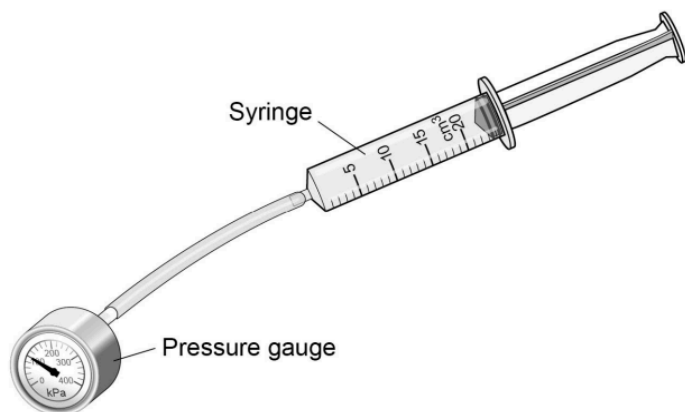


Q1.(2020)

a)

A student used the equipment in **Figure 9** to investigate how the pressure of a gas varies with the volume of the gas.

Figure 9

The syringe is filled with air.

Table 2 shows the results.

Table 2

Volume in cm ³	Pressure in kPa
24	100
20	120
12	200
10	240

Describe how the student could use the equipment in **Figure 9** to obtain the data shown in **Table 2**.

[4 marks]

b)

Describe what happens to the pressure of the air when the volume of the air is halved.

[2 marks]

c)

The temperature of the air in the syringe remained constant during the student's investigation.

Which **two** properties of the air particles would change if the temperature increased?

[2 marks]

Tick (✓) **two** boxes.

kinetic energy

☐

mass

☐

shape

☐

speed

☐

volume

☐

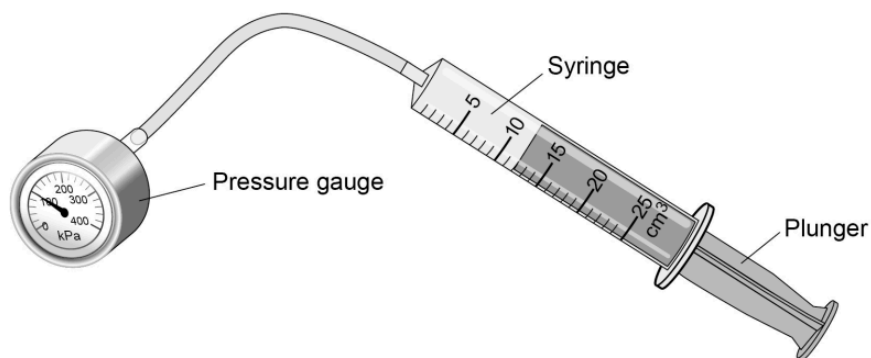
Q2.(2021)

a)

A teacher demonstrated the relationship between the pressure in a gas and the volume of the gas.

Figure 12 shows the equipment used.

Figure 12



What is the range of the syringe?

[1 mark]

Tick (✓) **one** box.

From 0 to 1 cm³

☐

From 0 to 5 cm³

☐

From 0 to 25 cm³

☐

b)

The relationship between the pressure and volume of a gas is given by the equation:

$$\text{pressure} \times \text{volume} = \text{constant}$$

Complete the sentence.

[1 mark]

For this equation to apply, both the mass of gas and the _____
of the gas must stay the same.

c)

The initial volume of the gas in the syringe was 12 cm^3 .

The initial pressure of the gas in the syringe was $101\,000 \text{ Pa}$.

Calculate the constant in the equation below.

$$\text{pressure} \times \text{volume} = \text{constant}$$

[2 marks]

$$\text{Constant} = \text{_____} \text{ Pa cm}^3$$

d)

The teacher pulled the plunger slowly outwards and the gas expanded.

The new volume of the gas was 24 cm^3 .

Calculate the new pressure in the gas.

The constant has the same value as in Question 08.3

[3 marks]

$$\text{New pressure} = \text{_____} \text{ Pa}$$

e)

Which change occurs when the plunger is pulled slowly outwards?

[1 mark]

Tick (✓) **one** box.

The gas particles stop moving.

☐

There are more frequent collisions between the gas particles.

☐

There is more space between the gas particles.

☐

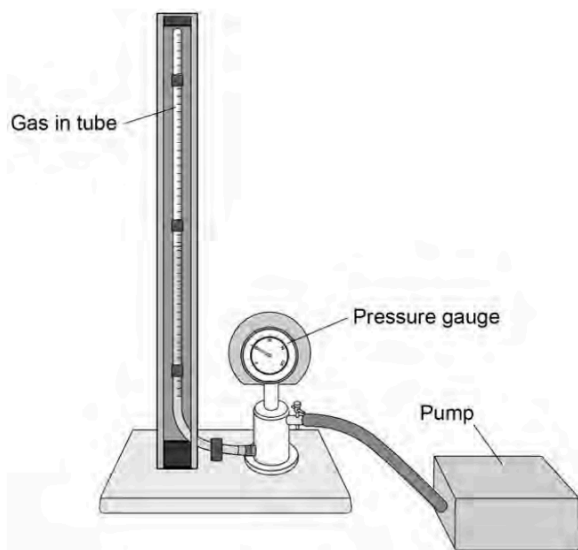
Q3.(2023)

a)

A teacher demonstrated the relationship between the pressure and the volume of a fixed mass of gas at a constant temperature.

Figure 9 shows the equipment used.

Figure 9



Complete the sentence.

Choose the answer from the box.

[1 mark]

circular paths	random directions	the same direction
----------------	-------------------	--------------------

Particles in a gas move in _____.

b)

Complete the sentence.

Choose the answer from the box.

[1 mark]

a constant speed

a constant velocity

a range of speeds

Particles in a gas move with _____.

c)

Table 6 shows some of the results.**Table 6**

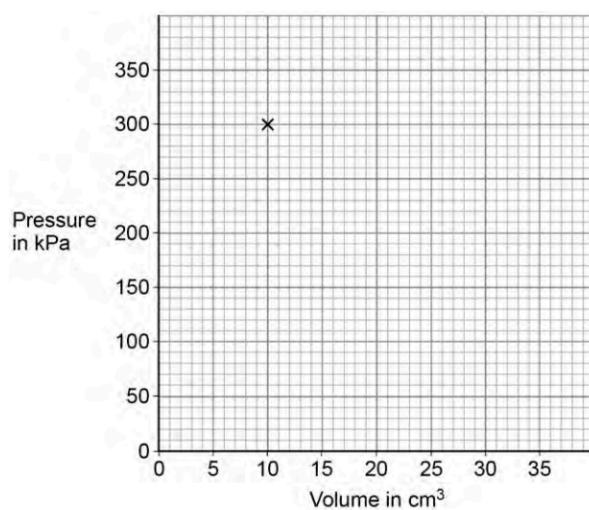
Pressure in kPa	Volume in cm ³
300	10
200	15
150	20
120	25
100	30

Complete **Figure 10**. The first point has been plotted for you.

You should:

- plot the points from **Table 6**
- draw the line of best fit.

[3 marks]

Figure 10

d)

The relationship between the pressure and the volume of a gas is given by the equation:

$$\text{pressure} \times \text{volume} = \text{constant}$$

Calculate the constant when the pressure of the gas was 300 kPa.

Use **Table 6**.

[2 marks]

Constant = _____ kPa cm³

e)

When the volume of the gas increases, the pressure in the gas decreases.

The temperature of the gas stays the same.

How does increasing the volume affect each of the following quantities?

[3 marks]

Tick (✓) **one** box in **each** row.

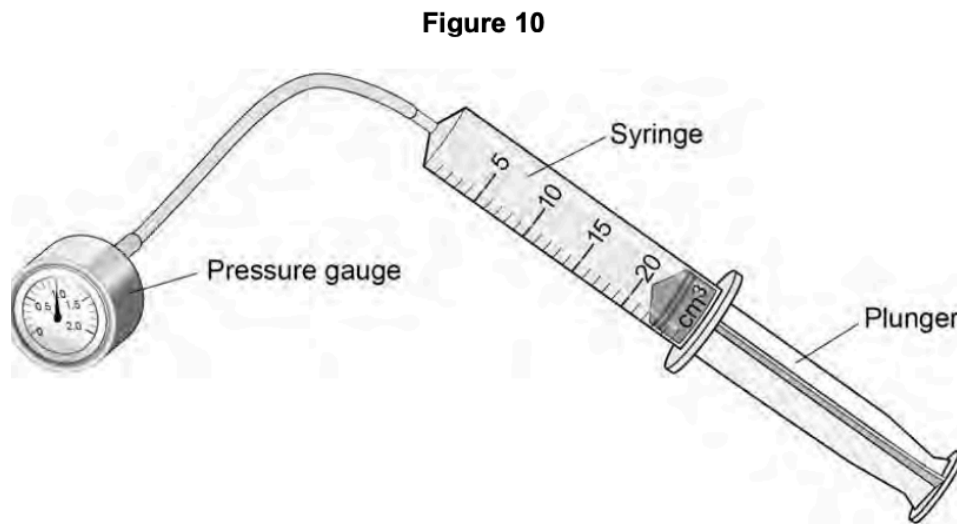
Quantity	Decreases	Stays the same	Increases
Mean time between collisions of the particles with the tube			
Mean distance between the particles			
Mean speed of the particles			

Q4.(2024)

a)

A student investigated how the pressure in a fixed mass of air varies with the volume of the air.

Figure 10 shows the equipment used.



When the plunger was pushed slowly into the syringe, the temperature of the air stayed the same.

How did pushing the plunger in affect the volume of air in the syringe?

[1 mark]

Tick (✓) **one** box.

The volume decreased.

☐

The volume stayed the same.

☐

The volume increased.

☐

b)

How did pushing the plunger in affect the distance between the air particles in the syringe?

[1 mark]

Tick (✓) **one** box.

The distance decreased.

☐

The distance stayed the same.

☐

The distance increased.

☐

c)

How did pushing the plunger in affect the frequency of collisions between the air particles and the syringe walls?

[1 mark]

Tick (✓) **one** box.

The frequency of collisions decreased.

☐

The frequency of collisions stayed the same.

☐

The frequency of collisions increased.

☐

d)

How did pushing the plunger in affect the air pressure in the syringe?

[1 mark]

Tick (✓) **one** box.

The air pressure decreased.

☐

The air pressure stayed the same.

☐

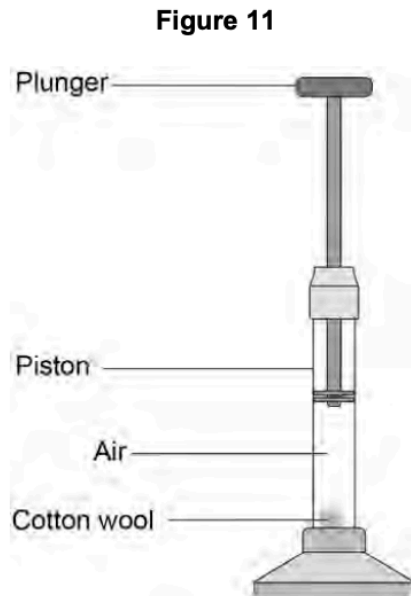
The air pressure increased.

☐

e)

A fire piston is a special type of syringe that can be used to start fires.

Figure 11 shows a fire piston.



The plunger is pushed quickly downwards and compresses the air.

When the air is compressed quickly, the temperature of the air increases.

How does an increase in temperature affect the mean speed of the air particles inside the syringe?

[1 mark]

Tick (✓) **one** box.

The mean speed of the particles decreases.

☐

The mean speed of the particles does not change.

☐

The mean speed of the particles increases.

☐

f)

When the air is hot enough, a small piece of cotton wool in the piston catches fire.

The energy transferred to the air in the piston is 0.0130 J.

The mass of air in the piston is 2.60×10^{-8} kg.

specific heat capacity of air = 1010 J/kg °C

Calculate the temperature change of the air.

Use the Physics Equations Sheet.

[3 marks]

Temperature change = _____ °C