Chapter test with answers

Chapter 8 Gases

Time permitted: 30 minutes

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|  | Section | Number of questions | Marks available |
| A | Multiple choice | 15 | 15 |
| B | Short answer | 5 | 15 |
|  | Total |  | 30 |

Scale:

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A+ | 29–30 | A | 26–28 | B | 23–25 | C | 19–22 | D | 15–18 | E | 9–14 | UG | 0–8 |

Section A Multiple choice (15 marks)

Section A consists of 15 questions, each worth one mark. Each question has only one correct answer. Circle the correct answer. Attempt all questions. Marks will not be deducted for incorrect answers. You are advised to spend no more than 15 minutes on this section.

1 Which gas is not a major constituent of dry air?

A Nitrogen

B Oxygen

C Argon

D Carbon monoxide

2 Which of the following is not a property of gases?

A Gases can be compressed.

B Gases can be poured.

C Gases assume the shape and volume of their containers.

D Gas particles diffuse more slowly than liquid particles.

3 The SI unit of gas pressure is:

A Pa.

B N m–2.

C atm.

D mmHg.

4 235 kPa converted into atmospheres is:

A 2.38 × 104 atm.

B 2.3 × 10–6 atm.

C 2.3 atm.

D 2.38 × 1010 atm.

5 1 atm is equal to:

A  mmHg.

B 760 mmHg.

C 1013 kPa.

D 1.0 N m–2.

6 Which of the following is true of the following chemical reaction?

4NH3(g) + 5O2(g)  4NO(g) + 6H2O(g)

A Mass is not conserved.

B The combustion of 4 L of ammonia produces 4 L of gas.

C The combustion of 4 L of ammonia produces 10 L of gas.

D The reactants and products occupy the same volume.

7 Which of the following is not correct?

A Gas particles cannot have the same average kinetic energy at a given temperature as different gas particles have different mass.

B Collisions between particles change their individual speeds.

C Heavier gases have lower speeds.

D All gas particles possess the same average kinetic energy at a given temperature.

8 12.56°C is equal to:

A absolute zero.

B 12.56 K.

C –260.44 K.

D 285.56 K.

9 As the temperature of a gas increases:

A the gas will spread to fill more of the container.

B its density decreases.

C the pressure it exerts on the sides of a container decreases.

D the gas particles collide at a higher speed but the number of collisions stays the same.

10 In which conditions would a cold soft drink in an open container go flat most quickly?

A On the kitchen bench during winter

B On the kitchen bench during summer

C In the fridge

D None of the above

For questions 11 and 12 refer to the following reaction.

3H2(g) + N2(g) 🡪 2NH3(g)

11 How many litres of NH3 would form from 25 L of N2 at STP?

A 50 L

B 25 L

C 75 L

D 100 L

12 How many litres of NH3 would form from 3.5 g of N2 at STP?

A 5.6 × 10–3 L

B 5.6 L

C 5.1 × 10–3 L

D 3.06 L

13 What volume does 1 mole of any gas occupy at standard temperature and pressure?

A 6.02 × 1023 L

B Different gases have different molar volumes

C 22.4 L

D 24.5 L

14 In the general gas equation, R represents:

A pressure.

B volume.

C temperature.

D the universal gas constant.

15 What property of gases explains why they must be handled in well-ventilated areas?

A Gases rapidly diffuse.

B Gases spread to fill the container.

C Gases have low density.

D A and B are both correct.

Section B Short answer (15 marks)

Section B consists of five questions. Write your answers in the spaces provided. You are advised to spend 20 minutes on this section.

1 Clearly outline the kinetic theory of gases. (3 marks)

Answer: The kinetic theory of gases explains their physical behaviour. It proposes that:

• gases consist of molecules that move in continual random straight-line motion

• the average distance between molecules is very large compared to the size of the molecule

• intermolecular forces between gas molecules are negligible

• all collisions of gas molecules are perfectly elastic

• pressure is due to collisions of gas molecules with the walls of the container

• temperature is a measure of the average kinetic energy of the molecules.

2 a 2.65 L of gas was collected at a pressure of 75.6 kPa. What volume would it occupy at 2.0 atm pressure? Assume temperature is constant. (2 marks)

Answer:

P1V1=P2V2

75.6 × 2.65 = (2 × )V2

V2=  = 0.989 L

b Outline why temperature was assumed to be constant in part a. (1 mark)

Answer: Because a change in temperature would alter the volume the gas occupies by making the molecules move faster and take up more space.

3 365 mL of gas is collected at 42°C. What volume would this occupy at 24°C? (2 marks)

Answer:



V2 = 365 × 

V2 = 365 ×  = 344.14 L

4 0.445 g calcium carbonate reacts with excess hydrochloric acid.

a Write a balanced chemical equation for this reaction. (1 mark)

Answer: CaCO3(s) + 2HCl(aq)  CaCl2(aq) + CO2(g) + H2O(l)

b Calculate the volume of gas produced at SLC. (2 marks)

Answer:

nCaCO3 = nCO2 = 

= 4.45 × 10-3 mol

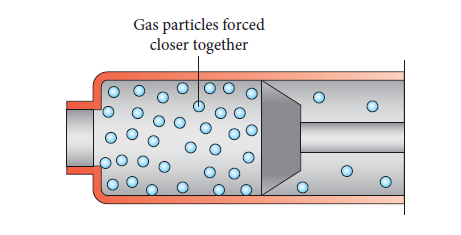
VCO2 = n × 24.5

= 0.1089 L

c Describe what would happen to the volume of gas produced if the experiment was carried out at standard temperature and pressure.   
 (1 mark)

Answer: The pressure remains the same; however, the temperature has been decreased to 0 °C. This means the particles will move more slowly and the volume will decrease (to 0.0997 L).

5 a Draw appropriate particle diagrams to help explain why gases can be easily compressed. (2 marks)  
Answer: According to the kinetic theory of gases, the average distance between gas molecules is very large compared to the size of the molecule. This mean that applying pressure to the particles can push them closer together, making it possible to compress them into a smaller volume.



b Describe the relationship between pressure and volume at a set temperature. (1 mark)

Answer: Pressure and volume are inversely proportional. If pressure increases, volume decreases. For example, if you push on a syringe filled with air, it will compress the air into a smaller volume.

End of test (30 marks)