

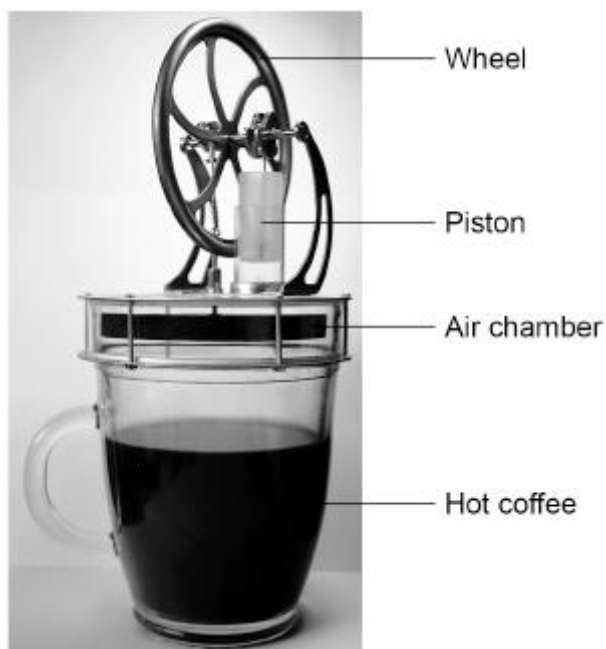
Name of the Student: _____

Max. Marks : 25 Marks

Time : 25 Minutes

Q1.

The figure below shows a device that uses a mug of hot coffee to turn a wheel.



- (a) The hot coffee increases the temperature of the air in the chamber.

Explain how the pressure in the chamber changes.

(3)

- (b) For the device to work, the air in the chamber must increase in temperature quickly.

Explain why the bottom of the air chamber is made of metal rather than plastic.

(2)

- (c) The mass of air in the chamber is constant.

What property of air allows a small change in internal energy to cause a large temperature change to the air in the chamber?

(1)

- (d) The changes in pressure in the air chamber cause the wheel to turn.

Suggest **one** way to increase the speed at which the wheel turns.

(1)

- (e) The temperature of the coffee decreases as the device is used.

The initial temperature of the coffee was $76\text{ }^{\circ}\text{C}$.

The internal energy of the coffee decreased by 15 kJ .

density of coffee = $1.1 \times 10^3\text{ kg/m}^3$

volume of coffee = $1.9 \times 10^{-4}\text{ m}^3$

specific heat capacity of coffee = $4200\text{ J/kg }^{\circ}\text{C}$

Calculate the final temperature of the coffee.

Use the Physics Equations Sheet.

Final temperature of the coffee = _____ °C (6)

(Total 13 marks)

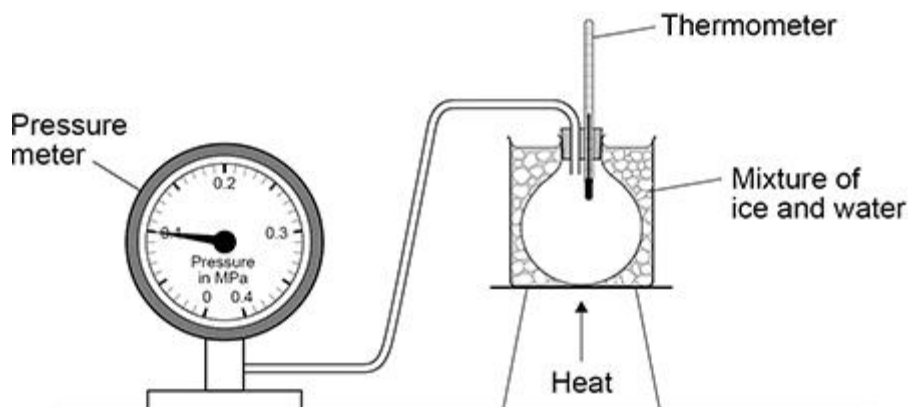
Q2.

A student investigated how the pressure of a gas depends on its temperature.

The volume of the gas did **not** change.

Figure 1 shows the equipment used.

Figure 1



- (a) Pressure is sometimes measured in units called atmospheres.

1 atmosphere is 10^5 pascals (Pa).

What is 1 atmosphere in kilopascals (kPa)?

1 atmosphere = _____ kPa (1)

- (b) The student took four pressure readings for each temperature.

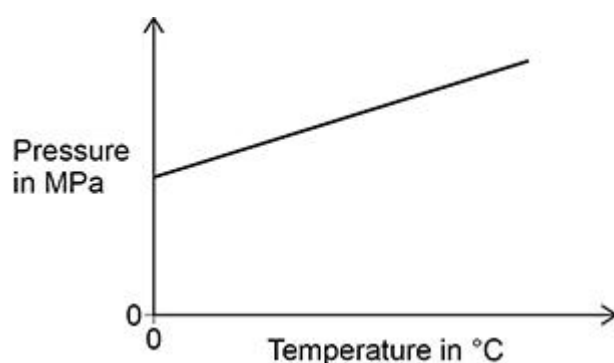
The table below shows the pressure readings when the temperature was 50.0 °C

Temperature in °C	Pressure in MPa			
	1	2	3	4
50.0	0.115	0.120	0.121	0.116

Calculate the uncertainty in the mean pressure.

(c) **Figure 2** shows a sketch graph of the results.

Figure 2



The student said that as the temperature increases the pressure increases.

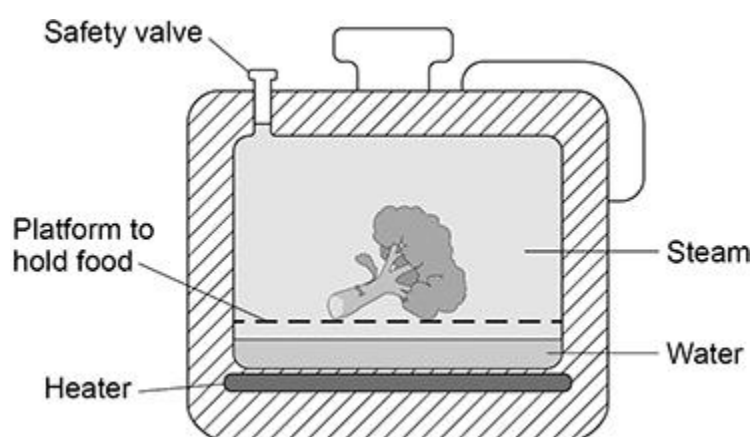
Give a better description of the relationship between temperature and pressure.

(1)

A pressure cooker is a sealed pot that uses steam to cook food.

Figure 3 shows a pressure cooker.

Figure 3



(d) When the water in the pressure cooker starts to boil:

- the amount of steam in the pressure cooker increases
- the temperature of the steam increases above 100 °C

Explain why these changes make the pressure in the cooker increase.

(5)

- (e) If the pressure inside the pressure cooker becomes greater than 200 kPa then some of the steam is released through the safety valve.

The released steam expands as it moves into the atmosphere.

Explain how a change in density of the steam is caused by a change in the arrangement of particles in the steam as it is released.

(3)

(Total 12 marks)