

Topic 2 Electricity F

Name: _____

Class: _____

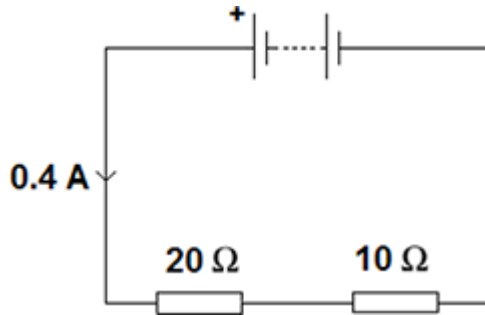
Date: _____

Time: **39 minutes**

Marks: **39 marks**

Comments:

Q1. An electrical circuit is shown in the figure below.



(a) The current in the circuit is direct current.

What is meant by direct current?

Tick **one** box.

Current that continuously changes direction.

Current that travels directly to the component.

Current that is always in the same direction.

(1)

(b) The equation which links current, potential difference and resistance is:

potential difference = current \times resistance

Calculate the potential difference across the battery in the circuit in the figure above.

.....

Potential difference = V

(3)

(c) The equation which links current, potential difference and power is:

power = current \times potential difference

Calculate the power output of the battery in the figure above.

Give your answer to one significant figure.

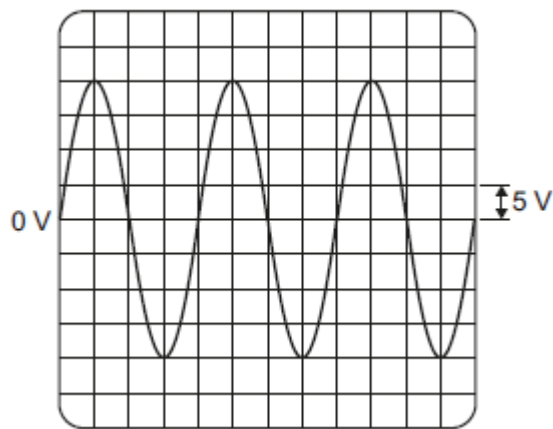
.....

Power = W

(2)
(Total 6 marks)

Q2.(a) **Figure 1** shows the oscilloscope trace an alternating current (a.c.) electricity supply produces.

Figure 1



One vertical division on the oscilloscope screen represents 5 volts.

Calculate the peak potential difference of the electricity supply.

.....

Peak potential difference = V

(1)

(b) Use the correct answer from the box to complete the sentence.

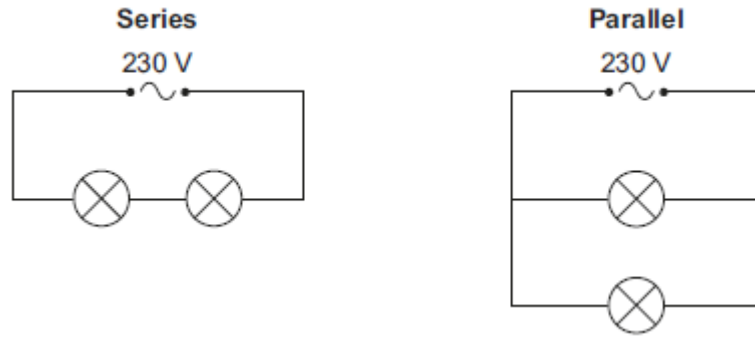
40	50	60
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In the UK, the frequency of the a.c. mains electricity supply is hertz.

(1)

(c) **Figure 2** shows how two lamps may be connected in series or in parallel to the 230 volt mains electricity supply.

Figure 2



- (i) Calculate the potential difference across each lamp when the lamps are connected in **series**.

The lamps are identical.

.....

Potential difference when in series = V

(1)

- (ii) What is the potential difference across each lamp when the lamps are connected in **parallel**?

Tick (✓) **one** box.

115 V 230 V 460 V

(1)

- (iii) Give **one** advantage of connecting the lamps in parallel instead of in series.

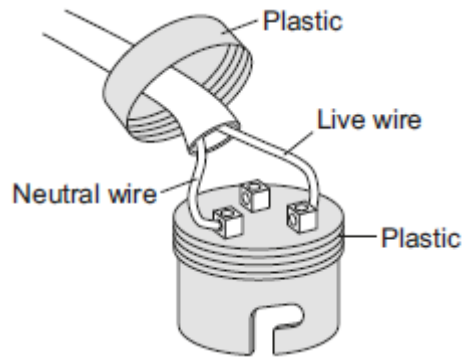
.....

.....

(1)

- (d) **Figure 3** shows the light fitting used to connect a filament light bulb to the mains electricity supply.

Figure 3



The light fitting does **not** have an earth wire connected.

Explain why the light fitting is safe to use.

.....

.....

.....

.....

(2)

(e) A fuse can be used to protect an electrical circuit.

Name a different device that can also be used to protect an electrical circuit.

.....

(1)

(Total 8 marks)

Q3. Many electrical appliances are connected to the mains supply using a three-core cable and a three-pin plug.

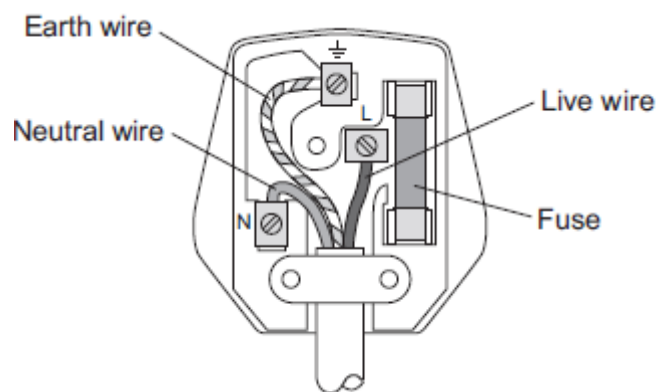
(a) Use the correct answer from the box to complete the sentence.

charge	energy	power
--------	--------	-------

Electric current is the rate of flow of

(1)

(b) The diagram shows a three-pin plug connected to a three-core cable.



- (i) The three wires of the three-core cable have different coloured coverings.
State the colour of the covering of the neutral wire.

.....

(1)

- (ii) Which **two** parts of the plug shown above protect the wiring of a circuit?
Tick (✓) **two** boxes.

	Tick (✓)
Earth wire	
Fuse	
Live wire	
Neutral wire	

(2)

- (c) Some electrical appliances are connected to the mains supply using a two-core cable and a three-pin plug. Appliances that are double insulated do not require all three wires.

- (i) What does 'double insulated' mean?

.....
.....

(1)

- (ii) State which of the three wires is **not** required.

.....

(1)

(d) (i) An electrical appliance is connected to a 20 V supply.

The current in the appliance is 3 A.

Calculate the power of the appliance.

.....
.....

Power = W

(2)

(ii) Another electrical appliance is connected to a 20 V supply.

The appliance transfers 300 J of energy.

Calculate the charge.

Give the unit.

.....
.....

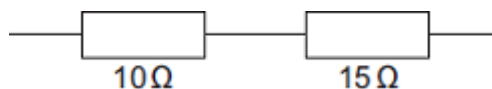
Charge =

Unit

(3)
(Total 11 marks)

Q4.(a) Electrical circuits often contain resistors.

The diagram shows **two** resistors joined in series.



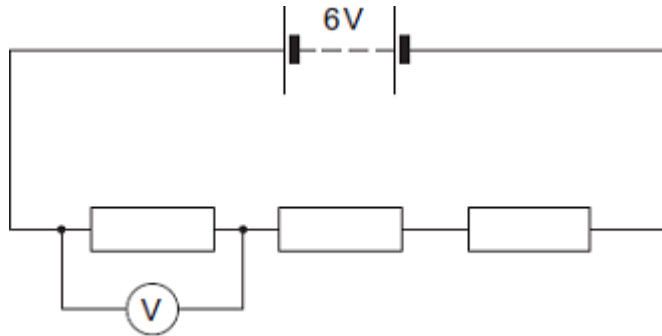
Calculate the total resistance of the **two** resistors.

.....

Total resistance = Ω

(1)

(b) A circuit was set up as shown in the diagram. The three resistors are identical.



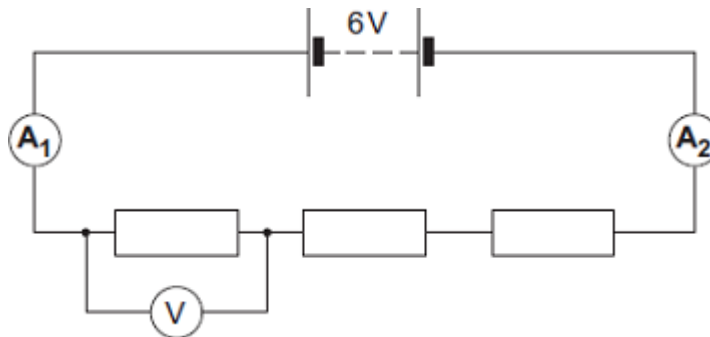
(i) Calculate the reading on the voltmeter.

.....

Reading on voltmeter = V

(2)

(ii) The same circuit has now been set up with two ammeters.



Draw a ring around the correct answer in the box to complete the sentence.

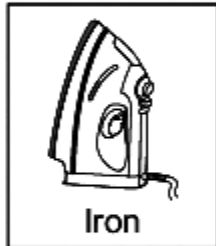
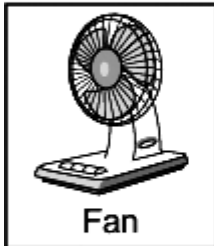
The reading on ammeter A_2 will be

smaller than
equal to
greater than

 the reading on ammeter A_1 .

(1)
 (Total 4 marks)

Q5. The appliances shown below transfer electrical energy to other types of energy.



(a) The vacuum cleaner is designed to transfer electrical energy to kinetic energy.

Three more of the appliances are also designed to transfer electrical energy to kinetic energy. Which **three**?

Draw a ring around each correct appliance.

3

(b) Which **two** of the following statements are true?

Tick (✓) **two** boxes.

Appliances only transfer part of the energy usefully.

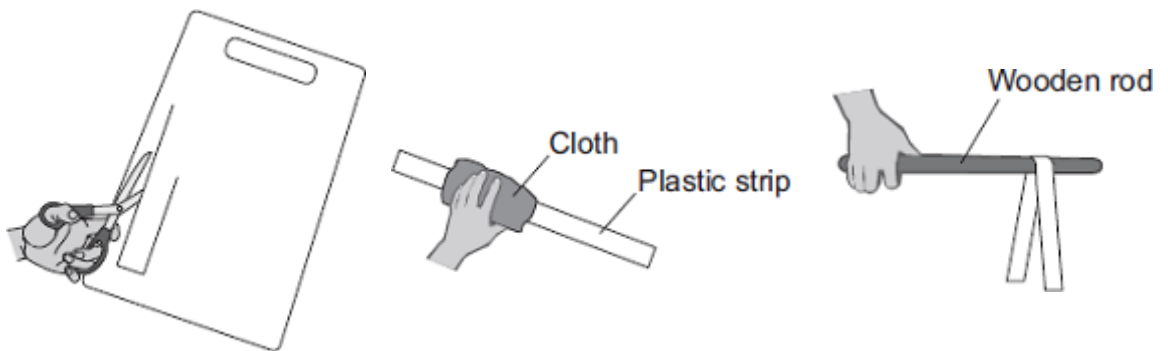
The energy transferred by appliances will be destroyed.

The energy transferred by appliances makes the surroundings warmer.

The energy output from an appliance is bigger than the energy input.

(2)
(Total 5 marks)

Q6.(a) A student uses some everyday items to investigate static electricity.



1 A strip of plastic is cut from a plastic carrier bag

2 The plastic strip is rubbed with a cloth

3 The plastic strip is hung over a wooden rod

(i) Draw a ring around the correct answer in the box to complete each sentence.

Rubbing the plastic strip with a cloth causes the strip to become negatively charged.

This happens because

electrons
neutrons
protons

 move from the cloth onto the plastic strip.

The cloth is left with

a negative
a positive
zero

 charge.

(2)

- (ii) When the plastic strip is hung over the wooden rod, the two halves of the strip move equally away from each other.

What **two** conclusions should the student make about the forces acting on the two halves of the plastic strip?

1

.....

2

.....

(2)

- (b) Electrical charges move more easily through some materials than through other materials.

Through which **one** of the following materials would an electrical charge move most easily?

Draw a ring around your answer.

aluminium

glass

rubber

(1)

(Total 5 marks)

M1.(a) current that is always in the same direction 1

(b) total resistance = 30 (Ω) 1

$V = 0.4 \times 30$ 1

12 (V) 1

*allow 12 (V) with no working shown for 3 marks
an answer of 8 (V) or 4 (V) gains 2 marks only*

(c) $P = 0.4 \times 12 = 4.8$ 1

5 (W) 1

*allow 5 (W) with no working shown for 2 marks
allow 4.8 (W) with no working shown for 1 mark*

[6]

M2.(a) 20 1

(b) 50 1

(c) (i) 115

1

(ii) 230

1

(iii) if one goes out the other still works

or

brighter

accept power (output) is greater

can be switched on/off independently is insufficient

1

(d) the outside/casing is plastic

there is plastic around the wires is insufficient

it is plastic is insufficient

1

and plastic is an insulator

an answer the light fitting is double insulated gains both marks

1

(e) (residual current) circuit breaker

accept RCCB

accept RCBO

accept RCCD

accept RCB

accept miniature circuit breaker / MCB

trip switch is insufficient

breaker is insufficient

do not accept earth wire

1

[8]

M3.(a) charge

1

(b) (i) blue

1

(ii) earth wire

1

fuse

1

(c) (i) case is non-metal / non-conducting / plastic / insulator
must refer to case / outside of appliance
do not accept plastic coating / covering

1

(ii) earth (wire)

1

(d) (i) 60 (W)

P = 3 × 20 gains 1 mark
provided no subsequent step shown

2

(ii) 15

300 = 20 × Q
or
20 = 300 / Q gains 1 mark

2

C / coulombs

must clearly be upper case C accept J / V or As

1

[11]

M4.(a) 25(Ω)

1

(b) (i) 2(V)

allow 1 mark for showing a correct method, ie 6 / 3

2

(ii) equal to

1

[4]

M5. (a) fan

drill 1

washing machine
four circled including correct three scores 1 mark
five circled scores zero 1

(b) Appliances only transfer part of the energy usefully 1

The energy transferred by appliances makes the surroundings warmer 1

[5]

M6.(a) (i) electrons 1

a positive 1

(ii) (forces are) equal
accept (forces are)the same
forces are balanced is insufficient 1

(forces act in) opposite directions
accept (forces) repel
both sides have the same charge is insufficient 1

(b) aluminium 1

[5]

