

Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Q1.

The image shows a girl riding a self-balancing scooter.



- (a) The scooter has an electric motor powered by a battery.

During the ride the battery transfers 15 000 C of charge.

The potential difference across the battery is 36 V

Calculate the energy transferred by the battery.

Use the equation:

$$\text{energy transferred} = \text{charge flow} \times \text{potential difference}$$

Give your answer in kJ

Energy transferred = _____ kJ

(3)

The table gives data for two scooters with different motors.

Both motors have the same efficiency.

| | Power of motor in W | Mass in kg |
|-----------|------------------------|---------------|
| Scooter A | 500 | 10.5 |
| Scooter B | 700 | 14.0 |

- (b) Explain why scooter **B** has a higher maximum speed.

(2)

- (c) Both scooters can be ridden for 20 minutes before the battery needs recharging.
Compare the amount of chemical energy stored in the batteries of each scooter.

(1)

- (d) Write the equation that links energy transferred, power and time.

(1)

- (e) Calculate the energy transferred by the motor in scooter **B** in 20 minutes.

Energy transferred = _____ J

(3)

(Total 10 marks)

Q2.

Most electrical appliances are connected to the mains electricity using three-core cables.

- (a) What is the approximate value of the potential difference of the UK mains electricity supply?

Tick **one** box.

23 V

☐

230 V

☐

300 V

☐

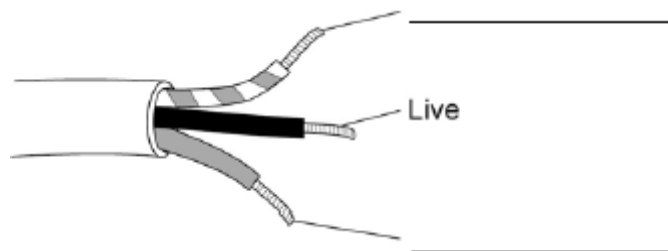
350 V

☐

(1)

- (b) **Figure 1** shows a three-core cable.

Figure 1



Use answers from the box to label the wires and complete **Figure 1**.

Earth

Negative

Neutral

(2)

- (c) In the UK the three wires in a three-core cable are always the same colours.

Why are the wires always the same colours?

Tick **one** box.

Each wire is made by a different company.

☐

It is easy to identify each wire.

☐

They are cheaper to manufacture.

☐

(1)

- (d) Touching the live wire is dangerous.

Use answers from the box to complete the sentences.

current

resistance

shock

force

voltage

Touching the live wire causes a large potential difference to exist across the body.

This causes a _____ through the body, which
results in an electric _____

(2)

- (e) What is the approximate frequency of the UK mains electricity supply?

Tick **one** answer.

50 Hz

☐

75 Hz

☐

100 Hz

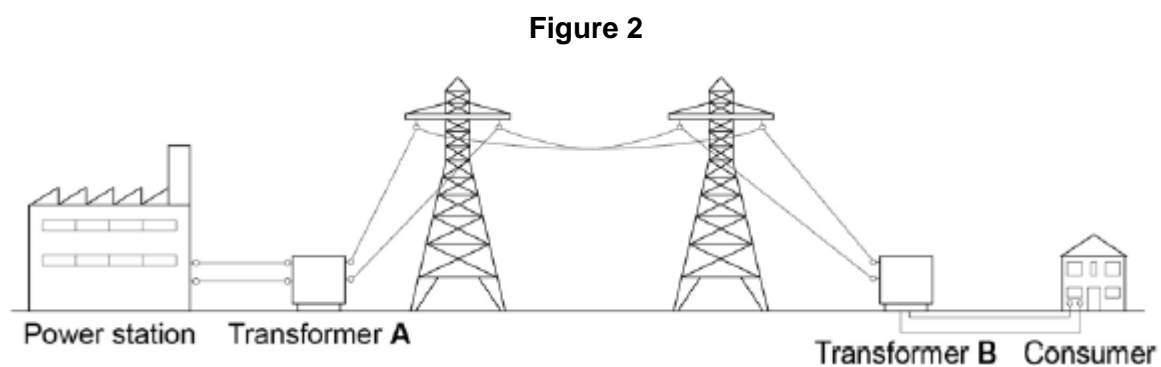
☐

150 Hz

☐

(1)

- (f) **Figure 2** shows how power stations transfer electrical power to consumers using the National Grid.



The power station generates electricity at a voltage of 25 kV.

Transformer **A** increases the voltage by a factor of 16.

What is the voltage output of transformer **A**?

Output voltage = _____ kV

(2)

- (g) Why is the voltage increased by transformer **A**?

Tick **one** box.

To reduce the energy lost due to heating ☐

To increase the power ☐

To increase the current ☐

(1)

(h) Why is it important that the voltage is decreased by transformer **B**?

Tick **one** box.

Less energy is used by consumers ☐

It is safer for consumers ☐

It reduces consumers' electricity bills ☐

(1)

(Total 11 marks)