OCR
RECOGNISING ACHIEVEMENT

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A332/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
PHYSICS A
Unit 2 Modules P4 P5 P6 (Higher Tier)
SAMPLE ASSESSMENT MATERIALS
(From 2010 onwards)

Time: 40 minutes

Candidates answer on the question paper
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- A list of physics equations is printed on page two.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	4	
2	5	
3	5	
4	4	
5	3	
6	4	
7	5	
8	4	
9	3	
10	5	
TOTAL	42	

This document consists of **15** printed pages and **1** blank page.

TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful Relationships

Explaining Motion

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

momentum = mass x velocity

change of momentum = resultant force x time for which it acts

work done by a force = force x distance moved by the force

change in energy = work done

change in GPE = weight x vertical height difference

kinetic energy = ½ x mass x $[\text{velocity}]^2$

Electric Circuits

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{Number of turns in primary coil}}{\text{Number of turns in secondary coil}}$$

energy transferred = power x time

power = potential difference x current

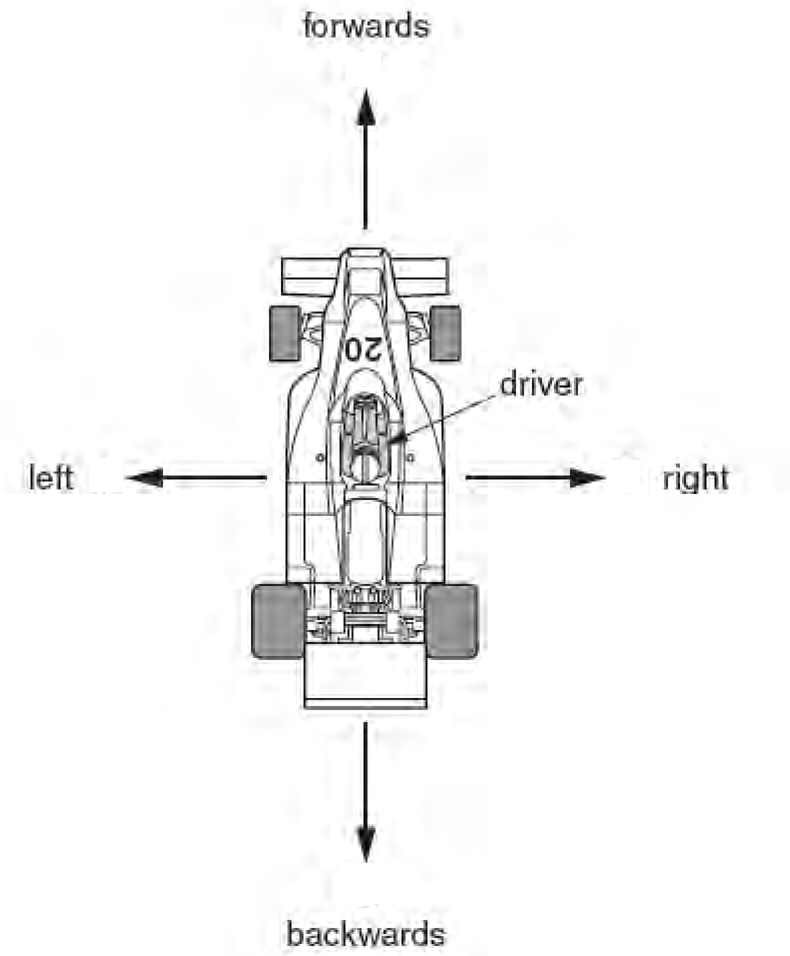
$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

The Wave Model of Radiation

wave speed = frequency x wavelength

Answer **all** the questions.

1 A driver in a car experiences forces in different directions as he drives forwards.



(a) Describe the forces acting **on the driver** as the car slows down and turns left at the same time.

....

....

.... **[2]**

(b) When the car speeds up in a straight line the driver and the car exert forces on each other.

Describe these forces.

....

....

.... **[2]**

[Total: 4]

2 Bobby throws a ball vertically in the air.

(a) The ball weighs 10 N.

How much gravitational potential energy is gained by the ball when it goes up 2.5 m?

Put a ring around the correct answer.

0.04 J **2.5 J** **4 J** **25 J** **40 J** **250 J**

[1]

(b) A different ball with a mass of 2.5 kg has a gravitational potential energy of 125 J at the top of the throw.

As the ball falls it loses gravitational potential energy, transferring it to kinetic energy.

Calculate the speed of the ball when it hits the ground.

You must show your calculations.

answer .... m / s **[3]**

(c) The velocity is actually less than that calculated by the equation in part (ii).

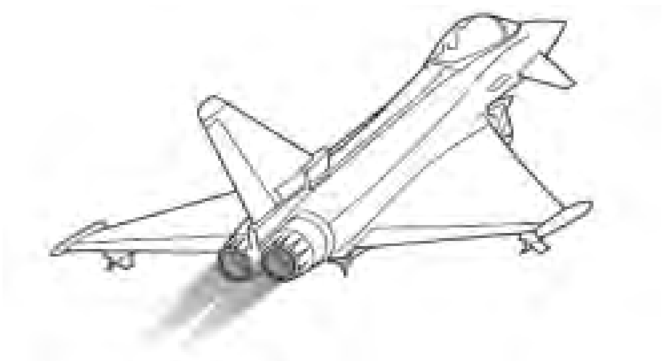
Explain why the velocity is actually less than that calculated by the equation.

....

.... **[1]**

[Total: 5]

3



A jet plane works by firing a stream of hot exhaust gas particles backwards.

(a) Some of the following statements are true and some are false. Complete the table with either **true** or **false**.

	true or **false**
The force on each gas particle equals the momentum of the jet plane.	
The change in momentum of the exhaust gas particles equals the change in momentum of the plane, ignoring air resistance.	
The force on one gas particle equals the total force on the jet plane.	
The change in momentum of the gas particles equals the force on the plane multiplied by the time for which it acts.	

[2]

(b) Explain how you would calculate the momentum of the exhaust gases.

You should include

- what information is needed
- how you would use this information to do the calculation.

....

....

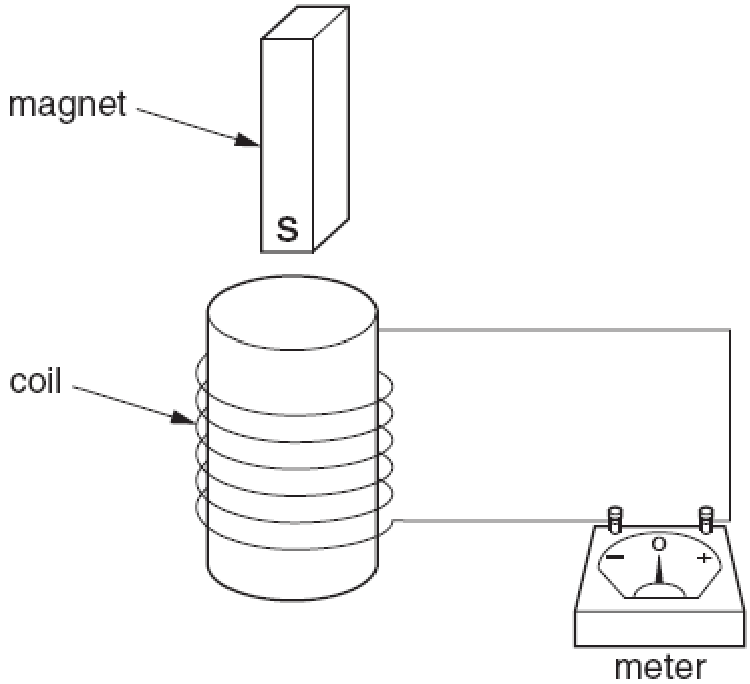
....

.... **[3]**

[Total: 5]

4 Electricity can be generated by moving a magnet in a coil of wire.

The diagram shows a magnet held above a coil of wire.



Experiments with this apparatus can show how the electricity is generated.

(a) Draw a straight line from each **experiment** to what **happens on the meter**.

The first line has been done for you.

experiment

- push the South end of the magnet into the coil
- pull the South end of the magnet out of the coil
- push the North end of the magnet into the coil
- hold the magnet still in the coil

what happens on the meter

- needle flicks to right
- needle does not move
- needle flicks to left

[3]

(b) What is the name for this method of producing a voltage?

Put a ring around the correct answer.

deduction **induction** **reduction** **transformation**

[1]

[Total: 4]

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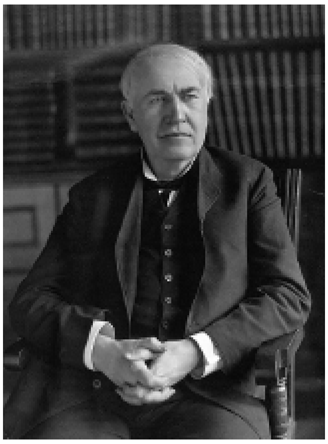
5



Thomas Edison was the first person to set up a company to provide electricity to houses. He used a direct current (d.c.) supply.

(a) We now use an alternating current (a.c.) electricity supply.

Explain why we use a.c. and not d.c.

Put ticks (✓) in the boxes next to the **two** correct explanations.

d.c. is old fashioned	☐
it is easier to generate a.c.	☐
Thomas Edison was unpopular so people would not buy his d.c. electricity	☐
a.c. can be distributed more efficiently	☐
d.c. is more expensive because it can only travel in straight lines	☐

[2]

(b) The main advantage of Thomas Edison's d.c. system was that it used low voltages.

He thought this was safer than a.c.

What is the voltage used for the mains supply to homes in the United Kingdom?

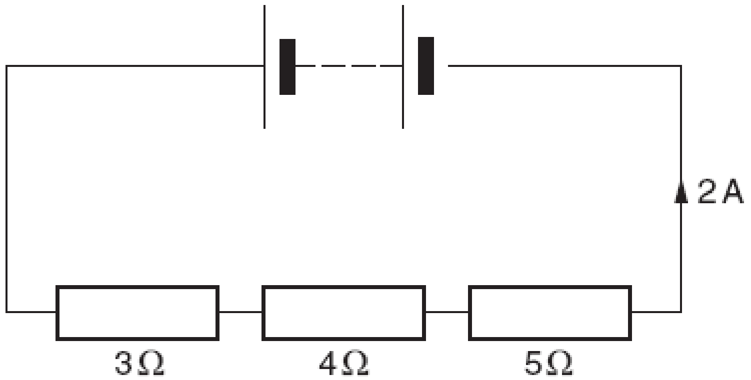
Put a ring around the correct answer.

12 V **120 V** **230 V** **11 000 V** **33 000 V**

[1]

[Total: 3]

6 This question is about resistors in a series circuit.



(a) What is the voltage across the 3 Ω resistor?

voltage = ... V **[1]**

(b) Which resistor will have the highest voltage across it?

Put a ring around the correct answer.

3 Ω **4 Ω** **5 Ω** **all the same**

[1]

(c) Which statements describe how to find the voltage across the battery?

Put a tick (✓) in each of the **two** correct boxes.

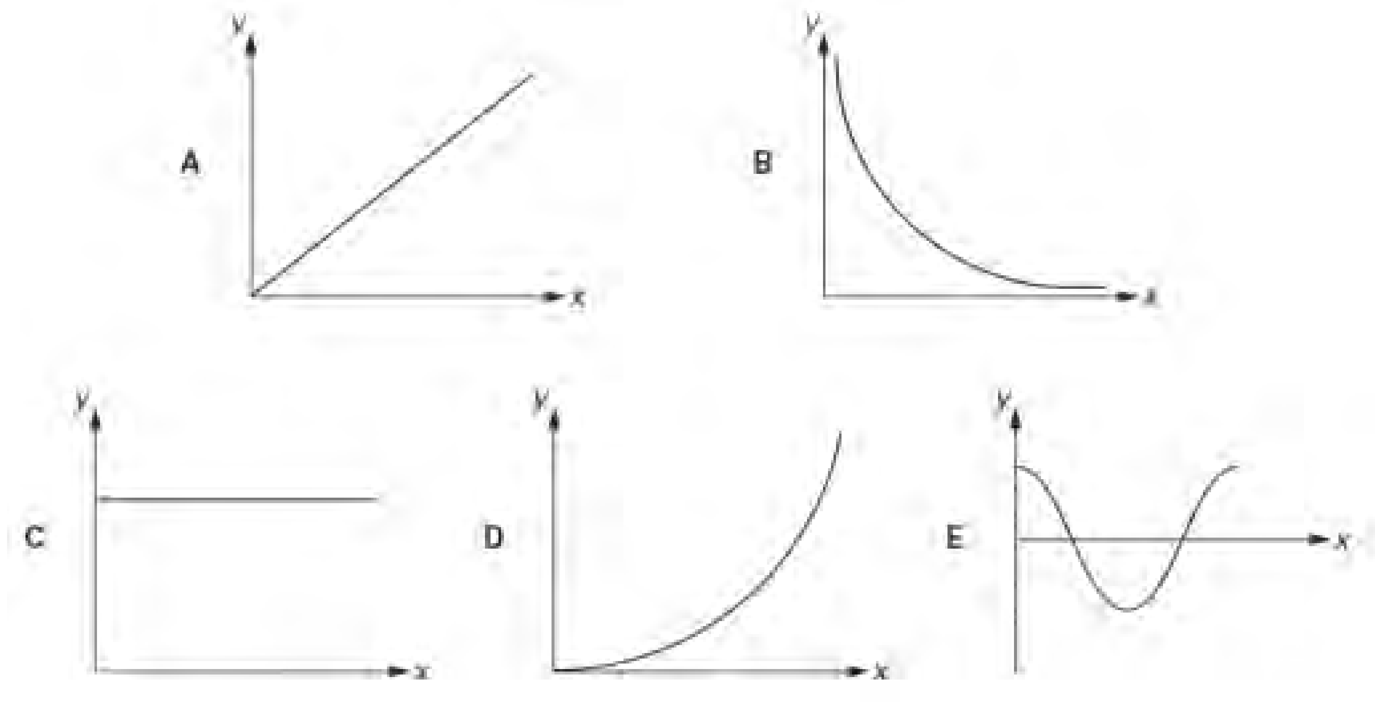
find the total resistance and divide by the current	☐
add the voltage across each of the resistors together	☐
multiply the voltage across each resistor by its resistance	☐
multiply the current by the total resistance	☐
divide each resistance by the current and add the answers together	☐

[2]

[Total: 4]

7 Sarah has been doing various electrical tests.

Unfortunately she forgot to label the axes (x and y) on her graphs.



Write down the letter, **A**, **B**, **C**, **D** or **E**, of the graph that best fits each experiment.

Graphs may be used once, more than once or not at all.

(a) How the resistance of an LDR (y) changes with light intensity (x).

answer .... **[1]**

(b) How the current (y) varies with the voltage (x) when the resistance does not change.

answer .... **[1]**

(c) How the voltage across the coil of an a.c. generator (y) changes with time (x).

answer .... **[1]**

(d) How the resistance of a thermistor (y) changes with temperature (x).

answer .... **[1]**

(e) The brightness of a lamp (y) connected to a battery as the length of the connecting wires (x) is decreased.

answer .... **[1]**

[Total: 5]

8 Here are different parts of the electromagnetic spectrum.

gamma radiation

infrared

microwaves

radio waves

ultraviolet

visible light

X-rays

(a) Put the parts of the electromagnetic spectrum in order of **increasing wavelength**.

The first one has been done for you.

shortest wavelength	**gamma radiation**
longest wavelength	

[3]

(b) Photons with the highest frequency have the most energy.

Write down the name of the part of the spectrum that has photons with the most energy.

answer .... **[1]**

[Total: 4]

9 Stephen lives in a valley not far from the TV transmitter mast.

Stephen cannot see the TV transmitter from his house, but his television can receive the radio waves carrying the TV signals.

Explain how the radio waves reach Stephen's house, but the visible light from the transmitter does not.

....

....

....

....

....

.... **[3]**

[Total: 3]

10 Hermione reads a passage about transmitting information. The diagrams of waves are missing from the passage.

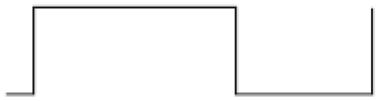
Choose the **best** wave diagram to use for each missing diagram in the passage.

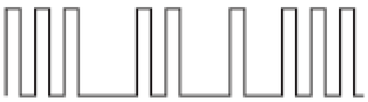
Write down the letter, **A**, **B**, **C**, **D**, **E** or **F**, for each diagram.

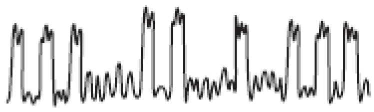
Diagrams may be used once, more than once or not at all.

The last one has been done for you.

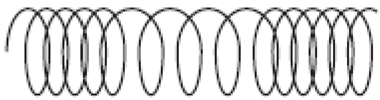
A


D


B


E


C


F


A sound wave is an analogue wave.

diagram .... **[1]**

The sound wave is converted into a digital code.

The digital signal is sent as a series of short pulses.

diagram .... **[1]**

Digital signals can be transmitted with higher quality than analogue signals.

As the signal is transmitted, it decreases in intensity and picks up noise.

diagram .... **[1]**

When the signal is received it is amplified.

diagram .... **[1]**

The signal is cleaned up to remove the noise.

diagram .... **[1]**

The digital signal is then decoded to reproduce the original sound wave.

diagram .... **C** ....

[Total: 5]

END OF QUESTION PAPER

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GCSE Unit

MARK SCHEME

SAMPLE ASSESSMENT MATERIAL
(from 2010 onwards)

Physics A (J635)
Modules P4, P5 and P6
Higher Tier

A332/02

Maximum Mark: 42

Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, e.g. mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
not/reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant - applies to neutral answers
allow/accept	=	answers that can be accepted
(words)	=	words which are not essential to gain credit
<u>words</u>	=	underlined words must be present in answer to score a mark
ecf	=	error carried forward
AW/owtte	=	alternative wording
ORA	=	or reverse argument

   E.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)
      work done = 0 marks
      work done lifting = 1 mark
      change in potential energy = 0 marks
      gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.
7. The list principle:
   If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

8. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.
Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

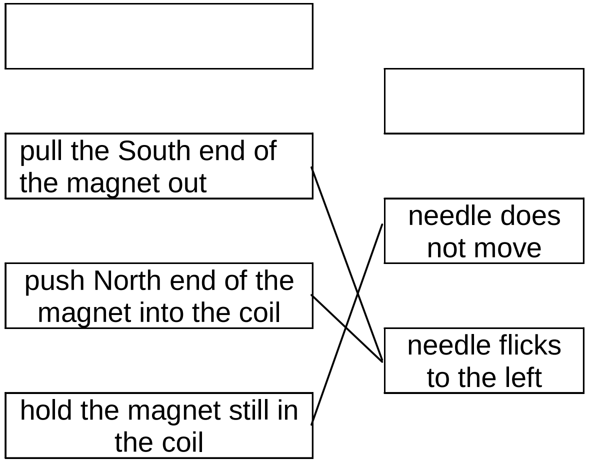
the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

Question			Expected Answers	Marks	Rationale
1	**a**		Forces on driver are backwards; and left;	2	
	b		forces are equal (in size); and opposite in direction; OR forwards on car; backwards on driver;	2	
			Total	**4**	

Question			Expected Answers	Marks	Rationale
2	**a**		25 J (1)	1	Any clear indication of correct answer is allowed.
	b		rearrangement, e.g. $\text{velocity} = \sqrt{\dfrac{2 \times \text{energy}}{\text{mass}}}$	1	award 3 marks for correct numerical answer.
			substitution, e.g $v = \sqrt{((2 \times 125)/2.5)}$	1	
			Calculation $v = 10$	1	
	c		air resistance/friction	1	
			Total	**5**	

Question			Expected Answers	Marks	Rationale
3	**a**		true or false F(alse) T(rue) F(alse) T(rue)	2	4 correct (2) 2 or 3 correct (1) Accept ticks for 'true' and crosses for 'false'.
	b		[3 marks] Candidate demonstrates a clear understanding of the calculation, identifying all necessary components. The answer is expressed clearly and logically. [2 marks] Candidate demonstrates a partial understanding of the calculation, identifying two of the necessary components. The answer is expressed clearly and logically. [1 mark] Candidate identifies correct formula, but does not relate the factors to the exhaust gases. The answer is expressed clearly.	3	Necessary components – mass of exhaust gases; velocity of exhaust gases (or distance / time arguments); mass x velocity allow arguments using momentum of the aircraft (mass & velocity etc) to calculate the momentum of the exhaust gases
			Total	**5**	

Question			Expected Answers	Marks	Rationale
4	**a**			3	Mark lines from left hand boxes 1 mark for each correct line If two or more lines from a left hand box, no mark.
	b		induction (1)	1	Any clear indication of correct answer is allowed.
			Total	**4**	

Question			Expected Answers	Marks	Rationale
5	**a**		it is easier to generate a.c. ✓ (1) distributed more efficiently ✓ (1)	2	**2 marks** for both 2nd and 4th box correct and no other ticks. **1 Mark** for 2nd **or** 4th box correct and at least 3 blanks. (note if 3 boxes ticked including the 2 correct boxes, **1 mark** scored.)
	b		230V (1)	1	Any clear indication of correct answer is allowed.
			Total	**3**	

Question			Expected Answers	Marks	Rationale
6	**a**		6 (1)	1	Accept ‘2x3’.
	b		5Ω (1)	1	Any clear indication of correct answer is allowed.
	c		☐ add the voltage across resistors ✓ (1) ☐ multiply the current by resistance ✓ (1) ☐	2	**2 marks** for both 2nd and 4th box correct and no other ticks. **1 Mark** for 2nd **or** 4th box correct and <u>at least</u> 3 blanks. (note if 3 boxes ticked including the 2 correct boxes, **1 mark** scored.)
			Total	**4**	

Question			Expected Answers	Marks	Rationale
7	**a**		B (1)	1	
	b		A (1)	1	
	c		E (1)	1	
	d		B (1)	1	
	e		C (1)	1	
			Total	**5**	

Question			Expected Answers	Marks	Rationale
8	**a**		(gamma radiation) X-ray ultraviolet visible light infrared microwave radio waves	3	x-ray above UV (or ultraviolet) UV (or ultraviolet) above visible light Visible light above IR (or Infrared) IR (or Infrared) above microwave Microwave above radio waves Phonetically correct spelling allowed. Allow first letter used in place of names. Allow . in place of 'micro'. Allow 'light' or 'visible' for 'visible light' All correct (3) 3 or 4 correct (2) 1 or 2 correct (1)
	b		gamma (1)	1	Accept cosmic rays. Phonetically correct spelling allowed.
			Total	**4**	

Question			Expected Answers	Marks	Rationale
9			[3 marks] Candidate demonstrates a high level of understanding of the process of diffraction, identifying all necessary components. The answer is expressed clearly and logically. [2 marks] Candidate demonstrates a good understanding of the process of diffraction, identifying three of the necessary components. The answer is expressed clearly and logically. [1 mark] Candidate names diffraction as the process described in the question, and identifies the difference in wavelengths as significant. The answer is expressed clearly.	3	Necessary components - diffraction; different wavelengths for light and radio; relative size of barrier and wavelength; small wavelength/light diffracts less; long wavelength/radio diffracts more
			Total	**3**	

Question			Expected Answers	Marks	Rationale
10			C (1) B (1) A (1) E (1) B (1)	1 1 1 1 1	
			Total	**5**	

			Section total	**42**	