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.

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

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

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.

_____

_____

_____

_____

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**	☐

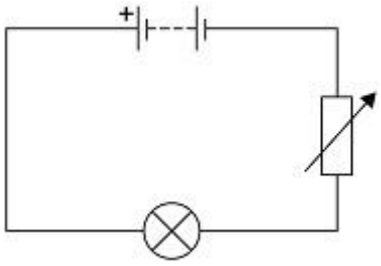
(1)

(Total 10 marks)

Q2.

A student investigated how the current in a filament lamp varied with the potential difference across the filament lamp.

The diagram below shows part of the circuit used.

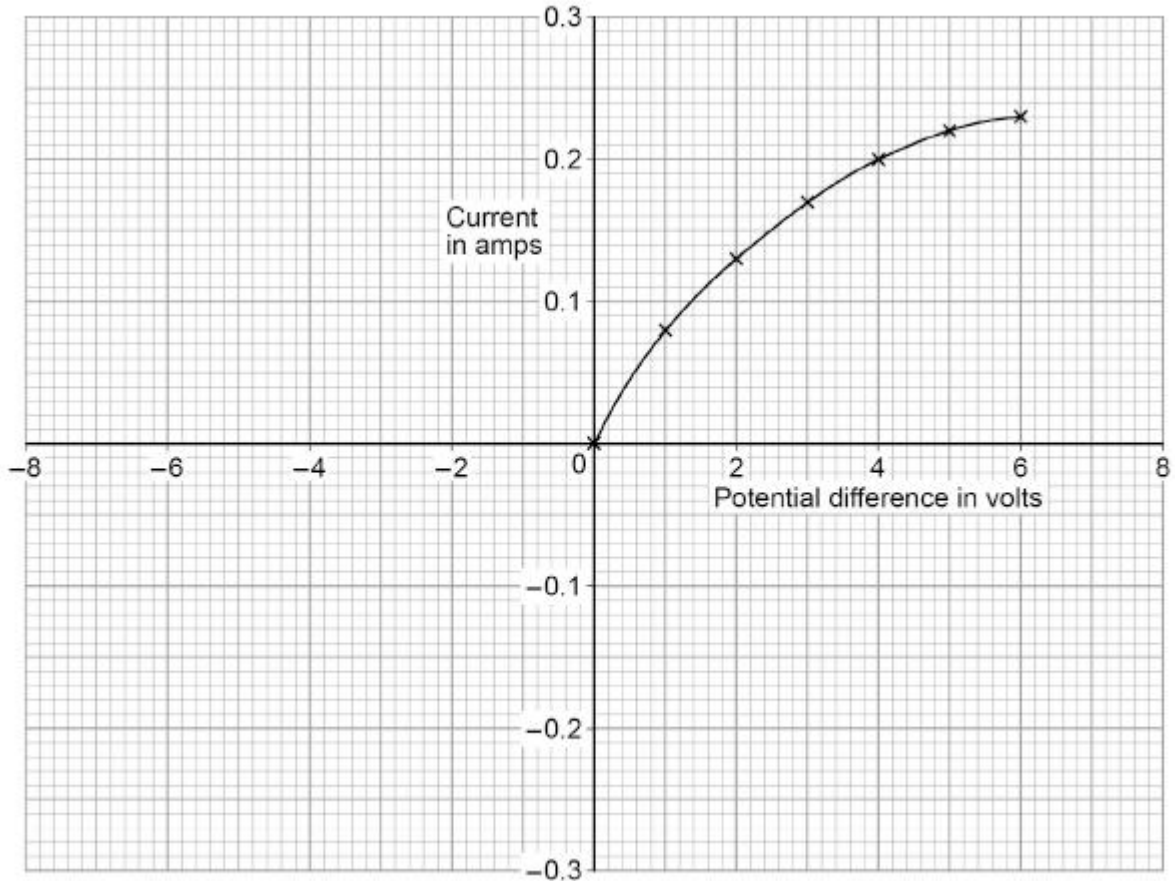


(a) Complete above diagram by adding an ammeter and a voltmeter.

Use the correct circuit symbols.

(3)

The graph below shows some of the results.



(b) The student reversed the connections to the power supply and obtained negative values for the current and potential difference.

Draw a line on the graph to show the relationship between the negative values of current and potential difference.

(2)

(c) Write down the equation which links current (I), potential difference (V) and resistance (R).

_____

(1)

(d) Determine the resistance of the filament lamp when the potential difference across it is 1.0 V.

Use data from the graph above.

_____

_____

_____

_____

Resistance = _____ Ω

(4)

(e) A second student did the same investigation. The ammeter used had a zero error.

What is meant by a zero error?

_____

_____

(1)

(Total 11 marks)