

## Honour Chemistry Practice Test: Unit 1: Basic Chemistry

### Part A: Multiple Choice

(1 mark each)

- Choose the response that includes all the items listed below that are pure substances.  
i. orange juice      ii. steam      iii. wine      iv. oxygen      v. vegetable soup  
A. i, iii, v      B. ii, iv      C. i, iii, iv      D. iv only      E. All of them are pure.
- All of these statements describe properties of sodium. Which one describes a *physical* property of sodium?  
A. Sodium's surface turns black when first exposed to air.  
B. Sodium is a solid at 25°C and changes to a liquid when heated to 98°C.  
C. When placed in water, sodium sizzles and a gas is formed.  
D. When placed in contact with chlorine, sodium forms a compound that melts at 801°C.  
E. Sodium is never found as the pure metal in nature.
- The diameter of an atom is approximately  $1 \times 10^{-8}$  cm. What is this diameter when expressed in nanometers?  
A.  $1 \times 10^{-19}$  nm      B.  $1 \times 10^{-15}$  nm      C.  $1 \times 10^1$  nm      D.  $1 \times 10^{-10}$  nm      E.  $1 \times 10^{-1}$  nm
- How many milliliters is 0.005 L?  
A. 0.5 mL      B. 5 mL      C. 0.50 mL      D. 0.000005 mL      E. 200 mL
- After carrying out the operations  $(99.9 + 0.573) \div 8.2$ , how many significant figures are appropriate to show in the result?  
A. 1      B. 2      C. 3      D. 4      E. 5
- Suppose a house has a floor area of 2,250 square feet. What is this area in units of  $\text{cm}^2$  (1 ft = 30.48 cm)?  
A.  $2.42 \text{ cm}^2$       B.  $2.09 \times 10^6 \text{ cm}^2$       C.  $5.02 \times 10^4 \text{ cm}^2$       D.  $6.86 \times 10^4 \text{ cm}^2$       E.  $101 \text{ cm}^2$
- Table salt (sodium chloride) is 39.1% sodium. How many grams of salt contains 72.0 g of sodium?  
A. 28.2 g salt      B. 72.0 g salt      C. 184 g salt      D. 2,820 g salt      E.  $1.84 \times 10^5$  g salt
- Radio waves travel at the speed of light, which is  $3.00 \times 10^8$  m/s. How many kilometers will radio messages to outer space travel in exactly one year (365 days)?  
A.  $9.46 \times 10^{15}$  km      B.  $7.30 \times 10^8$  km      C.  $7.10 \times 10^{10}$  km      D.  $9.46 \times 10^{12}$  km      E.  $3.33 \times 10^{-3}$  km
- The scientist who determined the magnitude of the electric charge of the electron was  
A. John Dalton.      B. Robert Millikan.      C. J. J. Thomson.      D. Henry Moseley.      E. Ernest Rutherford.
- An atom of the isotope sulfur-31 consists of how many protons, neutrons, and electrons?  
(p = proton, n = neutron, e = electron)  
A. 15 p, 16 n, 15 e      B. 16 p, 15 n, 16 e      C. 16 p, 31 n, 16 e      D. 32 p, 31 n, 32 e      E. 16 p, 16 n, 15 e

11. A magnesium ion,  $\text{Mg}^{2+}$ , has  
A. 12 protons and 13 electrons.      B. 24 protons and 26 electrons.  
C. 12 protons and 10 electrons.      D. 24 protons and 22 electrons.  
E. 12 protons and 14 electrons.
12. Which pair of elements would be most likely to form an ionic compound?  
A. P and Br      B. Zn and K      C. F and Al      D. C and S      E. Al and Rb
13. What is the formula for the ionic compound formed by calcium ions and nitrate ions?  
A.  $\text{Ca}_3\text{N}_2$       B.  $\text{Ca}(\text{NO}_3)_2$       C.  $\text{Ca}_2\text{NO}_3$       D.  $\text{Ca}_2\text{NO}_2$       E.  $\text{CaNO}_3$
14. The formula for strontium phosphate is  
A.  $\text{SrPO}_4$ .      B.  $\text{Sr}_3(\text{PO}_4)_2$ .      C.  $\text{Sr}_2(\text{PO}_4)_3$ .      D.  $\text{Sr}_3\text{P}_2$ .      E.  $\text{Sr}_3(\text{PO}_3)_2$ .
15. The proper chemical name for  $\text{Cr}_2\text{O}_3$  is  
A. chromium(III) oxide.      B. dichromium trioxide.      C. chromium(VI) oxide.  
D. chromium trioxide.      E. chromium(II) oxide.
16. Which of these elements is chemically similar to magnesium?  
A. sulfur      B. calcium      C. iron      D. nickel      E. potassium
17. The mass of  $1.63 \times 10^{21}$  silicon atoms is  
A.  $2.71 \times 10^{-23}$  g.      B.  $4.58 \times 10^{22}$  g.      C. 28.08 g.      D.  $1.04 \times 10^4$  g.      E.  $7.60 \times 10^{-2}$  g.
18. Which of these quantities does *not* represent 1.00 mol of the indicated substance?  
A.  $6.02 \times 10^{23}$  C atoms      B. 26.0 g Fe      C. 12.01 g C  
D. 65.4 g Zn      E.  $6.02 \times 10^{23}$  Fe atoms
19. How many atoms are in 0.0728 g of  $\text{PCl}_3$ ?  
A.  $1.28 \times 10^{21}$  atoms      B.  $4.38 \times 10^{22}$  atoms      C.  $4.39 \times 10^{21}$  atoms  
D.  $3.19 \times 10^{20}$  atoms      E.  $6.02 \times 10^{24}$  atoms
20. What is the mass of 0.0250 mol of  $\text{P}_2\text{O}_5$ ?  
A. 35.5 g      B. 5676 g      C. 0.0250 g      D.  $1.51 \times 10^{22}$  g      E. 3.55 g

**Part B: Numerical Response**

**(1 mark each)**

1. Carbon and hydrogen combined to form methane. Suppose that 32.1 g of methane was formed from 8.08 g of hydrogen. The mass of carbon used to form methane was \_\_\_\_\_ g.
2. Diamond has a density of  $3.51 \text{ g/cm}^3$ . The volume of a 24.6 g diamond is \_\_\_\_\_  $\text{cm}^3$ .
3. A gas has a mass of 9.60 g when the volume is 8.66 L. In a 36.5 L of the same gas, the mass of this gas would be \_\_\_\_\_ g.
4. To the nearest hundredth of a percent, the mass percent of chromium in aluminum dichromate is \_\_\_\_\_ %

***Part C: Extended Response***

1. Identify the type of reactions (formation, decomposition, hydrocarbon combustion, single and double replacements). Predict the products and balance the following reactions with the proper state for each chemical. **(6 marks)**

a. Heptene (C<sub>7</sub>H<sub>14</sub> (l)) is ignited. Type of Reaction: \_\_\_\_\_

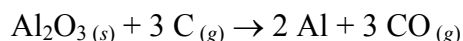
b. Zinc metal is placed in hydrochloric acid. Type of Reaction: \_\_\_\_\_

c. Aluminum metal is reacted with solid sulfur. Type of Reaction: \_\_\_\_\_

2. Methyl benzoate is commonly used in perfumes. It has mass percentages of 70.56% carbon, 5.934% hydrogen and the rest is oxygen. Determine the empirical and molecular formulas for methyl benzoate if it has a molar mass of 136.16 g/mol. **(5 marks)**

3. Using the equation  $3 \text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightarrow 2 \text{NH}_3(\text{g})$ , how many grams of hydrogen would be needed in order to produce 400. g of ammonia? **(3 marks)**

4. During the smelting process to produce aluminum, aluminum oxide is “cooked” with carbon. If 50.0 kg of aluminum oxide is reacted with 12.0 kg of carbon, decide on the limiting reagent and determine the mass of aluminum metal produced? **(4 marks)**



**Part A: Multiple Choice**

1. B    2. B    3. E    4. B    5. B    6. B    7. C    8. D    9. B    10. B  
11. C    12. C    13. B    14. B    15. A    16. B    17. E    18. B    19. A    20. E

**Part B: Numerical Response**

1. 24.0      2. 7.01      3. 40.5      4. 44.45

**Part C: Extended Response**

1. a.  $2 \text{C}_7\text{H}_{14}(\text{l}) + 21 \text{O}_2(\text{g}) \rightarrow 14 \text{CO}_2(\text{g}) + 14 \text{H}_2\text{O}(\text{g})$       Hydrocarbon Combustion  
b.  $\text{Zn}(\text{s}) + 2 \text{HCl}(\text{aq}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$       Single Replacement  
c.  $16 \text{Al}(\text{s}) + 3 \text{S}_8(\text{s}) \rightarrow 8 \text{Al}_2\text{S}_3(\text{s})$       Composition / Formation / Synthesis
2. Empirical Formula: C<sub>4</sub>H<sub>4</sub>O      Molecular Formula: C<sub>8</sub>H<sub>8</sub>O<sub>2</sub>
3. 71.1 g of H<sub>2</sub>(g) needed
4. Limiting Reagent is C<sub>(s)</sub>; 18.0 kg of Al<sub>(s)</sub> produced