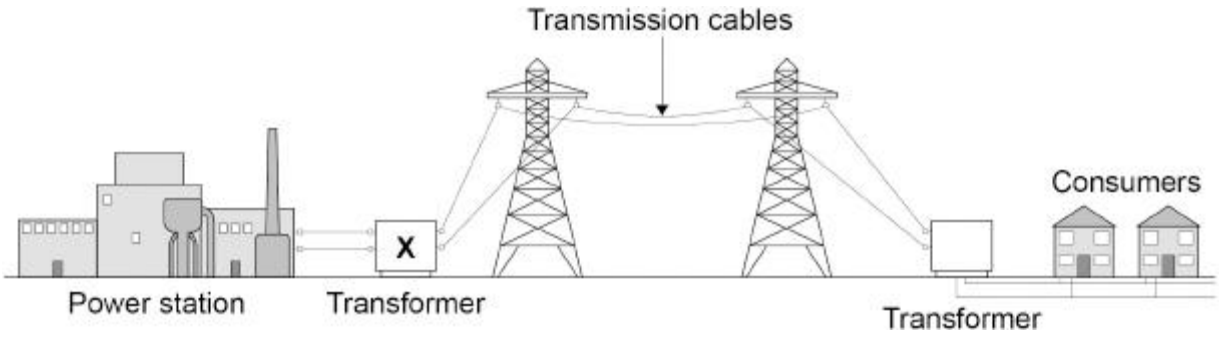
Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

The figure below shows how the National Grid connects a power station to consumers.



(a) Complete the sentences.

Transformer **X** causes the potential difference to _____.

Transformer **X** causes the current to _____.

(2)

Use the Physics Equations Sheet to answer parts (b) and (c).

(b) Which equation links current (*I*), power (*P*) and resistance (*R*)?

Tick (✓) **one** box.

$P = \frac{I}{R}$ ☐

$P = \frac{I}{R^2}$ ☐

$P = I^2 R$ ☐

$P = IR$ ☐

(1)

(c) A transmission cable has a power loss of 1.60×10^9 W.

The current in the cable is 2000 A.

Calculate the resistance of the cable.

_____

_____

_____

_____

_____

Resistance = _____ Ω

(3)

Use the Physics Equations Sheet to answer parts (d) and (e).

(d) Write down the equation which links efficiency, total energy input and useful energy output.

_____

(1)

(e) The total energy input to the National Grid from one power station is 34.2 GJ.

The National Grid has an efficiency of 0.992

Calculate the useful energy output from this power station to consumers in GJ.

_____

_____

_____

_____

_____

Useful energy output = _____ GJ

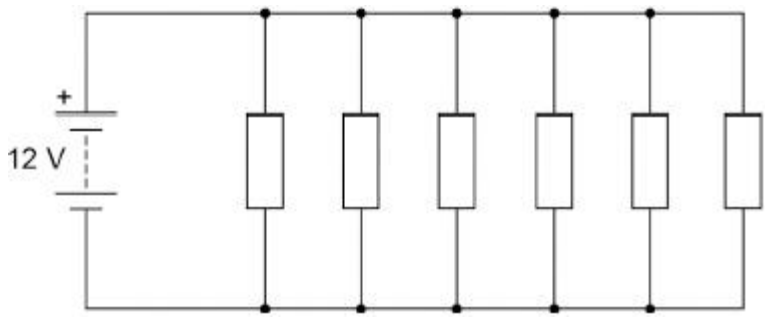
(3)

(Total 10 marks)

Q2.

The figure below shows an electrical circuit used to heat the windscreen of a car.

Each resistor in the circuit represents a heating element.



(a) The 12 V battery supplies direct potential difference.

What is meant by 'direct potential difference'?

_____

_____

_____

(1)

Use the Physics Equations Sheet to answer parts (b) and (c).

(b) Which equation links charge flow (*Q*), energy (*E*) and potential difference (*V*)?

Tick (✓) **one** box.

$E = \frac{V}{Q}$ ☐

$E = QV$ ☐

$E = \frac{Q}{V}$ ☐

$E = \frac{V^2}{Q}$ ☐

(1)

(c) Calculate the charge flow through the 12 V battery when the battery transfers 5010 J of energy.

_____

_____

_____

_____

_____

Charge flow = _____ C

(3)

(d) Ice forms on the windscreen at a temperature of 0 °C.

The electrical circuit transfers 5010 J of energy to the ice.

A mass of 0.015 kg of ice melts.

Calculate the specific latent heat of fusion of water.

Use the Physics Equations Sheet.

_____

_____

_____

Specific latent heat of fusion of water = _____ J/kg

(3)

(e) The electrical circuit was left switched on while the ice changed from a solid to a liquid and increased in temperature to 5 °C.

Explain the changes in the arrangement **and** movement of the particles as the ice melted and the temperature increased to 5 °C.

(6)

(Total 14 marks)