AQA GCSE Physics | 8463

SPECIFICATION POINT 4.2.3.1

Direct and alternating potential difference

Past-paper questions

Tier	**Foundation**
Question groups	**14**
Available paper years	**2006–2023**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

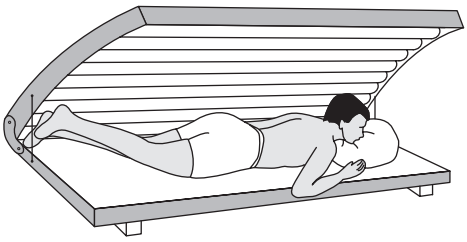
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.3.1 Direct and alternating potential difference

Question 01

June 2006 | 3451 | Original Q2 | Legacy

2 (a) The diagram shows a person using a sunbed.



(i) Which type of radiation is used in a sunbed to give a suntan?

Draw a ring around your answer.

infra red **light** **microwave** **ultraviolet**

(1 mark)

(ii) What can a high dose of radiation from a sunbed do to living cells?

.....

.....

(1 mark)

Question 01 · continued

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(b) The box contains the information shown on the side of a sunbed.

230 V	**1.8 kW**
50 Hz	**7.8 A**

(i) Which **one** of the following statements is true? Put a tick (✓) in the box next to your choice.

The sunbed uses an alternating current (a.c.) electricity supply. ☐

A 5 amp fuse should be used in the plug of the sunbed. ☐

The sunbed transfers 1.8 joules of energy every second. ☐

(1 mark)

(ii) In one week the sunbed is used for a total of 6 hours.

Use the following equation to calculate the number of units of energy transferred by the sunbed in 6 hours.

Show clearly how you work out your answer.

energy transferred (kilowatt-hour, kWh) = power (kilowatt, kW) × time (hour, h)

.....

.....

Energy transferred = ... kWh

(2 marks)

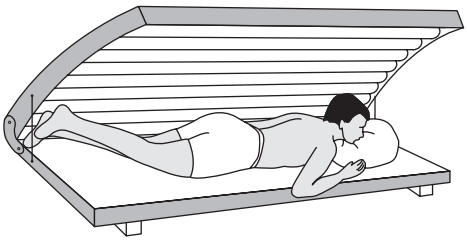
5

4.2.3.1 Direct and alternating potential difference

Question 02

June 2006 | 3462 | Original Q2 | Legacy

2 (a) The diagram shows a person using a sunbed.



(i) Which type of radiation is used in a sunbed to give a suntan?

Draw a ring around your answer.

infra red **light** **microwave** **ultraviolet**

(1 mark)

(ii) What can a high dose of radiation from a sunbed do to living cells?

.....

.....

(1 mark)

Question 02 · continued

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(b) The box contains the information shown on the side of a sunbed.

230 V	**1.8 kW**
50 Hz	**7.8 A**

(i) Which **one** of the following statements is true? Put a tick (✓) in the box next to your choice.

The sunbed uses an alternating current (a.c.) electricity supply. ☐

A 5 amp fuse should be used in the plug of the sunbed. ☐

The sunbed transfers 1.8 joules of energy every second. ☐

(1 mark)

(ii) In one week the sunbed is used for a total of 6 hours.

Use the following equation to calculate the number of units of energy transferred by the sunbed in 6 hours.

Show clearly how you work out your answer.

energy transferred (kilowatt-hour, kWh) = power (kilowatt, kW) × time (hour, h)

.....

.....

Energy transferred = ... kWh

(2 marks)

5

4.2.3.1 Direct and alternating potential difference

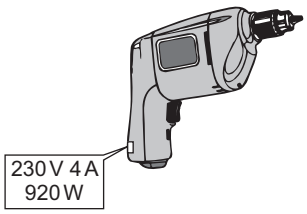
Question 03

4 (a) Look at this electrical safety information poster.

Get it right!
Choose the right fuse.

Most fuses are 3 A or 13 A.

To choose the right fuse you must know the power of the appliance.



Power is marked on the information plate.

Power over 700 W use a 13 A fuse.	Power under 700 W use a 3 A fuse.
• Fan heaters • Kettles • Dishwashers • Washing machines	• Radios • Table lamps • Portable TVs • Electric blankets

(i) Complete the table to show which size fuse, 3 A or 13 A, should be fitted to each of the appliances.

Appliance	Power rating	Fuse
Hairdryer	1600 W	
Electric saw	350 W	
Food mixer	1200 W	

(2 marks)

(ii) The plug of an electric kettle has been wrongly fitted with a 3 A fuse.

What will happen to the fuse when the kettle is switched on?

.....

.....

(1 mark)

4.2.3.1 Direct and alternating potential difference

Question 03 · continued

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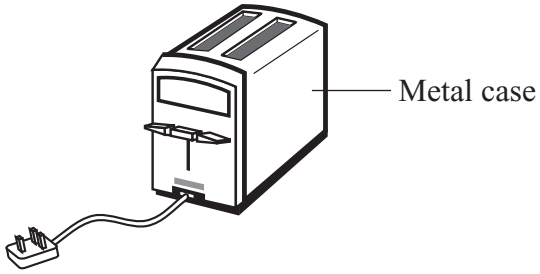
(b) The drawing shows a toaster, which takes a current of 4 A from the 230 V mains electricity supply.



(i) Use the equation in the box to calculate the power of the toaster.

Power (watt, W)	=	current (ampere, A)	×	potential difference (volt, V)

Show clearly how you work out your answer.

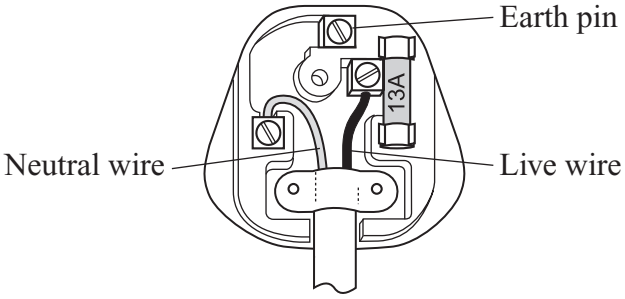
.....

.....

Power = ... W

(2 marks)

(ii) A householder rewires the toaster with a new cable and plug. The diagram shows how the new cable has been connected to the plug.



Explain why the toaster may **not** be safe to use.

.....

.....

.....

.....

(2 marks)

Question 4 continues on the next page

4.2.3.1 Direct and alternating potential difference

Question 03 · continued

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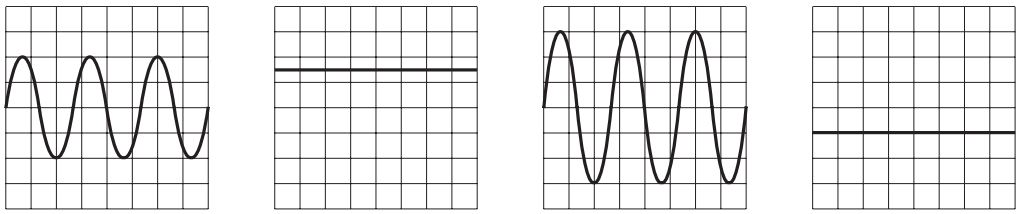
(c) The diagram shows the oscilloscope traces produced by four different electricity supplies. The settings on the oscilloscope are the same for each electricity supply.



K **L** **M** **N**

(i) Which **two** supplies give a direct current (d.c)?

..... and .....

(1 mark)

(ii) Supply **K** provides a peak potential difference of 6 V.

What is the peak potential difference provided by supply **M**?

.....

(1 mark)

9

4.2.3.1 Direct and alternating potential difference

Question 04

March 2009 | PHY1BP | Original Q9 | Legacy

QUESTION NINE

This question is about electromagnetic waves.

9A Changes may occur in substances when they absorb the energy carried by electromagnetic waves.

Which row in the table is correct?

	An alternating current is created in the substance	The substance becomes hotter
1	always	never
2	sometimes	always
3	sometimes	sometimes
4	never	sometimes

9B Radio waves travel in straight lines. However, some types of radio waves can be received on the opposite side of the Earth from the transmitter.

This happens because the radio waves are . . .

1 absorbed by the atmosphere.

2 interfered with by the atmosphere.

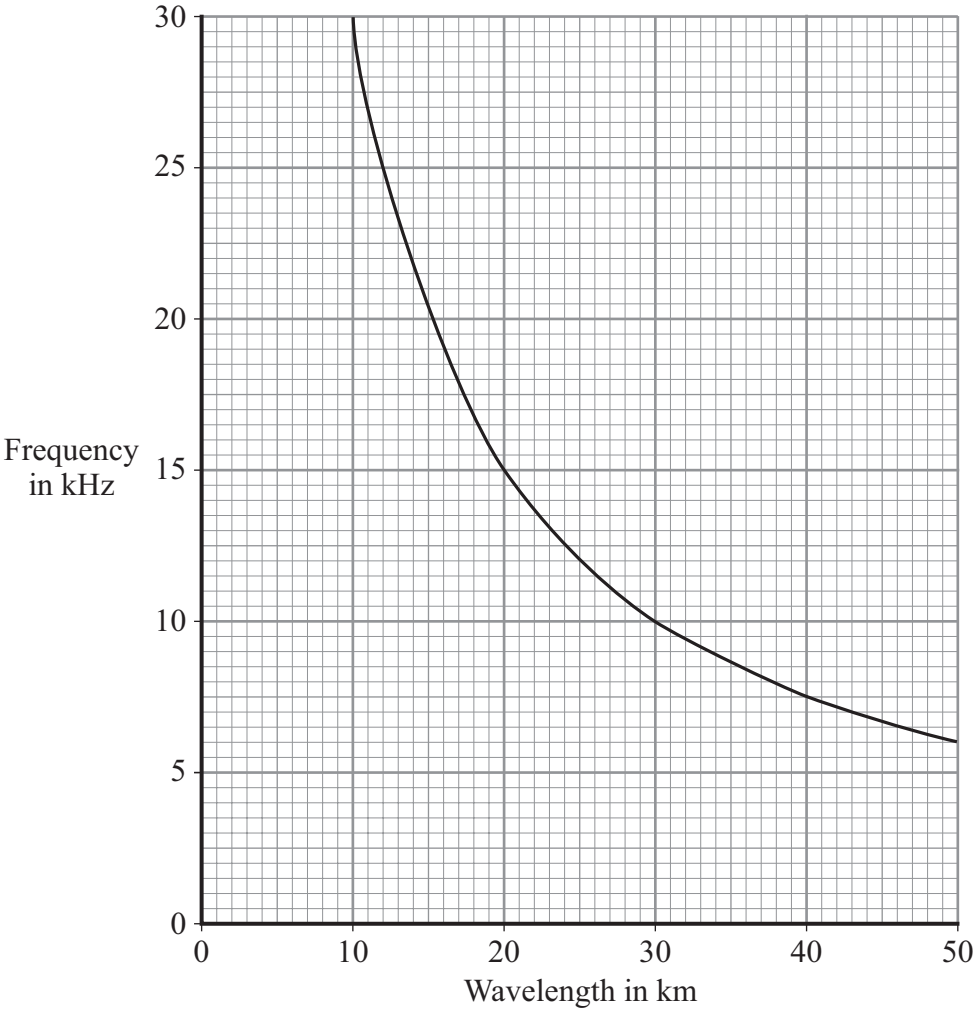
3 reflected by the atmosphere.

4 stopped by the atmosphere.

4.2.3.1 Direct and alternating potential difference

Question 04 · continued

The graph indicates how the frequency of electromagnetic waves changes with wavelength.



9C The graph shows that when the wavelength doubles, the frequency . . .

1 doubles.

2 halves.

3 quadruples.

4 stays the same.

9D What is the frequency of electromagnetic waves of wavelength 25 000 metres?

1 1.2 kHz

2 1.4 kHz

3 12 kHz

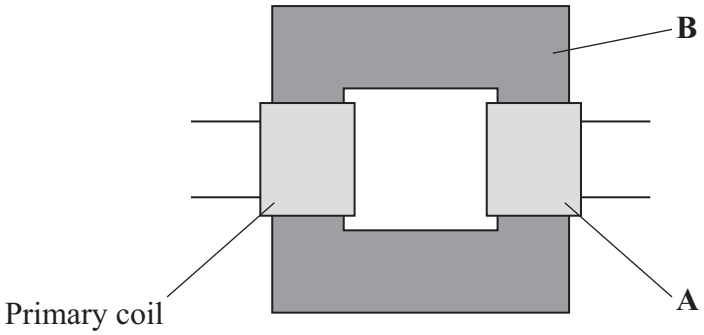
4 14 kHz

END OF TEST

4.2.3.1 Direct and alternating potential difference

Question 05

7 (a) The diagram shows a transformer.



7 (a) (i) What is part **A**?

.....

(1 mark)

7 (a) (ii) What is part **B** and what is it made of?

.....

.....

(2 marks)

7 (a) (iii) When there is an alternating current in the primary coil, what is produced in part **B**?

.....

.....

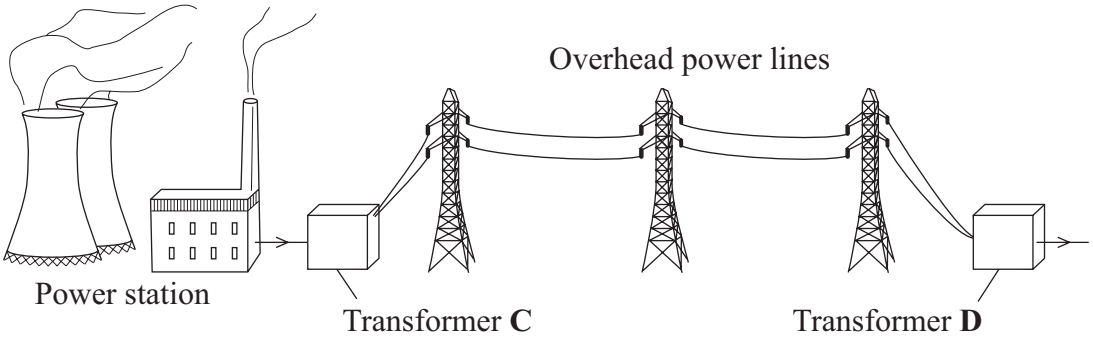
(2 marks)

4.2.3.1 Direct and alternating potential difference

Question 05 · continued

for mark

7 (b) Transformers are used in the National Grid. The diagram shows part of the National Grid.



Complete the **two** spaces in the sentence.

Transformer **C** is a ..... transformer and transformer **D** is

a ..... transformer. *(1 mark)*

7 (c) This is an item from a newspaper.

Health at risk from power lines?

Are high voltage power lines a health risk to people who live near them?

Some scientists think that scientific evidence shows that they are.

Other scientists do not think that the scientific evidence supports this conclusion.

Which **two** suggestions would reduce the possible risk to people's health?
Put a tick (✓) in the box next to your answers.

Do not build new houses near to existing power lines. ☐

Move the power lines so that they take the shortest routes. ☐

Move each power station to the centre of the nearest city. ☐

Build new power lines away from where people live. ☐

Use more transformers in the National Grid. ☐

(2 marks)

8

4.2.3.1 Direct and alternating potential difference

Question 06

June 2019 | PHY2F | Original Q2 | Legacy

2 Complete each of the following sentences, **A**, **B**, **C**, **D** and **E**, by choosing the correct ending from **K**, **L**, **M**, **N** or **O**.

The first one has been done for you.

A The current through a resistor depends ..... **O**

B A direct current ..... ☐

C In a series circuit, the potential difference ..... ☐

D An alternating current ..... ☐

E In a parallel circuit, the potential difference ..... ☐

K ..... across each component is the same.

L ..... is supplied by a cell or battery.

M ..... is constantly changing direction.

N ..... of the power supply is shared by the components.

O ..... on the potential difference across the resistor.

(3 marks)

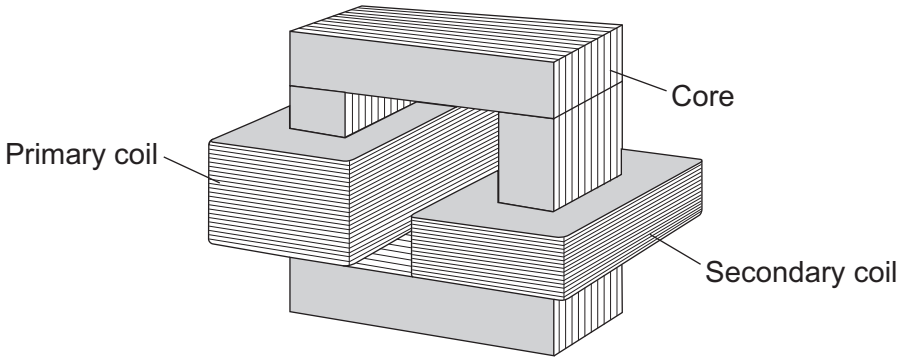
3

4.2.3.1 Direct and alternating potential difference

Question 07

June 2010 | PHY3F | Original Q4 | Legacy

4 A teacher demonstrates a small transformer.



4 (a) (i) What is the core made of?

Draw a ring around the correct word in the box.

aluminium	**copper**	**iron**

(1 mark)

4 (a) (ii) The potential difference (p.d.) across the secondary coil is less than the p.d. across the primary coil.

What sort of transformer is it?

.....

(1 mark)

4 (b) Where is a step-up transformer used as part of the National Grid?

.....

(1 mark)

4.2.3.1 Direct and alternating potential difference

Question 07 · continued

4 (c) The teacher writes a note about the transformer but leaves **five** spaces.

Use the correct words from the box to complete the spaces.

coil	**core**	**current**	**ends**	**field**	**wire**

A transformer works because an alternating ..... in the primary ..... produces a changing magnetic ..... in the ..... and then in the secondary coil.

This induces an alternating potential difference across the ..... of the secondary coil.

(5 marks)

8

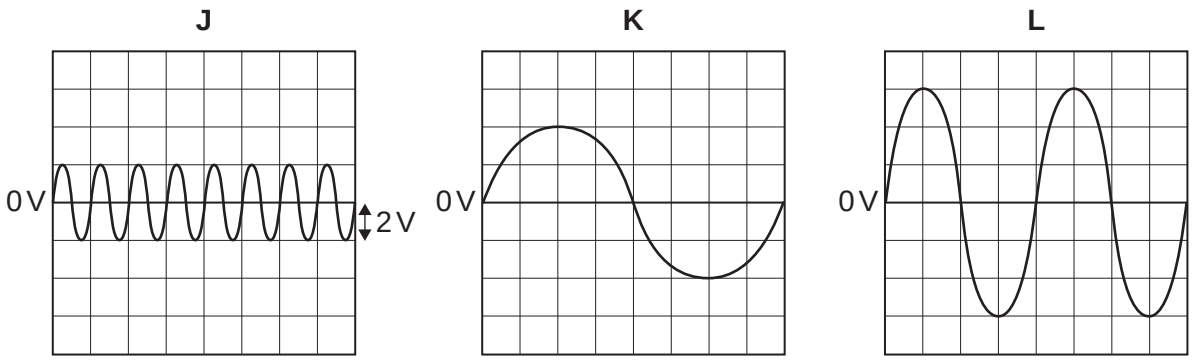
Turn over for the next question

4.2.3.1 Direct and alternating potential difference

Question 08

June 2013 | PH2FP | Original Q2 | Legacy

2 The diagrams show oscilloscope traces. Three different alternating current (a.c.) electricity supplies, **J**, **K** and **L**, produce these traces.



In each diagram, one vertical division on the oscilloscope screen represents 2 volts.

2 (a) Which **one** of the electricity supplies, **J**, **K** or **L**, has the largest peak potential difference?

Write your answer, **J**, **K** or **L**, in the box. ☐

(1 mark)

2 (b) Calculate the value of the largest peak potential difference.

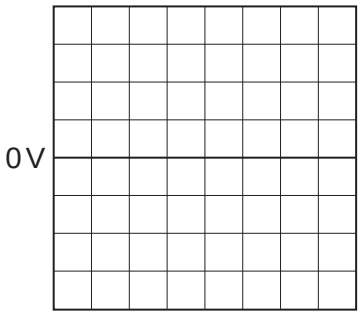
.....

Largest peak potential difference = ... V

(1 mark)

2 (c) The oscilloscope is now connected across a 3 V battery. The battery supplies direct current (d.c.). The settings on the oscilloscope are **not** changed.

On the diagram below draw the trace you would see on the oscilloscope screen.



(2 marks)

4

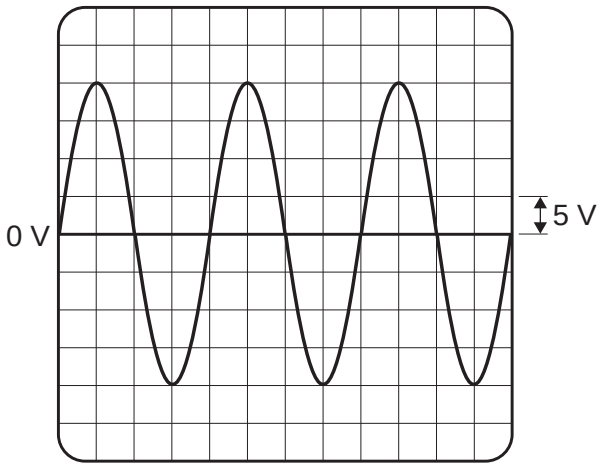
4.2.3.1 Direct and alternating potential difference

Question 09

June 2016 | PH2FP | Original Q2 | Legacy

2 (a) **Figure 2** shows the oscilloscope trace an alternating current (a.c.) electricity supply produces.

Figure 2



One vertical division on the oscilloscope screen represents 5 volts.

Calculate the peak potential difference of the electricity supply.

[1 mark]

_____

Peak potential difference = _____ V

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

[1 mark]

40	**50**	**60**

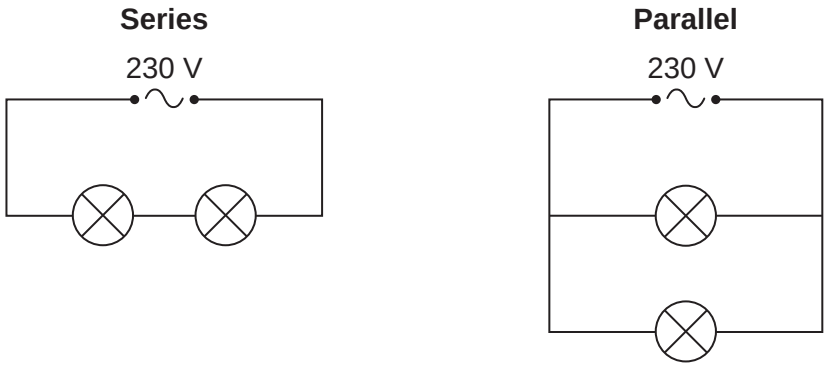
In the UK, the frequency of the a.c. mains electricity supply is _____ hertz.

4.2.3.1 Direct and alternating potential difference

Question 09 · continued

2 (c) **Figure 3** shows how two lamps may be connected in series or in parallel to the 230 volt mains electricity supply.

Figure 3



2 (c) (i) Calculate the potential difference across each lamp when the lamps are connected in **series**.
The lamps are identical.

[1 mark]

Potential difference when in series = _____ V

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

[1 mark]

Tick (✓) **one** box.

115 V ☐ 230 V ☐ 460 V ☐

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

[1 mark]

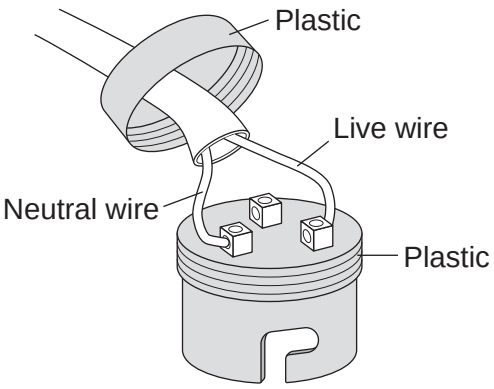
Question 2 continues on the next page

4.2.3.1 Direct and alternating potential difference

Question 09 · continued

2 (d) **Figure 4** shows the light fitting used to connect a filament light bulb to the mains electricity supply.

Figure 4



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

Explain why the light fitting is safe to use.

[2 marks]

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 mark]

8

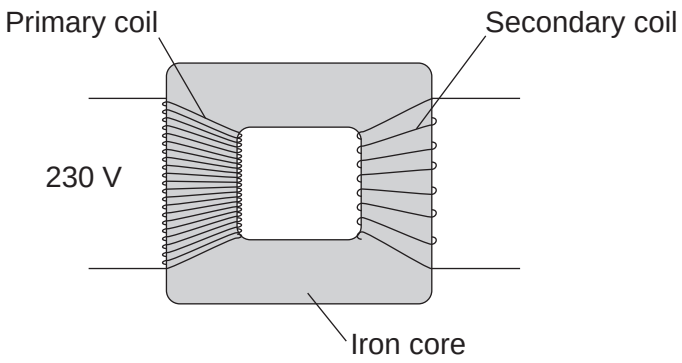
4.2.3.1 Direct and alternating potential difference

Question 10

June 2016 | PH3FP | Original Q9 | Legacy

9 **Figure 12** shows the structure of a traditional transformer.

Figure 12



9 (a) There is an alternating current in the primary coil of the transformer.

State what is produced in the iron core.

[2 marks]

_____

_____

9 (b) A transformer has only **one** turn of wire on the secondary coil.
The potential difference across the secondary coil is 11.5 V
The potential difference across the primary coil is 230 V

Calculate the number of turns on the primary coil.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

_____

_____

Number of turns on the primary coil = _____

Question 9 continues on the next page

4.2.3.1 Direct and alternating potential difference

Question 10 · continued

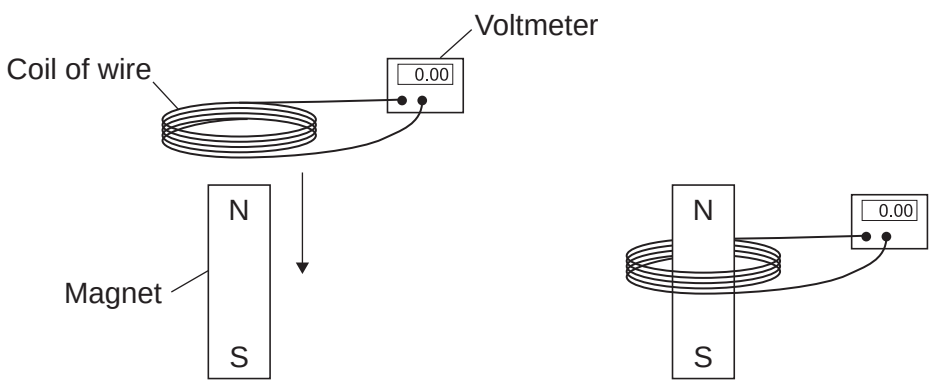
9 (c) In most transformers, the power output is less than the power input.

State why.

[1 mark]

9 (d) Two students investigated how magnets can be used to produce a potential difference. The students held a coil of wire above a magnet. The students quickly lowered the coil so that the magnet was inside the coil, as shown in **Figure 13**.

Figure 13



The students recorded the maximum potential difference for coils with different numbers of turns of wire. The results are shown in **Table 2**.

Table 2

Number of turns of wire in the coil	Maximum potential difference in volts	
	Results from student 1	Results from student 2
5	0.09	0.08
10	0.20	0.15
15	0.31	0.25
20	0.39	0.33
25	0.51	0.39

4.2.3.1 Direct and alternating potential difference

Question 10 · continued

June 2016 | PH3FP | Original Q9 | Legacy

9 (d) (i) State the resolution of the voltmeter.

Give **one** reason why the resolution of the voltmeter is suitable for this investigation.

[2 marks]

Resolution _____

Reason _____

_____

9 (d) (ii) The two students used exactly the same equipment to carry out their investigations. Both students recorded their results correctly.

Give the reason why student 2 got different results from student 1.

[1 mark]

_____

_____

9 (d) (iii) The students decided that even though the results were different, there was no need to repeat the investigation.

How do the results show that the investigation is reproducible?

[1 mark]

_____

_____

9 (d) (iv) State the name of the process which causes the potential difference to be produced in this investigation.

[1 mark]

_____

9 (e) A transformer has been developed that can be used with many different devices.

Suggest **one** advantage of having a transformer that can be used with many different devices.

[1 mark]

_____

_____

11

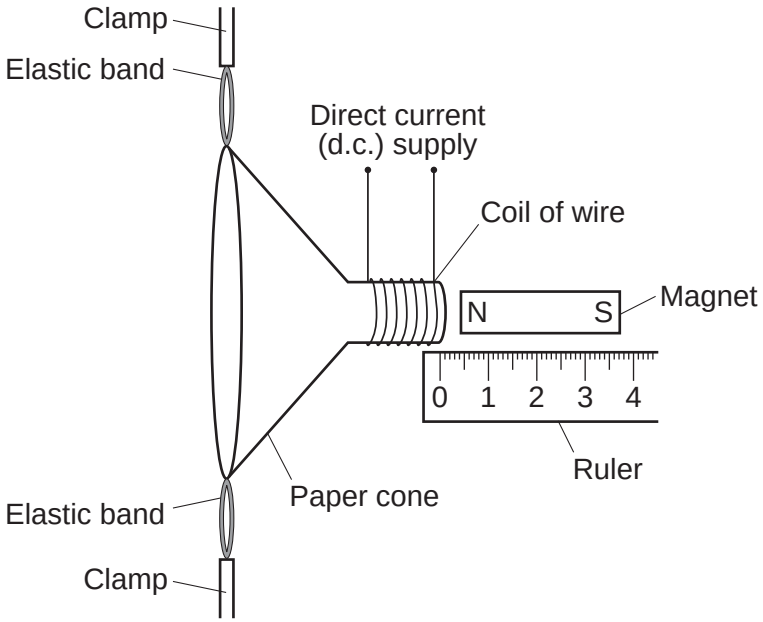
4.2.3.1 Direct and alternating potential difference

Question 11

June 2017 | PH3FP | Original Q7 | Legacy

7 **Figure 13** shows a loudspeaker made by a student. When there is a current in the coil the paper cone moves.

Figure 13



The student investigates how changing the size of the current in the coil of wire affects the distance moved by the paper cone.

7 (a) State **two** variables the student should control.

[2 marks]

1 _____

_____

2 _____

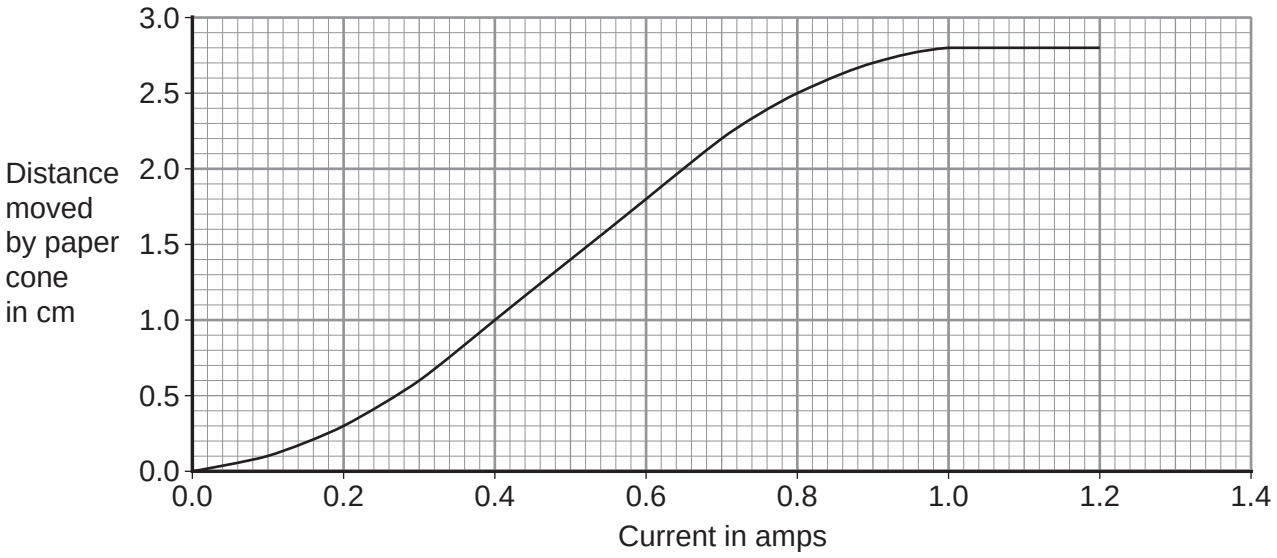
_____

4.2.3.1 Direct and alternating potential difference

Question 11 · continued

7 (b) The results of the student's investigation are shown in **Figure 14**.

Figure 14



7 (b) (i) When the current increases from 0.5 A to 0.9 A, how much does the distance moved increase?

[2 marks]

Increase in distance moved = _____ cm

7 (b) (ii) State **two** conclusions that can be made from the graph.

[2 marks]

1 _____

_____

2 _____

_____

6

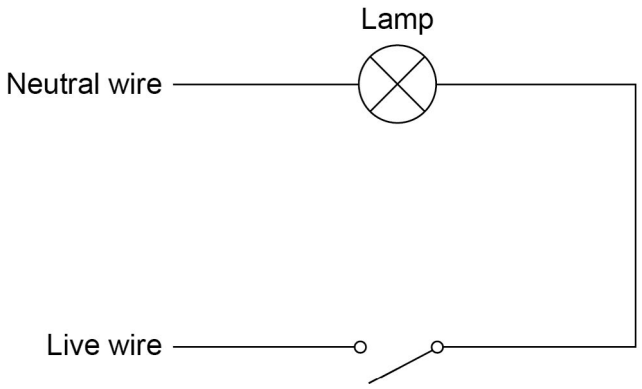
4.2.3.1 Direct and alternating potential difference

Question 12

November 2020 | 8463/1F | Original Q3

0 3 **Figure 5** shows part of a lighting circuit in a house.

Figure 5



0 3 . 1 What is the frequency of the ac mains electricity supply in the UK?

[1 mark]

Tick (✓) **one** box.

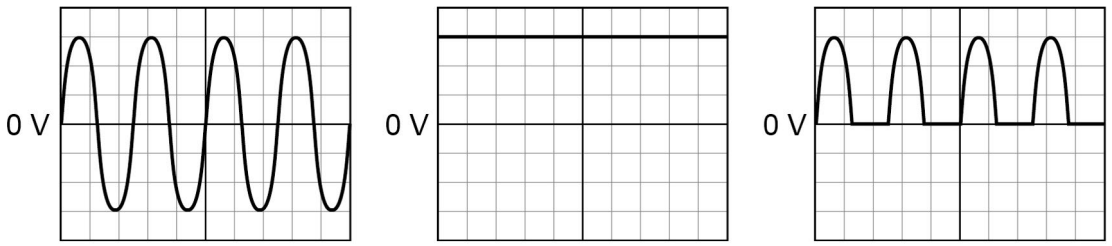
20 Hz ☐ 50 Hz ☐ 60 Hz ☐ 100 Hz ☐

0 3 . 2 The mains electricity supply has an alternating potential difference.

Which diagram shows an alternating potential difference?

[1 mark]

Tick (✓) **one** box.



☐ ☐ ☐

4.2.3.1 Direct and alternating potential difference

Question 12 · continued

0 3 . 3 The potential difference across the lamp is 230 V.

The current in the lamp is 0.020 A.

Calculate the power output of the lamp.

Use the equation:

power = potential difference × current

[2 marks]

Power = _____ W

0 3 . 4 The potential difference across the lamp is 230 V.

Calculate the energy transferred by the lamp when 180 C of charge flows through the lamp.

Use the equation:

energy transferred = charge flow × potential difference

[2 marks]

Energy transferred = _____ J

0 3 . 5 An electrician needs to replace the light switch in **Figure 5**.

Describe the possible hazard and the risk to the electrician of changing the light switch.

[2 marks]

Hazard _____

Risk _____

8

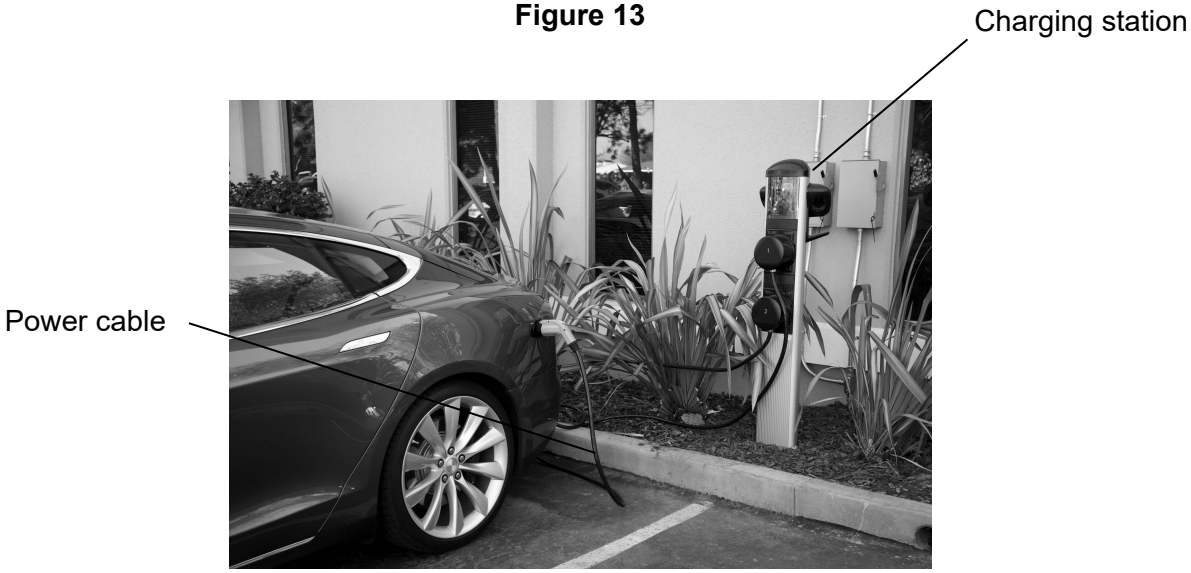
4.2.3.1 Direct and alternating potential difference

Question 13

November 2021 | 8463/1F | Original Q9

0 9 **Figure 13** shows an electric car being recharged.

Figure 13



0 9 . 1 The charging station applies a direct potential difference across the battery of the car.

What does 'direct potential difference' mean?

[1 mark]

Question 9 continues on the next page

4.2.3.1 Direct and alternating potential difference

Question 13 · continued

0 9 . 2 Which equation links energy transferred (*E*), power (*P*) and time (*t*)?

[1 mark]

Tick (✓) **one** box.

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

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

energy transferred = power × time ☐

energy transferred = power^2 × time ☐

0 9 . 3 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.

[3 marks]

Time taken = _____ s

4.2.3.1 Direct and alternating potential difference

Question 13 · continued

0 9 . 4 Which equation links current (I), potential difference (V) and resistance (R)?

[1 mark]

Tick (✓) **one** box.

$I = V \times R$ ☐

$I = V^2 \times R$ ☐

$R = I \times V$ ☐

$V = I \times R$ ☐

0 9 . 5 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.

[3 marks]

Resistance = _____ Ω

Question 9 continues on the next page

4.2.3.1 Direct and alternating potential difference

Question 13 · continued

0 9 . 6 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**?

[1 mark]

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** ☐

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4.2.3.1 Direct and alternating potential difference

Question 14

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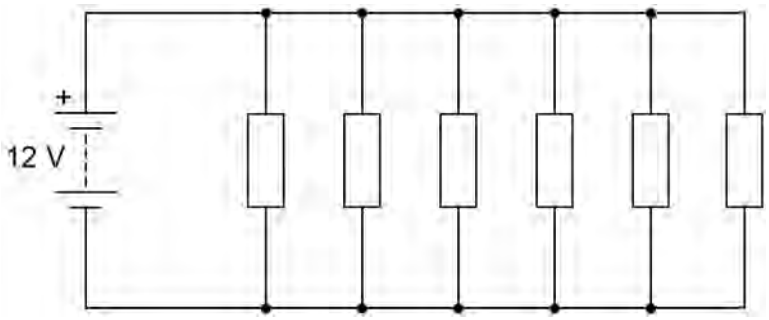
1 0 **Figure 14** shows an electrical circuit used to heat the windscreen of a car.

Each resistor in the circuit represents a heating element.

Figure 14



1 0 . 1 The 12 V battery supplies direct potential difference.

What is meant by 'direct potential difference'?

[1 mark]

Use the Physics Equations Sheet to answer questions **10.2** and **10.3**.

1 0 . 2 Which equation links charge flow (Q), energy (E) and potential difference (V)?

[1 mark]

Tick (✓) **one** box.

$E = \frac{V}{Q}$ ☐

$E = QV$ ☐

$E = \frac{Q}{V}$ ☐

$E = \frac{V^2}{Q}$ ☐

4.2.3.1 Direct and alternating potential difference

Question 14 · continued

1 0 . 3 Calculate the charge flow through the 12 V battery when the battery transfers 5010 J of energy.

[3 marks]

Charge flow = _____ C

1 0 . 4 Ice forms on the windscreen at a temperature of 0 °C.

The electrical circuit transfers 5010 J of energy to the ice.

A mass of 0.015 kg of ice melts.

Calculate the specific latent heat of fusion of water.

Use the Physics Equations Sheet.

[3 marks]

Specific latent heat of fusion of water = _____ J/kg

4.2.3.1 Direct and alternating potential difference

Question 14 · continued

10.5 The electrical circuit was left switched on while the ice changed from a solid to a liquid and increased in temperature to 5 °C.

Explain the changes in the arrangement **and** movement of the particles as the ice melted and the temperature increased to 5 °C.

[6 marks]

14