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

Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Q1.

(a) Define the Avogadro constant.

_____

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_____

(1)

(b) (i) Calculate the mean kinetic energy of krypton atoms in a sample of gas at a temperature of 22 °C.

mean kinetic energy _____ J

(1)

(ii) Calculate the mean-square speed, $(c_{rms})^2$, of krypton atoms in a sample of gas at a temperature of 22 °C.
State an appropriate unit for your answer.

mass of 1 mole of krypton = 0.084 kg

mean-square speed_____ unit _____

(3)

(c) A sample of gas consists of a mixture of krypton and argon atoms.
The mass of a krypton atom is greater than that of an argon atom.
State and explain how the mean-square speed of krypton atoms in the gas compares with that of the argon atoms at the same temperature.

_____

_____

(2)
(Total 7 marks)

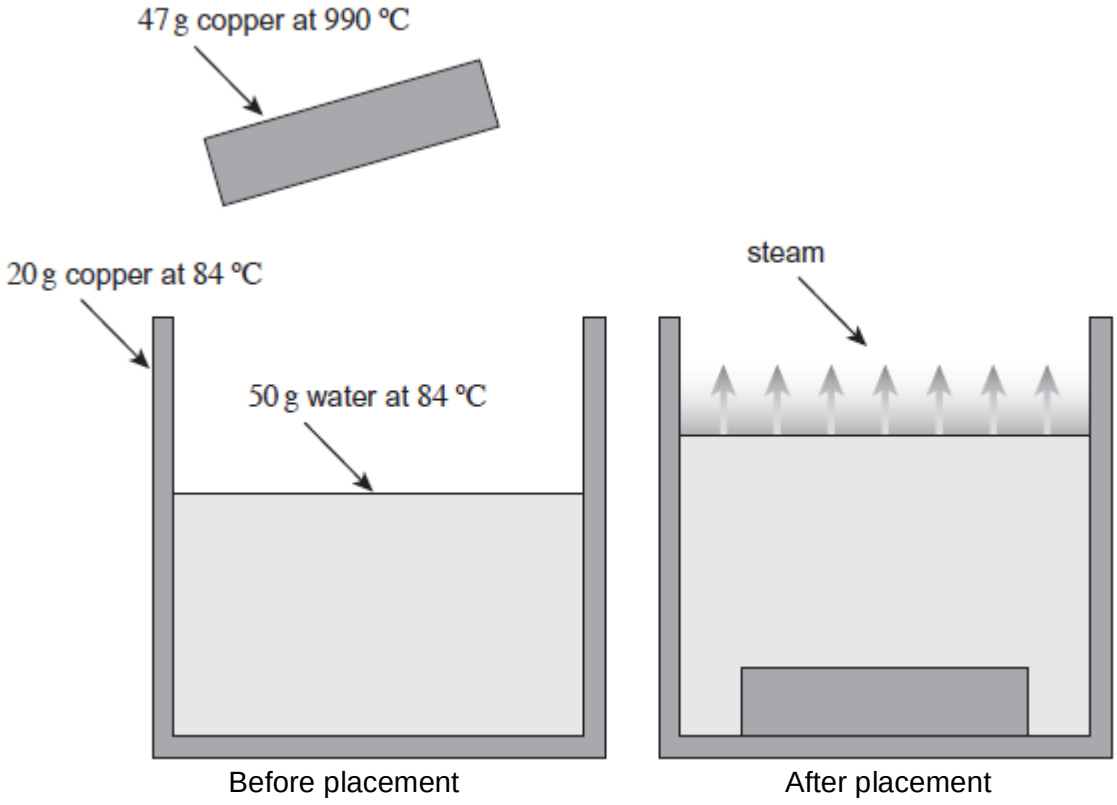
Q2.

(a) Define the specific latent heat of vaporisation of water.

(2)

(b) An insulated copper can of mass 20 g contains 50 g of water both at a temperature of 84 °C. A block of copper of mass 47 g at a temperature of 990 °C is lowered into the water as shown in the figure below. As a result, the temperature of the can and its contents reaches 100 °C and some of the water turns to steam.

specific heat capacity of copper = 390 J kg^{-1} K^{-1}
specific heat capacity of water = 4200 J kg^{-1} K^{-1}
specific latent heat of vaporisation of water = 2.3 × 10^6 J kg^{-1}



(i) Calculate how much thermal energy is transferred from the copper block as it cools to 100 °C.
Give your answer to an appropriate number of significant figures.

thermal energy transferred _____ J

(2)

(ii) Calculate how much of this thermal energy is available to make steam.
Assume no heat is lost to the surroundings.

available thermal energy _____ J

(2)

(iii) Calculate the maximum mass of steam that may be produced.

mass _____ kg

(1)

(Total 7 marks)

Q3.

A cola drink of mass 0.200 kg at a temperature of 3.0 °C is poured into a glass beaker. The beaker has a mass of 0.250 kg and is initially at a temperature of 30.0 °C.

specific heat capacity of glass = 840 J $kg^{-1}K^{-1}$
specific heat capacity of cola = 4190 J $kg^{-1}K^{-1}$

(i) Show that the final temperature, T_f, of the cola drink is about 8 °C when it reaches thermal equilibrium with the beaker.
Assume no heat is gained from or lost to the surroundings.

(2)

(ii) The cola drink and beaker are cooled from T_f to a temperature of 3.0 °C by adding ice at a temperature of 0 °C.
Calculate the mass of ice added.

Assume no heat is gained from or lost to the surroundings.

specific heat capacity of water = 4190 J kg^{-1} K^{-1}
specific latent heat of fusion of ice = 3.34×10^5 J kg^{-1}

mass _____ kg

(3)

(Total 5 marks)