# Eduqas Physics GCSE
# Topic 2: Particle model of matter
## Questions by topic

**1.**

A fixed mass of gas is kept under conditions of constant volume. The table shows how the pressure of this gas changes with temperature when it is heated.

| Temperature (°C) | Temperature (K) | Pressure ($N/cm^2$) |
|---|---|---|
| –273 | ..... | 0 |
| –173 | 100 | 4 |
| –123 | 150 | 6 |
| –73 | 200 | 8 |
| +27 | 300 | ..... |
| +77 | 350 | 14 |
| +127 | 400 | 16 |

*(a)* **Complete the table above.** [2]

*(b)* Explain in terms of molecules why the pressure increases as the temperature increases. [2]

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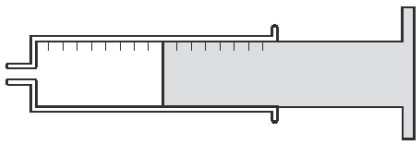
**2.**

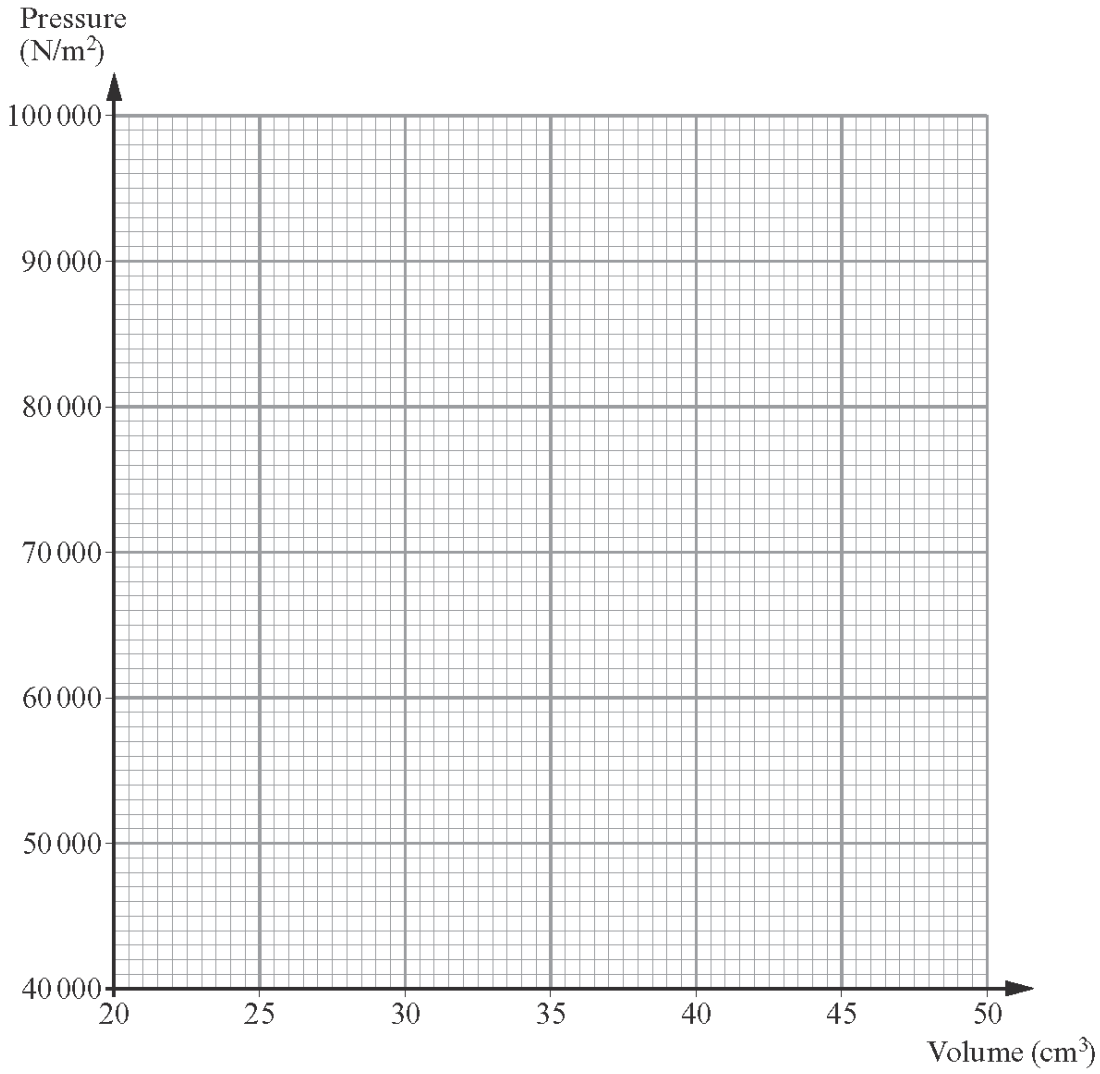
A fixed mass of gas is kept at constant temperature in a syringe as shown below.



The gas in the syringe is expanded (made larger) by slowly pulling the plunger out. The table shows the pressure exerted by the gas at different volumes.

| Volume ($cm^3$) | 20 | 25 | 35 | 40 | 50 |
|---|---|---|---|---|---|
| Pressure ($N/m^2$) | 100 000 | 80 000 | 57 000 | 50 000 | 40 000 |

*(a)* (i) Use the information in the table to **plot a graph** on the grid below. [3]



(ii) Describe the relationship between the volume and pressure of the gas. [2]

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(iii) Use your graph to write down the pressure of the gas when its volume is 30 $cm^3$. [1]

..... $N/m^2$

*(b)* The gas is at constant temperature. Explain in terms of molecular motion and collisions why the pressure changes in the way it does when the volume is increased. (You may want to refer to the diagram on the previous page in your answer.) [6 QWC]

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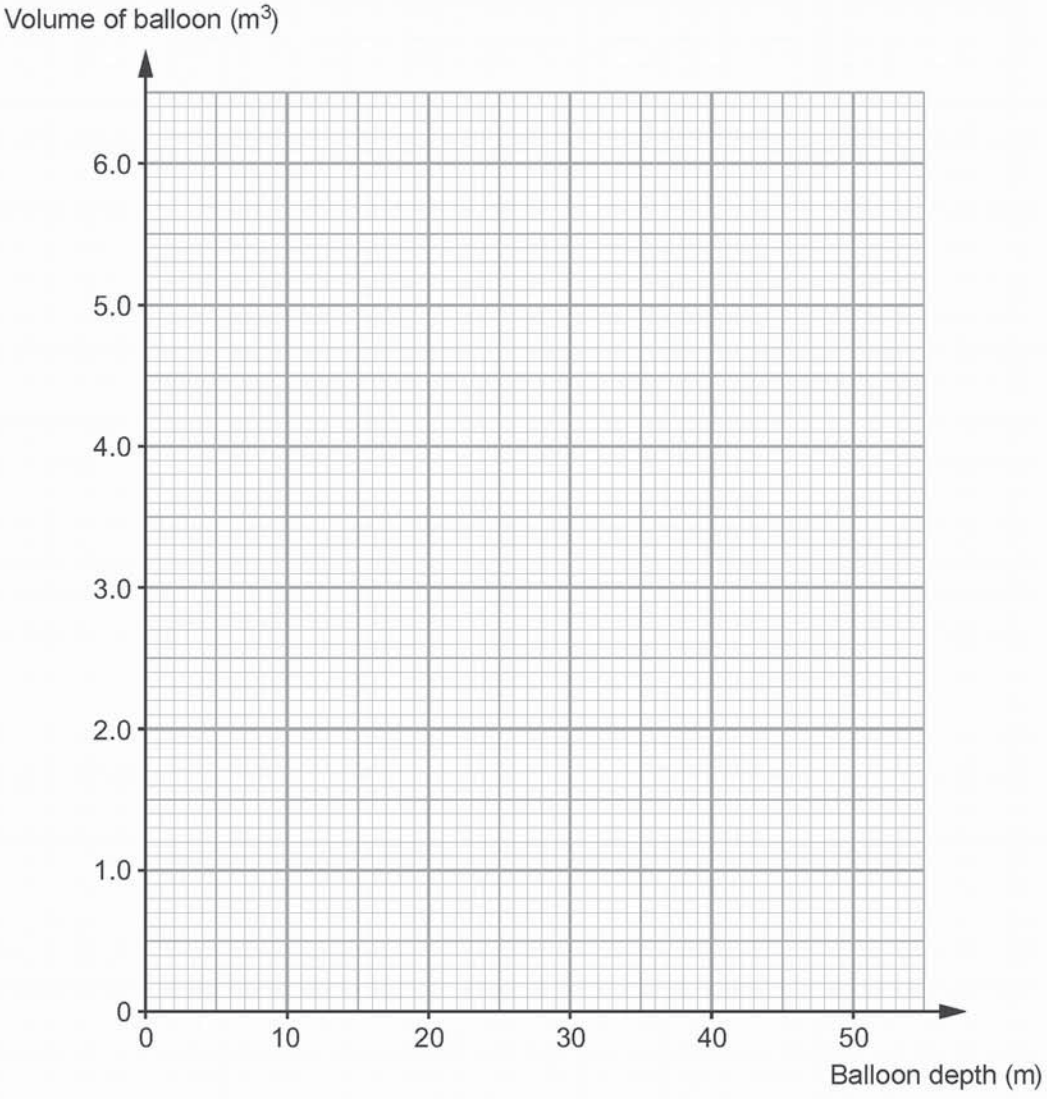
**3.**

A balloon of volume $2\,m^3$ is released underwater at a depth of 50 m.
The table below shows information about the balloon as it rises towards the surface of the water.

| Balloon depth (m) | Pressure on balloon (kPa) | Volume of balloon ($m^3$) | $pV$ (kJ) |
|---|---|---|---|
| 10 | 200 | 6.0 | 1200 |
| 20 | 300 | 4.0 | 1200 |
| 30 | 400 | 3.0 | 1200 |
| 40 | 500 | 2.4 | 1200 |
| 50 | 600 | 2.0 | 1200 |

*(a)* Use data in the table to plot values of the volume of the balloon against its depth and draw a suitable line. [3]



*(b)* Use the table and / or the graph to answer the following questions.

(i) Describe the relationship between the volume of the balloon and its depth. [2]

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(ii) At what depth would the volume of the balloon be $5.0\,m^3$? [1]

depth = ..... m

(iii) Give a value for the pressure of the atmosphere and state how you obtained your answer. [2]

atmospheric pressure = ..... kPa

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(iv) Explain how you can tell that the temperature of the gas in the balloon remains constant. [2]

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4.

**In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

The information in the box is about the properties of solids and gases.

| |
|---|
| Solids:<br>• have a fixed shape<br>• are difficult to compress (to squash).<br>Gases:<br>• will spread and fill the entire container<br>• are easy to compress (to squash). |

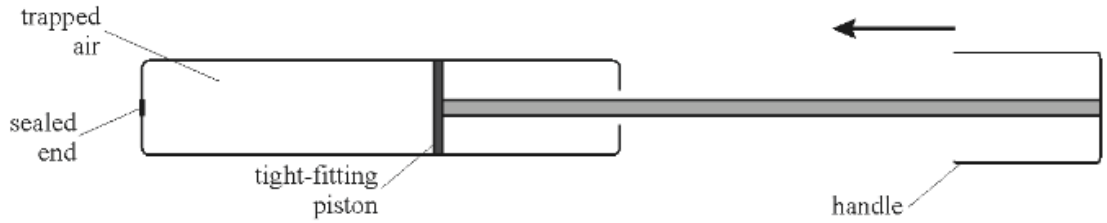
Use your knowledge of kinetic theory to explain the information given in the box.

You should consider:
- the spacing between the particles
- the movement of individual particles
- the forces between the particles.

**[6 marks]**

## 5 (part (iii) HIGHER).

This question is about compressing a gas inside a cylinder. The cylinder is the pump used for inflating a bicycle tyre. In this case, it is sealed at the end so no air can escape.




**(a)** The trapped air has a volume of 120 $cm^3$ and a pressure of 100 kPa.

**(i)** The handle is slowly pushed in until the volume of trapped air is 50 $cm^3$.

Calculate the new pressure of the air on the walls of the pump.

Show your working clearly.

.....kPa **[3]**

**(ii)** Explain the pressure change in terms of the behaviour of the particles of trapped air.

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..... **[3]**

**(iii)** In doing the calculation, you have to assume that no gas leaked out when the handle was moved.

State one other assumption which must be made for the calculation, and explain why this assumption would be correct if the volume change were slow but incorrect if the volume change were rapid.

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..... **[4]**