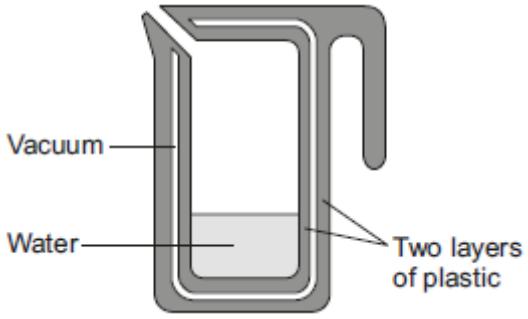
Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Q1.

A new design for a kettle is made from two layers of plastic separated by a vacuum.
After the water in the kettle has boiled, the water stays hot for at least 2 hours.

The new kettle is shown below.



(a) The energy transferred from the water in the kettle to the surroundings in 2 hours is 46 200 J.

The mass of water in the kettle is 0.50 kg.

The specific heat capacity of water is 4200 J/kg °C.

The initial temperature of the water is 100 °C.

Calculate the temperature of the water in the kettle after 2 hours.

_____

_____

_____

_____

Temperature after 2 hours = _____ °C

(3)

(b) Calculate the average power output from the water in the kettle to the surroundings in 2 hours.

_____

_____

_____

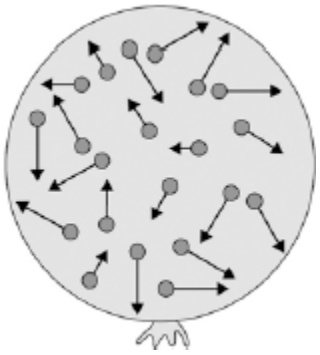
Average power output = _____ W

(2)

(Total 5 marks)

Q2.

The figure below shows a balloon filled with helium gas.



(a) Describe the movement of the particles of helium gas inside the balloon.

_____

_____

_____

_____

(2)

(b) What name is given to the total kinetic energy and potential energy of all the particles of helium gas in the balloon?

Tick **one** box.

External energy ☐

Internal energy ☐

Movement energy ☐

(1)

(c) Write down the equation which links density, mass and volume.

_____

(1)

(d) The helium in the balloon has a mass of 0.00254 kg.

The balloon has a volume of 0.0141 m^3.

Calculate the density of helium. Choose the correct unit from the box.

m^3 / kg	kg / m^3	kg m^3

_____

_____

_____

_____

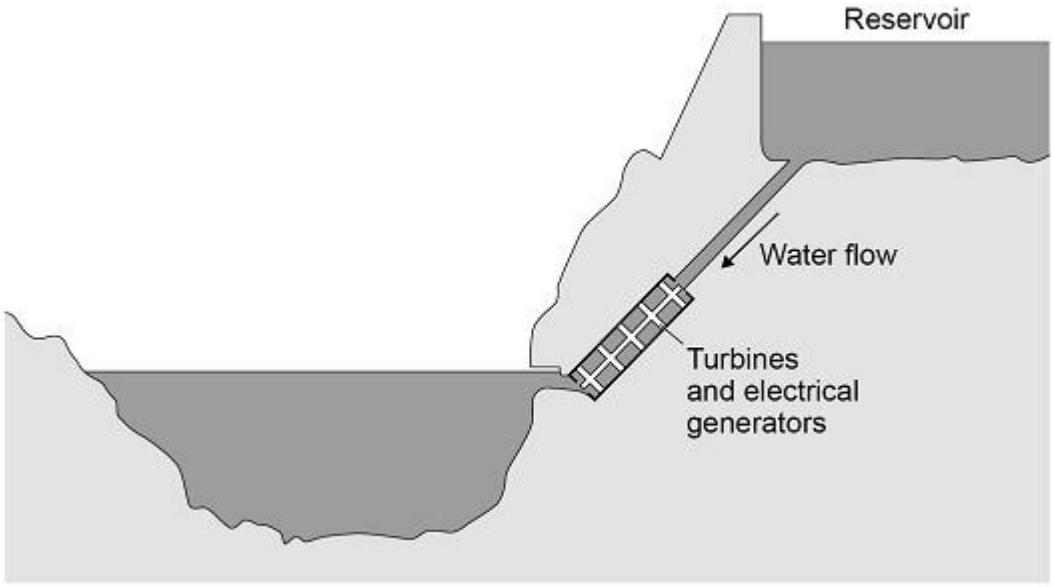
Density = _____ Unit _____

(3)

(Total 7 marks)

Q3.

The diagram below shows a hydroelectric power station.



Electricity is generated when water from the reservoir flows through the turbines.

(a) Write down the equation which links density (ρ), mass (m) and volume (V).

_____

(1)

(b) The reservoir stores 6 500 000 m^3 of water.

The density of the water is 998 kg/m^3.

Calculate the mass of water in the reservoir.

Give your answer in standard form.

_____

_____

_____

_____

_____

Mass (in standard form) = _____ kg

(4)

(c) Write down the equation which links energy transferred (E), power (P) and time (t).

_____

(1)

(d) The electrical generators can provide 1.5×10^9 W of power for a maximum of 5 hours.

Calculate the maximum energy that can be transferred by the electrical generators.

_____

_____

_____

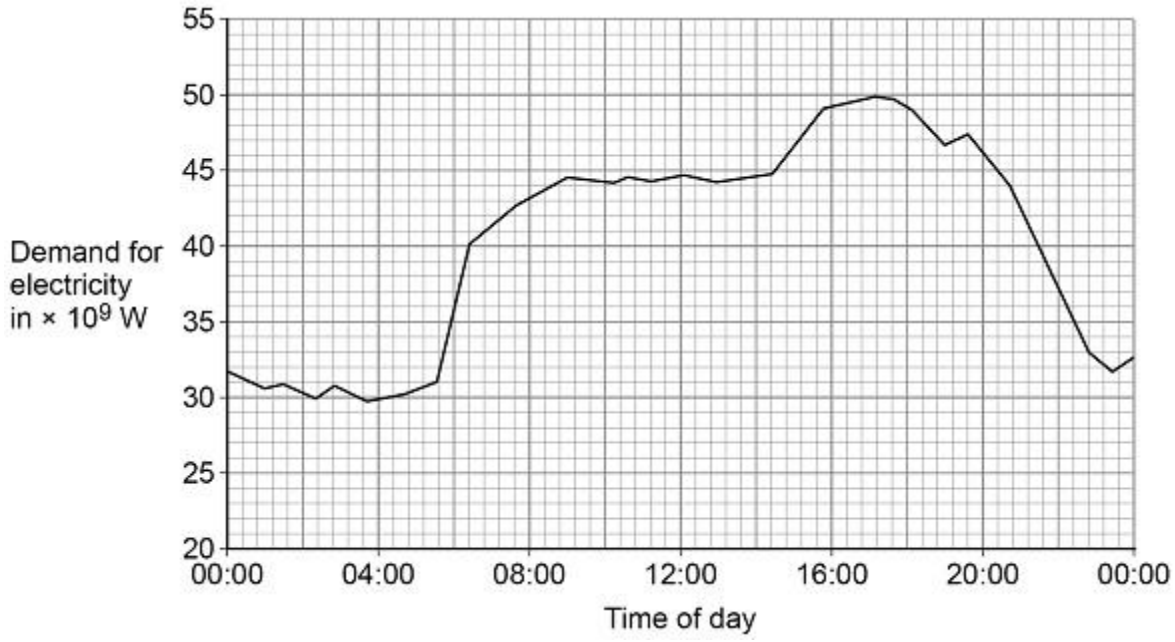
_____

_____

Energy transferred = _____ J

(3)

(e) The graph below shows how the UK demand for electricity increases and decreases during one day.



The hydroelectric power station in the above diagram can provide 1.5×10^9 W of power for a maximum of 5 hours.

Give **two** reasons why this hydroelectric power station is not able to meet the increase in demand shown between 04:00 and 16:00 in above graph.

1 _____

_____

_____

2 _____

_____

_____

(2)
(Total 11 marks)