

Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

Q1.

Our understanding of the atom has developed over time, from early models in which atoms were considered to be hard incompressible spheres, through to the nuclear model of the atom and the ladder model in which electrons exist in a discrete number of allowed energy states.

* The model of atoms as hard incompressible spheres, moving rapidly and randomly, can be used to explain why gases exert a pressure.

Explain, using ideas of momentum, why the pressure exerted by a gas increases as the temperature of the gas increases.

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(Total for question = 6 marks)

Q2.

Solar panels consisting of combinations of photovoltaic cells use energy in the radiation received from the Sun to generate electricity.

An advertisement for solar panels claims that the intensity of radiation from the Sun incident at the top of the Earth's atmosphere is more than 2 kW m^{-2} .

Assess the validity of this claim.

radius of Sun = $6.96 \times 10^8 \text{ m}$

surface temperature of Sun = 5790 K

distance from Sun to Earth = $1.50 \times 10^{11} \text{ m}$

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(Total for question = 4 marks)

Q3.

(a) Explain what is meant by internal energy of a liquid.

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(b) A cup of tea contains 175 g of water at a temperature of 85.0 °C. Milk at a temperature of 4.5 °C is added to the tea and the temperature of the mixture becomes 74.0 °C.

(i) Show that the internal energy of the water decreases by about 8 kJ as its temperature decreases.
Specific heat capacity of water = 4200 J kg⁻¹ K⁻¹

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(ii) Calculate the mass of milk that was added to the tea. State an assumption that must be made.
Specific heat capacity of milk = 3900 J kg⁻¹ K⁻¹

(3)

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Mass of milk =

Assumption

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(Total for question = 7 marks)