

Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Thermal Physics

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Q1.

- (a) Outline what is meant by an *ideal gas*.

(2)

- (b) An ideal gas at a temperature of 22 °C is trapped in a metal cylinder of volume 0.20 m³ at a pressure of 1.6 × 10⁶ Pa.

- (i) Calculate the number of moles of gas contained in the cylinder.

number of moles _____ mol

(2)

- (ii) The gas has a molar mass of 4.3 × 10⁻² kg mol⁻¹.

Calculate the density of the gas in the cylinder.

State an appropriate unit for your answer.

density _____ unit _____

(3)

- (iii) The cylinder is taken to high altitude where the temperature is -50 °C and the pressure is 3.6 × 10⁴ Pa. A valve on the cylinder is opened to allow gas to escape.

Calculate the mass of gas remaining in the cylinder when it reaches equilibrium with its surroundings.

Give your answer to an appropriate number of significant figures.

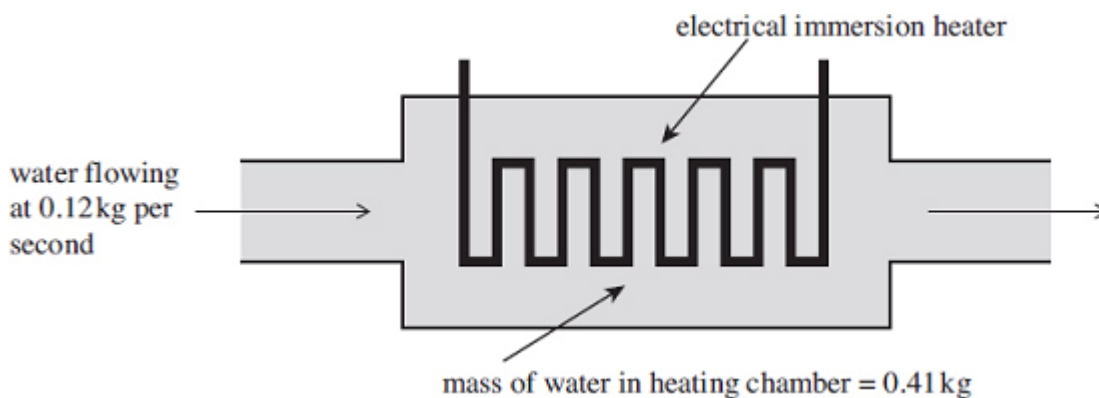
mass _____ kg

(3)

(Total 10 marks)

Q2.

An electrical immersion heater supplies 8.5 kJ of energy every second. Water flows through the heater at a rate of 0.12 kg s^{-1} as shown in the figure below.



- (a) Assuming all the energy is transferred to the water, calculate the rise in temperature of the water as it flows through the heater.

specific heat capacity of water = $4200 \text{ J kg}^{-1} \text{ K}^{-1}$

answer = _____ K

(2)

- (b) The water suddenly stops flowing at the instant when its average temperature is $26 \text{ }^\circ\text{C}$. The mass of water trapped in the heater is 0.41 kg. Calculate the time taken for the water to reach $100 \text{ }^\circ\text{C}$ if the immersion heater continues supplying energy at the same rate.

answer = _____ s
(2)
(Total 4 marks)

Q3.

(a) The pressure inside a bicycle tyre of volume $1.90 \times 10^{-3} \text{ m}^3$ is $3.20 \times 10^5 \text{ Pa}$ when the temperature is 285 K.

(i) Calculate the number of moles of air in the tyre.

answer = _____ mol
(1)

(ii) After the bicycle has been ridden the temperature of the air in the tyre is 295 K. Calculate the new pressure in the tyre assuming the volume is unchanged. Give your answer to an appropriate number of significant figures.

answer = _____ Pa
(3)

(b) Describe **one** way in which the motion of the molecules of air inside the bicycle tyre is similar and **one** way in which it is different at the two temperatures.

similar _____

different _____

(2)
(Total 6 marks)