Cambridge Assessment International Education

Cambridge IGCSE™

7: Thermal physics – Topic questions

Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
4	2016	June	41
5	2016	June	41
5	2016	March	42

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

4 **(a)** Explain, in terms of molecules, why it is possible to compress a gas, but not a liquid.

.....

.....

.....

..... [2]

(b) Two containers made of insulating material contain the same volume of water at room temperature. The containers do not have lids. The volume of liquid in each container gradually decreases.

(i) After a certain time, the temperature of the water has decreased to below room temperature.

Explain, in terms of molecules, why the temperature has decreased.

.....

.....

.....

..... [2]

(ii) One of the containers is wide and shallow. The other container is narrow and deep.

Predict which container has the greater rate of cooling. Explain your answer.

.....

.....

..... [2]

[Total: 6]

5 **(a)** State what happens to the molecules of a gas in a sealed container when the temperature of the gas is increased.

..... [1]

(b) A quantity of gas is contained in a sealed container of fixed volume. The temperature of the gas is increased.

State, in terms of molecules, **two** reasons why the pressure of the gas increases.

1. .....

2. .....

[2]

(c) A helium-filled weather balloon is held at ground level. The volume of the balloon is 4800 m^3. The pressure of the helium is 98 kPa.

The balloon is released and rises to a height where the volume of the balloon is 7200 m^3.

(i) Calculate the new pressure of the helium. Assume that the temperature stays constant.

pressure = ... [2]

(ii) Suggest why it may be necessary to release helium from the balloon as it rises even higher.

.....

..... [1]

[Total: 6]

5 **(a)** A student carries out an experiment to find the relationship between the pressure p and the volume V of a fixed mass of gas. The table contains four of her sets of measurements.

p/kPa	250	500	750	1000
V/cm^3	30.0	15.2	9.8	7.6

(i) Use the data in the table to suggest the relationship between the pressure and the volume in this experiment. Explain how you reach your conclusion.

.....

.....

.....

.....[2]

(ii) State the property of the gas, apart from the mass, that remains constant during the experiment.

.....[1]

(b) A lake is 5.0 m deep. The density of the water is 1000 kg/m^3.

(i) Calculate the pressure at the bottom of the lake due to this depth of water.

pressure = ...[2]

(ii) A bubble of gas escapes from the mud at the bottom of the lake and rises to the surface.

Place one tick in each row of the table to indicate what happens to the volume, the mass and the density of the gas in the bubble. Assume that no gas or water vapour enters or leaves the bubble.

	increases	stays the same	decreases
volume of bubble			
mass of gas in bubble			
density of gas in bubble			

[2]

[Total: 7]

Question	Answer	Mark
4 (a)	Gas molecules (very) far apart **OR** empty space between gas molecules Molecules of liquid (very) close together / compact **OR** are touching (each other)	B1 B1
4 (b) (i)	Faster / more energetic water molecules evaporate / escape / leave Slower / less energetic molecules remain (so temperature is lower)	B1 B1
4 (b) (ii)	Water in wide container **AND** has water with larger surface (area) Rate of evaporation higher / faster / quicker **OR** higher chance of evaporation	B1 B1
		Total: 6
5 (a)	One of 1, 2 or 3: 1 Molecules move faster **OR** have more k.e. / momentum 2 Molecules hit walls more often / more frequently 3 Molecules hit walls with greater force / impulse / harder	B1
5 (b)	1 mark for each of 1, 2 and 3 in (a) not given as answer to (a)	B2
5 (c) (i)	PV = constant **OR** $P_1V_1 = P_2V_2$ **OR** 98 × 4800 = P × 7200 65 kPa	C1 A1
5 (c) (ii)	To prevent the balloon bursting (as its volume increases) **OR** to reduce the pressure inside the balloon **OR** pressure difference between inside and outside balloon rises	B1
		Total: 6
5 (a) (i)	P × V values are 7500 or about 7500 **OR** If P / pressure doubles, V / volume halves **OR** vice versa (so) PV = constant **OR** P α 1 / V **OR** either in words	B1 B1
5 (a) (ii)	temperature	B1
5 (b) (i)	P = hdg **OR** 5.0 × 10 × 1000 50 000 Pa or 50 kPa	C1 A1
5 (b) (ii)	Volume of bubble <u>increases</u> Mass of gas <u>stays the same</u> Density of gas <u>decreases</u>	B2
		Total: 7

Notes about the mark scheme are available separately.