Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

A tray containing 0.20 kg of water at 20 °C is placed in a freezer.

(a) The temperature of the water drops to 0 °C in 10 minutes.

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

Calculate

(i) the energy lost by the water as it cools to 0 °C,

_____

_____

(ii) the average rate at which the water is losing energy, in J s^{-1}.

_____

_____

(3)

(b) (i) Estimate the time taken for the water at 0 °C to turn completely into ice.

specific latent heat of fusion of water = 3.3×10^5 J kg^{-1}

_____

_____

_____

(ii) State any assumptions you make.

_____

_____

_____

_____

(3)

(Total 6 marks)

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Q2.

(a) A cylinder of fixed volume contains 15 mol of an ideal gas at a pressure of 500 kPa and a temperature of 290 K.

(i) Show that the volume of the cylinder is 7.2×10^{-2} m^3**.**

_____

_____

(ii) Calculate the average kinetic energy of a gas molecule in the cylinder.

_____

_____

(4)

(b) A quantity of gas is removed from the cylinder and the pressure of the remaining gas falls to 420 kPa. If the temperature of the gas is unchanged, calculate the amount, in mol, of gas remaining in the cylinder.

_____

_____

_____

(2)

(c) Explain in terms of the kinetic theory why the pressure of the gas in the cylinder falls when gas is removed from the cylinder.

_____

_____

_____

_____

_____

(4)

(Total 10 marks)

Q3.

(a) A student immerses a 2.0 kW electric heater in an insulated beaker of water. The heater is switched on and after 120 s the water reaches boiling point.

The table below gives data collected during the experiment.

initial mass of beaker	25 g
initial mass of beaker and water	750 g
initial temperature of water	20 °C
final temperature of water	100 °C

Calculate the specific heat capacity of water if the thermal capacity of the beaker is negligible.

_____

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_____

_____

(4)

(b) The student in part (a) continues to heat the water so that it boils for 105 s. When the mass of the beaker and water is measured again, it is found that it has decreased by 94 g.

(i) Calculate a value for the specific latent heat of vaporisation of water.

_____

_____

(ii) State **two** assumptions made in your calculation.

_____

_____

(4)

(Total 8 marks)

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