**Unit 2 Topic Test 5: Gases Student name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Section A: Multiple choice**

**Question 1**

Kinetic molecular theory of gases suggests that

**A**. the volume of the particles in a gas sample is much smaller than the volume of the container.

**B**. the particles continually lose energy to the surroundings.

**C**. the forces acting between gas particles cause the particles to collide.

**D**. all particles in a gas sample have the same speed.

**Question 2**

Select the alternative that contains only one value for pressure.

**A**. 1.1 atm, 110 kPa, 1100 Pa

**B**. 1.2 atm, 130 kPa, 130000 Pa

**C**. 1.48 atm, 150 kPa, 0.150 kPa

**D**. 1.48 atm, 150 kPa, 150000 Pa

**Question 3**

A sample of hydrogen gas and a sample of helium gas are compared. The containers used have the same volume and the temperature and pressure of both gases is the same. The helium atoms will

**A**. have the same average velocity as the hydrogen molecules.

**B**. be the same number as there are hydrogen atoms.

**C**. have a lower average velocity than the hydrogen molecules.

**D**. have a lower kinetic energy than the hydrogen molecules.

**Question 4**

The principal greenhouse gases produced by human activities are:

**A**. CO2 and methane only.

**B**. CO2, methane and H2O.

**C**. CO2, CO and methane.

**D**. CO2, methane and SO2.

**Question 5**

A value for absolute zero temperature can be obtained by

**A**. placing a gas sample in your freezer.

**B**. extrapolating a volume vs temperature graph.

**C**. taking a gas sample to the Antarctic.

**D**. extrapolating a pressure vs volume graph.

**Question 6**

A sample of gas has a volume of 60 L and a pressure of 80 kPa. The temperature is held constant and the pressure is increased to 320 kPa. The volume will now be

**A**. 15 L

**B**. 30 L

**C**. 120 L

**D**. 240 L

**Question 7**

The volume of an 8.0 g sample of gas at SLC is 12.4 L. The gas could be

**A**. hydrogen.

**B**. helium.

**C**. methane.

**D**. oxygen.

**Question 8**

A 64 g sample of oxygen gas is at 260 C and it has a pressure of 3 atm.

The values of pressure, number of mole and temperature that could be substituted into the general gas equation to give a volume in L would be:

**A**. n = 2, T = 26, P = 300

**B**. n = 2, T = 299, P = 300

**C**. n = 2, T = 299, P = 304

**D**. n = 4, T = 299, P = 304

*Use the following information to answer Questions 9 and 10.*

The reaction between hydrogen and chlorine gases is

H2(g) + Cl2(g) 🡪 2HCl(g)

A reaction produces 6.0 L of HCl gas. Assume all volumes in the question are measured at the same temperature and pressure.

**Question 9**

The volume of hydrogen gas required for this reaction was, in L,

**A**. 3

**B**. 6

**C**. 9

**D**. 12

**Question 10**

10 L of Cl2 gas was used for the above reaction.

**A**. 10 L of H2 must have been used also.

**B**. 7 L of Cl2 remained after the reaction.

**C**. 4 L of Cl2 remained after the reaction.

**D**. 12 L of reactants was consumed by the reaction.

**SECTION B- Short-answer questions**

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| --- |
| **Instructions for Section B**  Questions must be answered in the spaces provided in this book. To obtain full marks for your responses you should   * Give simplified answers with an appropriate number of significant figures to all numerical questions; unsimplified answers will not be given full marks. * Show all workings in your answers to numerical questions. No credit will be given for an incorrect answer unless it is accompanied by details of the working.   Make sure chemical equations are balanced and that the formulas for individual substances include an indication of state; for example, H2(g); NaCl(s) |

**Question 1** (10 marks)

The diagram below is a representation of the particles of gas in a container.

A diagram of a molecule

Description automatically generated

**a. i**. Describe the motion of an individual particle. 2 marks

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**ii**. Do all particles have the same velocity? Explain your answer. 2 marks

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**iii**. Describe the impact of an increase in temperature on this gas sample. 2 marks

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**b**. Hydrochloric acid, HCl, is a gas at room temperature. It contains significant dipoles. Will the dipoles affect

the motion of the HCl gas particles? Explain your answer. 2 marks

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**ii**. If the number of gas particles in the sample is doubled, is it likely that the volume of the particles will be

greater than the volume of the container? 1 mark

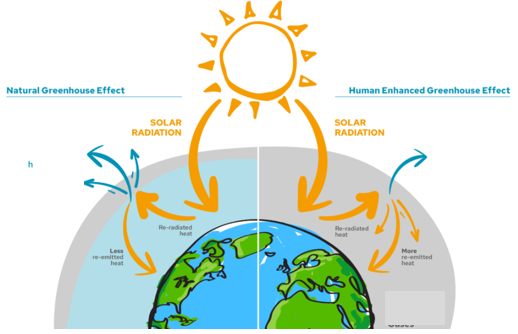
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**c**. Use the diagram provided to explain what ‘pressure’ means. 1 mark

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**Question 2** (9 marks)

The diagram below contrasts the greenhouse effect on the left with the enhanced greenhouse effect, shown on the right.

**a. i**. Name three greenhouse gases. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2 marks

**ii**. Write an equation for a reaction that leads to significant CO2 emissions. 2 marks

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**iii**. State an example of a natural activity that is adding to emission levels. 1 marks

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**b**. Refer to the diagram provided to explain how human activity is causing an enhanced greenhouse effect. In

your answer, explain the impact on the Earth of changes in greenhouse gas emissions. 4 marks

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**Question 3** (6 marks)

**a. i**. A sample of gas has a volume of 4.8 L and a pressure of 0.80 atm. The volume of the container is reduced

to 1.2 L. Determine the new pressure in the container. (The temperature is fixed). 1 mark

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**ii**. A sample of gas at 150 K has a volume of 36 L. The temperature is increased to 450 K. Calculate the

volume of the gas at the new temperature. (Pressure is held constant) 1 mark

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**b**. Scientists use the Kelvin scale in preference to the Celsius scale in many applications. Explain why. 2 marks

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**c. i**. Convert to kPa: 0.85 atm \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

ii. Convert to K: -120 0C \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

**Question 4** (6 marks)

**a**. 50.0 g of nitrogen gas is added to a 35.0 L container at 28.4 0C. Calculate the pressure the gas will reach in

the container. 4 marks

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**b**. 96 g of hydrogen gas is added to a reactor and the conditions are adjusted to SLC.

Calculate the volume of the container. 2 marks

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**Question 5** (9 marks)

The equation for the complete combustion of ethane is

2C2H6(g) + 7O2(g) 🡪 4CO2(g) + 6H2O(g)

**a**. **i**. If conditions are held constant and 30 L of ethane gas reacts, calculate the

volume of oxygen gas required for the reaction \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

**-** volume of product gas formed. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

**ii**. If 25 L of ethane reacts with 40 L of oxygen gas, calculate the volume of the products formed.

(Assume conditions are held constant) 2 marks

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**b**. **i**. Determine the mass of CO2 that could be formed from the complete combustion of 80 g of ethane?

3 marks

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**ii**. Calculate the volume of the CO2 gas, if the pressure is 125 kPa and the temperature is 22 0C. 2 marks

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**END OF KEY TOPIC TEST**