Name of the Student:_____

Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

The photograph below shows an electric car being recharged.



(a) The charging station applies a direct potential difference across the battery of the car.

What does 'direct potential difference' mean?

_____

_____

_____

(1)

(b) Which equation links energy transferred (*E*), power (*P*) and time (*t*)?

Tick (✓) **one** box.

$$\text{energy transferred} = \frac{\text{power}}{\text{time}}$$ ☐

$$\text{energy transferred} = \frac{\text{time}}{\text{power}}$$ ☐

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energy transferred = power × time ☐

energy transferred = power^2 × time ☐

(1)

(c) The battery in the electric car can store 162 000 000 J of energy.

The charging station has a power output of 7200 W.

Calculate the time taken to fully recharge the battery from zero.

_____

_____

_____

_____

_____

Time taken = _____ s

(3)

(d) Which equation links current (*I*), potential difference (*V*) and resistance (*R*)?

Tick (✓) **one** box.

$I = V \times R$ ☐

$I = V^2 \times R$ ☐

$R = I \times V$ ☐

$V = I \times R$ ☐

(1)

(e) The potential difference across the battery is 480 V.

There is a current of 15 A in the circuit connecting the battery to the motor of the electric car.

Calculate the resistance of the motor.

_____

_____

_____

_____

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Resistance = _____ Ω

(3)

(f) Different charging systems use different electrical currents.

- Charging system **A** has a current of 13 A.
- Charging system **B** has a current of 26 A.
- The potential difference of both charging systems is 230 V.

How does the time taken to recharge a battery using charging system **A** compare with the time taken using charging system **B**?

Tick (✓) **one** box.

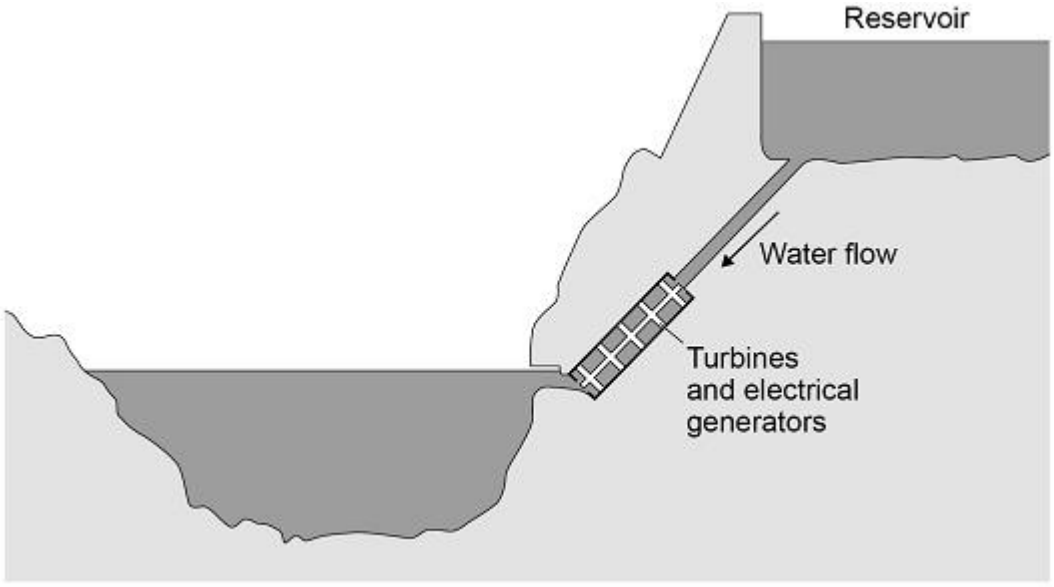
Time taken using system **A** is half the time of system **B**	☐
Time taken using system **A** is the same as system **B**	☐
Time taken using system **A** is double the time of system **B**	☐

(1)

(Total 10 marks)

Q2.

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)

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(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.

_____

_____

_____

_____

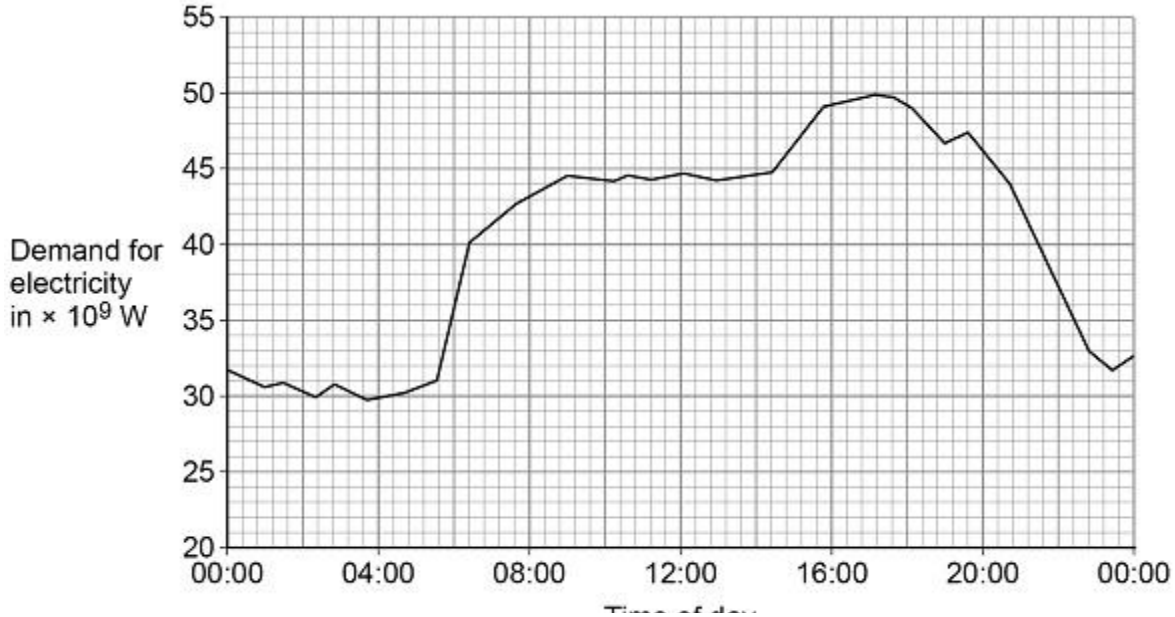
_____

Energy transferred = _____ J

(3)

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

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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)

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