the following statements is false?
 a. Silver is represented by the symbol Si.
 b. Carbon is represented by the symbol C.
 c. Hydrogen is represented by the symbol H.
 d. Mercury is represented by the symbol Hg.
 e. Copper is represented by the symbol Cu.
4. Which of the following is the largest mass?
 a. 6.5×10^6 pg b. 7.5×10^7 ng c. 2.5×10^5 μg
 d. 3.5×10^2 mg e. 1.5×10^{-1} g
5. Atoms are isotopes if
 a. they contain equal numbers of protons and electrons, but different numbers of neutrons.
 b. they contain equal numbers of protons and neutrons, but different numbers of electrons.
 c. they contain equal numbers of electrons and neutrons, but different numbers of protons.
 d. they are radioactive.
 e. they have the same mass number.
6. Alpha (α) particles are
 a. electrons. b. the mass of electrons but they have the opposite charge.
 c. high energy radiation. d. ${}^2_4\text{He}$ that have been stripped of their electrons.
 e. elemental helium.
7. Sodium metal and water react to form sodium hydroxide and hydrogen gas. How many grams of Na are required to produce 23 g NaOH ? (Atomic weight of Na is 23.0)
 $2\text{Na(s)} + 2\text{H}_2\text{O(l)} \rightarrow \text{H}_2\text{(g)} + 2\text{NaOH(aq)}$
 a. 23 g b. 26 g c. 40. g d. 0.076 g e. 13 g
8. How many moles of sodium ions are present in 2.50 L of 0.200 M Na_3PO_4 ?
 a. 0.167 mol b. 0.500mol c. 1.50mol d. 0.0800 mol e. 0.240 mol
9. Precipitation reactions occur
 a. when soluble ionic reactants combine to form insoluble products.
 b. when insoluble reactants are mixed. c. only in net ionic equations.
 d. solution temperatures are too cold. e. predominantly with halide salts.
10. Which of the following is a weak acid?
 a. HF b. HCl c. HBr d. HI e. HClO_4
11. $\text{NH}_3\text{(aq)}$ is
 a. strong acid. b. strong base. c. weak base.
 d. weak acid. e. neither an acid nor a base.
12. Exactly 21.47 ml of 0.2013 M NaOH is used to titrate a 25.00 ml sample of H_2SO_4 .
 What is the concentration of the sulfuric acid?
 a. 8.644×10^{-2} M b. 3.458×10^{-1} M c. 1.875×10^{-2} M d. 1.729×10^{-1} M
13. Place the following units of pressure in order from lowest to highest pressure.
 a. 1 atm < 1 Pa < 1 mm Hg < 1 bar b. 1 Pa < 1 mm Hg < 1 bar < 1 atm
 c. 1mm Hg < 1 bar < 1 atm < 1 Pa d. 1 Pa < 1mm Hg < 1 atm < 1 bar
 e. 1 bar < 1 mm Hg < 1 Pa < 1 atm
14. 25.0 L of hydrogen gas at 50.0 atm and 21 °C expands to 45.0 L and is subsequently heated to 35 °C. What is the new pressure?
 a. 26.2 atm b. 27.7 atm c. 29.1 atm d. 85.9 atm e. 94.2 atm
15. Place the following regions of the electromagnetic spectrum in order from longest to shortest wavelength.
 a. radio > microwave > infrared > ultraviolet > x-ray
 b. x-ray > microwave > radio > infrared > ultraviolet
 c. ultraviolet > infrared > microwave > radio > x-ray
 d. microwave > radio > ultraviolet > infrared > x-ray
 e. infrared > x-ray > radio > ultraviolet > microwave
16. What is the ground state electron configuration of ${}_{24}\text{Cr}$?
 a. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$ b. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$ c. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^2$



17. Which of the following are state properties?

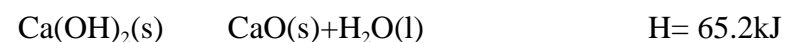
- a. enthalpy b. volume c. heat flow d. answers a and b e. answers a, b and c

18. A 2.500 g sample of ethanol, C_2H_5OH , is combusted in a bomb calorimeter. The temperature of the calorimeter increases by $14.20^\circ C$. If the heat capacity of the calorimeter is $5.22 \text{ kJ/}^\circ C$, what is the heat evolved per mole of ethanol combusted?

- a. 29.6 kJ/mol b. 6.77 kJ/mol c. 4.02 kJ/mol
 d. 74.1 kJ/mol e. $1.37 \times 10^3 \text{ kJ/mol}$

19. Determine the heat of reaction for the following chemical reaction:

$CaO(s) + CO_2(g) \rightarrow CaCO_3(s)$ given the following thermochemical equations:



- a. -48.0 kJ b. -1711.7 kJ c. -178.4 kJ d. -441.0 kJ e. 345.5 kJ

20. For an ideal gas, a plot of $\ln P$ versus $1/T$ (in Kelvin) yields a straight line with a slope equal to

- a. H_{vap} b. $-H_{vap}$ c. $-H_{vap}/R$ d. $-H_{vap}/RT$ e. $1/-H_{vap}$

21. How many grams of HCl are required to prepare 1.00 kg of 5.5 mass % aqueous HCl?

- a. 18 g b. 0.018 g c. 5.5 g d. 55 g e. 550 g

22. Henry's law states that gas solubility is

- a. inversely proportional to pressure. b. independent of pressure.
 c. directly proportional to pressure. d. directly proportional to temperature.
 e. directly proportional to the molar mass of the gas.

23. For a first order reaction, what are the units of the rate constant?

- a. $\text{mol/L} \cdot \text{s}$ b. mol/L c. $1/\text{L} \cdot \text{s}$ d. $1/\text{s}$ e. s

24. For the first-order reaction below, the initial concentration of A is 0.280 M. If the concentration of A decreases to 0.0700 M after 22.8 hours, what is the half-life of the reaction?

$A \rightarrow B \quad \text{rate} = k[A]$

- a. $6.08 \times 10^{-2} \text{ hours}$ b. 22.8 hours c. 5.70 hours
 d. 11.4 hours e. 2.85 hours

25. The correct form of the Arrhenius equation is

- a. $E_a = Ae^{-k/RT}$ b. $k = Ae^{-E_a/RT}$ c. $k = Ae^{-RT/E_a}$
 d. $E_a = Ae^{k/RT}$ e. $A = E_a e^{-k/RT}$

26. If the value of Q is greater than K_p , then

- a. the system is in equilibrium.
 b. the reaction will proceed to the right until equilibrium is established.
 c. a catalyst is necessary to achieve equilibrium.
 d. the reaction will go left or right depending the reaction stoichiometry.
 e. the reaction will proceed to the left until equilibrium is established.

27. A Lewis base is defined as a species that

- a. increases the OH^- concentration in water.
 b. donates a pair of electrons.
 c. accepts a proton.
 d. has a negative charge.
 e. is two electrons short of an octet in the valence shell.

28. Which of the following metals will precipitate as chloride salts:

Ag^+ , Pb^{2+} , Ca^{2+} , K^+ , and Cu^{2+}

- a. Ag^+ b. Pb^{2+} , Ca^{2+} , and Cu^{2+} c. Ag^+ , K^+ , and Cu^{2+}
 d. Ag^+ and Pb^{2+} e. Ca^{2+} , and Cu^{2+}

29. Which of the following is true for the freezing of water at 298 K?

- a. $H < 0$ b. $H > 0$ c. $S = 0$ d. $S > 0$
 e. Both answers a and d are correct.

30. Which of the following reactions is likely to have the most positive change in entropy?

- a. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ b. $CaO(s) + CO_2(g) \rightarrow CaCO_3(s)$
 c. $N_2(g) + 2O_2(g) \rightarrow 2NO_2(g)$ d. $C(s) + O_2(g) \rightarrow CO_2(g)$
 e. $2C(s) + O_2(g) \rightarrow 2CO(g)$

二、計算題：(10%)

1. Calculate ΔG_f^0 at 25 $^\circ C$ for ethane, $C_2H_6(g)$, given the thermodynamic data below.

Substance	ΔH_f^0 (kJ)	S^0 (kJ/K.)
C(s)	0.0	+0.0057
$H_2(g)$	0.0	+0.1306
$C_2H_6(g)$	-84.7	+0.2295