



Narrogin SHS Year 11 ATAR CHEMISTRY

Name: *Solutions*

Task No: 13

2021
OT

Task Type: Test

Content: Gases; Rates of reaction; Stoichiometry

Task Description: Complete the attached questions on the multiple choice answer sheet or in the spaces provided.
Marks will be awarded for presentation and working.
Test conditions (50 minutes).
Formulae and data booklet provided.
Non-programmable calculator permitted.

Total Marks: 33

Weighting: 2.15 %

Due Date:

IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.



Multiple Choice Answer Sheet

Task Number: _____ Name: Solutions Year: _____

Multiple Choice – 10 questions.

Circle your choice. If you change your mind, scrub your choice out and circle the one you want. If it is messy, clearly write your choice next to question.

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
9. A B C D
10. A B C D

Section 1: Multiple Choice (1 mark each)

Indicate your answers on the multiple choice answer sheet

1. Which of the following statements is not consistent with the kinetic theory of gases?

- a) Any two gases at the same temperature will have the same average kinetic energy. ✓
- b)** The average distance between gas molecules is small compared to the size of the molecules themselves. ✗
- c) Collisions between gas molecules are perfectly elastic; therefore no energy is lost as gas molecules collide. ✓
- d) There are no attractive or repulsive forces between molecules as they come into close contact with one another. ✓

2. If 1.00 mole of hydrogen gas (H_2) is compared to 1.00 mole of helium gas (He) at STP

- a)** The volumes of the gases are equal and their masses unequal ✓
- b) The volumes of the gases are equal and their masses equal ✗
- c) The volumes of the gases are unequal and their masses unequal ✗
- d) The volumes of the gases are unequal and their masses equal ✗

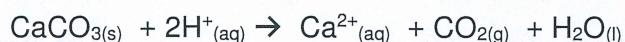
3. Which one of the following is NOT an example of a chemical reaction?

- a) Coating a piece of iron with copper by dipping the iron into a solution of copper sulfate.
- b) Burning a piece of magnesium ribbon.
- c)** The passing of an electric current through the filament of a light bulb. ✗
- d) Rusting of iron.

4. Hydrogen gas is produced from the reaction of magnesium metal with hydrochloric acid. Which of the following could not be used to monitor the rate of the reaction?

- a) concentration of magnesium ions in solution
- b) volume of hydrogen gas produced
- c) mass of magnesium remaining
- d)** total mass of reactants and products in a closed container

8. Consider the reaction between marble chips (calcium carbonate) and dilute hydrochloric acid:



Which one of the following would increase the rate at which the carbon dioxide would be evolved?

- a) decreasing the concentration of hydrochloric acid
 - b) adding more water to the solution
 - c) crushing the marble chips into powder form
 - d) decreasing the temperature of the acid solution added
9. Which one of the following changes would have the least effect on the rate of reaction between a block of magnesium metal and 0.01 mol L⁻¹ hydrochloric acid?

- a) doubling the temperature of the hydrochloric acid
 - b) using tap water rather than distilled water in preparing the hydrochloric acid
 - c) using magnesium powder rather than a block of magnesium
 - d) changing the concentration of hydrochloric acid to 2.00 mol L⁻¹
10. The decomposition of hydrogen peroxide into oxygen and water proceeds very slowly at room temperature. However, the addition of a small amount of manganese dioxide causes the hydrogen peroxide to bubble vigorously due to the rapid production of oxygen. The best explanation for this is that the manganese dioxide:

- a) acts as a catalyst, providing an alternative reaction pathway that has a lower activation energy.
- b) increases the temperature of the reaction, thereby increasing the collision rate between the molecules.
- c) increases the collision rate between reacting molecules, simply by causing an increase in the total number of molecules in the solution.
- d) increases the collision energy of the hydrogen peroxide molecules.

13. When magnesium carbonate is heated it decomposes to produce magnesium oxide and carbon dioxide.

- a) Write a balanced equation for this reaction



(2 marks)

1 mark without correct states.

- b) Determine the mass of magnesium oxide that would result from the decomposition of 5.00g of magnesium carbonate.

$$n(\text{MgCO}_3) = \frac{5}{(24.31 + 12.01 + (16 \times 3))} = \frac{5}{84.32} = 0.059 \text{ moles.}$$

$$n(\text{MgO}) = n(\text{MgCO}_3) = 0.059 \text{ mole,}$$

$$m(\text{MgO}) = 0.059 \times (24.31 + 16) = 0.059 \times 40.31 \text{ g}$$

$$m(\text{MgO}) = 2.38 \text{ g}$$

- c) Determine the volume of carbon dioxide (measured at STP) that would be produced when 12.0 g of magnesium oxide is produced.

$$n(\text{CO}_2) = n(\text{MgO}) \quad (1) \quad n(\text{MgO}) = \frac{12}{(24.31 + 16)} = \frac{12}{40.31} = 0.297 \text{ mole.}$$

$$V(\text{CO}_2) = n \times 22.71 = 0.297 \times 22.71$$

$$V(\text{CO}_2) = 6.76 \text{ L}$$

- d) What volume would this occupy if heated to 25°C at 101.5 kPa?

(3 marks)

$$PV = n RT$$

$$V = \frac{n RT}{P} \quad (1)$$

$$V = \frac{0.297 \times 8.314 \times (25 + 273.15)}{101.5} \quad (1)$$

$$V = 7.253 \text{ L} \quad (1)$$