Electricity

Total mark – 16

Question: 1

1 (a) A student rubs a rubber balloon against the sleeve of her woollen jumper. The balloon becomes negatively charged.

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

[1 mark]

electrons	neutrons	protons

The balloon becomes negatively charged because it gains _____ from the jumper.

1 (a) (ii) After charging the balloon, what is the overall charge left on the jumper?

[1 mark]

Tick (✓) **one** box.

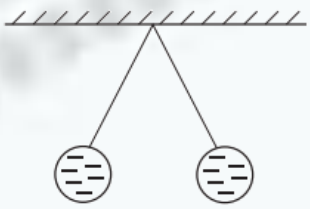
negative ☐

neutral ☐

positive ☐

1 (b) **Figure 1** shows two identically charged balloons hanging close together.

Figure 1



1 (b) (i) Complete the following sentence.

[1 mark]

The balloons carry the same type of charge and so _____ each other.

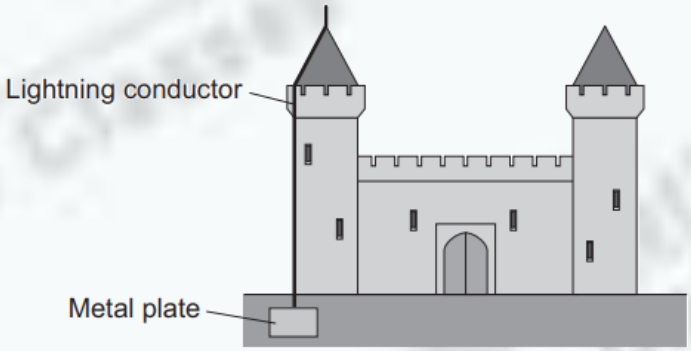
1 (b) (ii) From **Figure 1**, what can you conclude about the sizes of the **forces** acting on the balloons?

[1 mark]

_____

1 (c) A lightning conductor attached to the outside of a building reduces the risk of damage being caused to the building by a lightning strike.

Figure 2



If the building is struck by lightning the electrical charge flows through the lightning conductor to earth.

1 (c) (i) Through which one of the following materials can electrical charge flow easily?

Draw a ring around the correct answer.

[1 mark]

copper **plastic** **rubber**

1 (c) (ii) What happens to the temperature of a lightning conductor when electrical charge flows through it?

[1 mark]

Tick (✓) **one** box.

the temperature decreases ☐

the temperature does not change ☐

the temperature increases ☐

1 (c) (iii) During a lightning strike, 4 coulombs of charge flow through a lightning conductor in 0.002 seconds.

Calculate the current in the lightning conductor.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

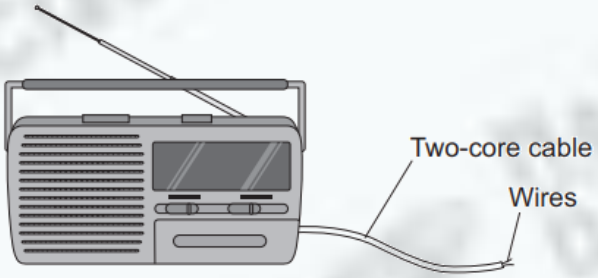
Current = _____ A

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	electrons		1	AO1 2.3.1b
1(a)(ii)	positive		1	AO1 2.3.1b
1(b)(i)	repel	accept a correct description eg push away from	1	AO1 2.3.1d
1(b)(ii)	(the forces are) equal (in magnitude)	accept in equilibrium accept balanced accept the same	1	AO3 2.3.1c
1(c)(i)	copper		1	AO1 2.3.1e
1(c)(ii)	the temperature increases		1	AO2 2.4.2a
1(c)(iii)	2000	allow **1** mark for correct substitution ie $I = \frac{4}{0.002}$ provided no subsequent step	2	AO2 2.3.2a
Total			**8**	

Question: 2

4 **Figure 5** shows a radio. The radio can be powered by connecting the two-core cable to the mains electricity supply.

Figure 5



4 (a) (i) What must be fitted to the cable before it can be connected to the mains electricity supply?

[1 mark]

.....

4 (a) (ii) There are only two wires inside the cable.
What are the names of the two wires inside the cable?

[1 mark]

Tick (✓) **one** box.

Earth and live ☐

Earth and neutral ☐

Live and neutral ☐

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

[1 mark]

double	**extra**	**fully**

It is safe to connect the radio to the mains electricity supply using a two-core cable because the radio is ..... insulated.

4 (b) The radio can also be powered by a battery.

What type of current does a battery supply?

[1 mark]

Tick (✓) **one** box.

Alternating current (a.c.) only ☐

Direct current (d.c.) only ☐

Both a.c. and d.c. ☐

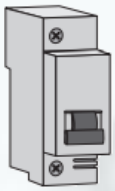
4 (c) **Figure 6** shows a fuse and a circuit breaker.

Fuses and circuit breakers are able to disconnect and switch off circuits.

Figure 6

Fuse

Circuit breaker



4 (c) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

earth	**live**	**neutral**

A fuse or a circuit breaker is connected to the ..... wire in a circuit.

4 (c) (ii) What happens to cause a fuse or circuit breaker to disconnect a circuit?

[1 mark]

.....

4 (c) (iii) Suggest **two** advantages of using a circuit breaker to disconnect a circuit compared with using a fuse.

[2 marks]

1 .....

.....

2 .....

.....

4(a)(i)	(3-pin) plug	do **not** accept plug socket	1	AO1 2.4.1d	**E**
4(a)(ii)	live and neutral		1	AO1 2.4.1e	**A**
4(a)(iii)	double		1	AO1 2.4.1j	**G**
4(b)	Direct current (d.c.) only		1	AO1 2.4.1a	**A**
4(c)(i)	live		1	AO1 2.4.1g	**G**
4(c)(ii)	too great a current flows	accept a surge of current accept too great a power accept an electrical fault do **not** accept voltage / energy / electricity too high	1	AO1 2.4.1g	**E**
4(c)(iii)	can be reset (disconnects circuit) faster	accept does not need replacing cheaper is insufficient does not melt is insufficient quicker to fix / replace is insufficient	1 1	AO2 2.4	**E**
Total			**8**		