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

Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

(a) Suggest **two** reasons why an α particle causes more ionisation than a β particle of the same initial kinetic energy.

You may be awarded marks for the quality of written communication in your answer.

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(2)

(b) A radioactive source has an activity of 3.2×10^{9} Bq and emits α particles, each with kinetic energy of 5.2 Me V. The source is enclosed in a small aluminium container of mass 2.0×10^{-4} kg which absorbs the radiation completely.

(i) Calculate the energy, in J, absorbed from the source each second by the aluminium container.

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(ii) Estimate the temperature rise of the aluminium container in **1 minute**, assuming no energy is lost from the aluminium.

specific heat capacity of aluminium = 900 J kg^{-1} K^{-1}

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(5)

(Total 7 marks)

Q2.

(a) (i) One of the assumptions of the kinetic theory of gases is that molecules make *elastic collisions.* State what is meant by an elastic collision.

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(ii) State **two** more assumptions that are made in the kinetic theory of gases.

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(3)

(b) One mole of hydrogen at a temperature of 420 K is mixed with one mole of oxygen at 320 K. After a short period of time the mixture is in *thermal equilibrium*.

(i) Explain what happens as the two gases approach and then reach thermal equilibrium.

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(ii) Calculate the average kinetic energy of the hydrogen molecules before they are mixed with the oxygen molecules.

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(4)

(Total 7 marks)

Q3.

A female runner of mass 60 kg generates thermal energy at a rate of 800 W.

(a) Assuming that she loses no energy to the surroundings and that the average specific heat capacity of her body is 3900 J $kg^{-1}K^{-1}$, calculate

(i) the thermal energy generated in one minute,

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(ii) the temperature rise of her body in one minute.

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(3)

(b) In practice it is desirable for a runner to maintain a constant temperature. This may be achieved partly by the evaporation of sweat. The runner in part (a) loses energy at a rate of 500 Wby this process.

Calculate the mass of sweat evaporated in one minute.

specific latent heat of vaporisation of water = 2.3×10^{6} J kg^{-1}

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(3)

(c) Explain why, when she stops running, her temperature is likely to fall.

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(2)

(Total 8 marks)