OCR
RECOGNISING ACHIEVEMENT

SPECIMEN H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE **A182/02**

PHYSICS A

Unit A182: Modules P4, P5, P6 (Higher Tier)

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly 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 that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- A list of useful relationships is printed on page **2**.
- The number of marks for each question is given in brackets **[ ]** at the end of the question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **24** pages. Any blank pages are indicated.

For Examiner's Use		
	Max	**Mark**
1	**6**	
2	**6**	
3	**2**	
4	**4**	
5	**2**	
6	**6**	
7	**3**	
8	**3**	
9	**2**	
10	**6**	
11	**6**	
12	**3**	
13	**3**	
14	**3**	
15	**5**	
TOTAL	**60**	

TWENTY FIRST CENTURY SCIENCE DATA SHEET

Useful Relationships

The Earth in the Universe

distance = wave speed x time

wave speed = frequency x wavelength

Sustainable Energy

energy transferred = power x time

power = voltage x current

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

Explaining Motion

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

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

momentum = mass x velocity

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

work done by a force = force x distance moved in the direction of the force

amount of energy transferred = work done

change in gravitational potential energy = weight x vertical height difference

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

Electric Circuits

power = voltage x current

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

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

Radioactive Materials

energy = mass x [speed of light in a vacuum]^2

Answer **all** the questions.

1 This question is about different journeys made in a lorry.

(a) The lorry is passing through a built up area where the speed limit is 14 m/s.

In 20 seconds, the lorry travels 250 metres.

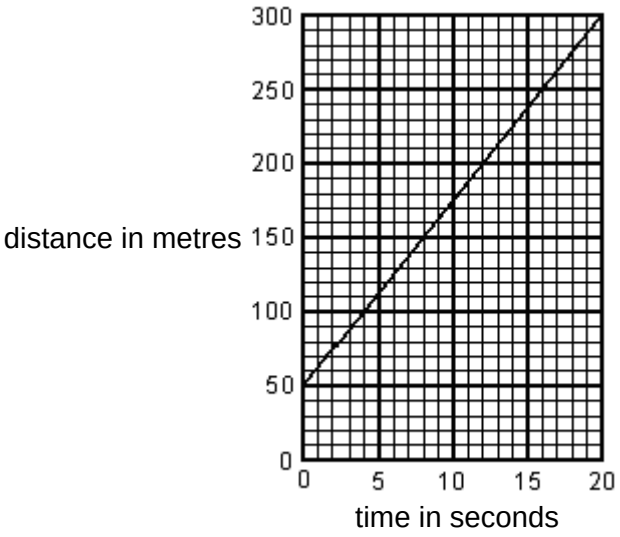
(i) Calculate the speed of the lorry, and decide whether the lorry is within the speed limit.

speed = ... m/s

.....

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

(ii) Here is the distance-time graph for 250 metre part of the journey.



Explain how the graph increases your confidence in your decision about whether the lorry is within the speed limit.

.....

.....

..... **[2]**

(b) The lorry is fitted with a speed limiter.

This sets its maximum speed to 25 m/s.

The lorry is driven down a test track to test the speed limiter.

Here are six measurements, taken on two successive days.

day	trial number	measured speed
one	1	24.7 m/s
	2	25.2 m/s
	3	24.9 m/s
two	4	24.8 m/s
	5	24.2 m/s
	6	24.5 m/s

Day two was much colder than day one.

Did this make any difference to the results?

Use calculations to justify your answer.

.....

.....

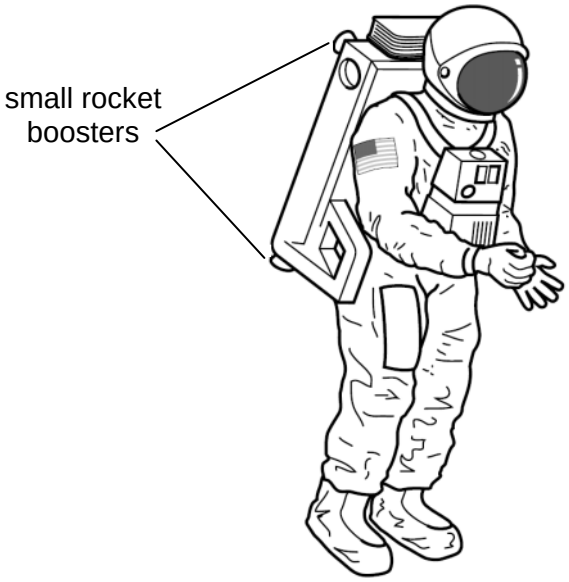
..... **[3]**

[Total: 6]

2 Buzz is an astronaut.

He is in space far away from the Sun or any planets, repairing the outside of his spacecraft.

He uses small rocket boosters on his space pack to move about.



Explain how the rockets move him from one end of the spacecraft to the other.

✎ *The quality of written communication will be assessed in your answer to this question.*

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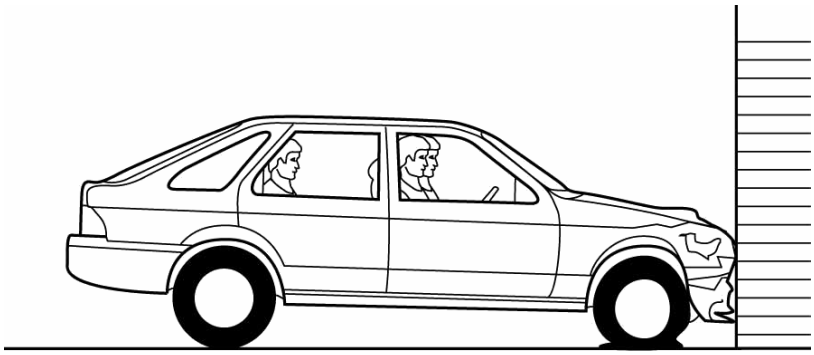
..... **[6]**

[Total: 6]

3 This question is about car safety features.



During safety tests a car of mass 1200 kg is crashed into a wall at a speed of 20 m/s.

The collision stops the car.

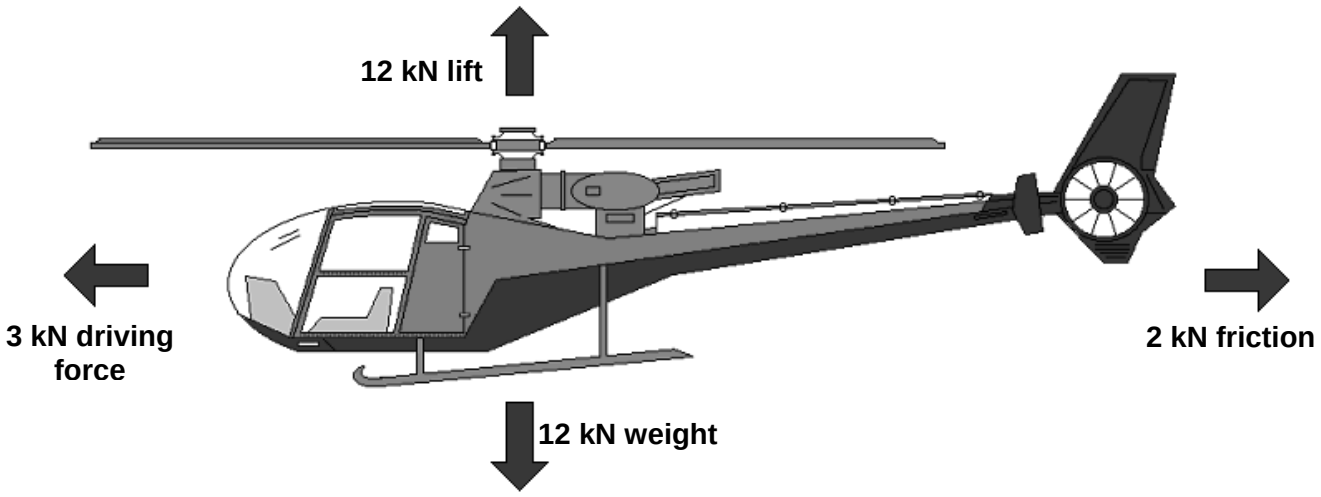
This takes a time of 1.2 seconds.

Calculate the force exerted by the wall to stop the car.

force = ... N **[2]**

[Total: 2]

4 The diagram shows the forces acting on a helicopter in level flight.



(a) Describe the resultant force acting on the helicopter.

.....

..... **[2]**

(b) Which of these quantities will be increasing for the helicopter?

Put (rings) around the **two** correct answers.

height

weight

momentum

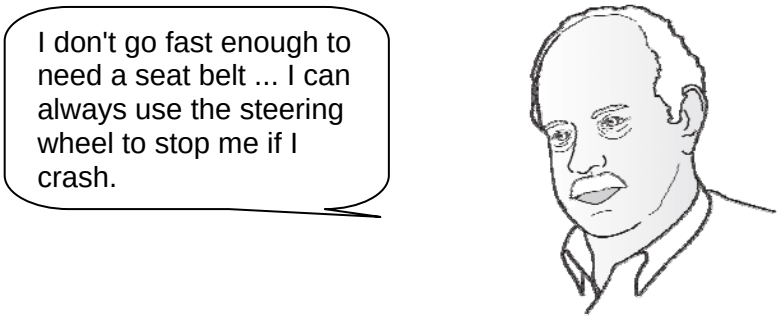
kinetic energy

gravitational potential energy

[2]

[Total: 4]

5 Paul is a taxi driver in town.



(a) How would a seatbelt help Paul if he had a crash?

Put a tick (✓) in the box next to the correct answer.

A seatbelt increases the counterforce on him in a crash. ☐

A seatbelt transfers less energy to him as the car slows down. ☐

A seatbelt increases the time it takes for him to slow down in a crash. ☐

A seatbelt reduces the amount of momentum he needs to lose in a crash. ☐

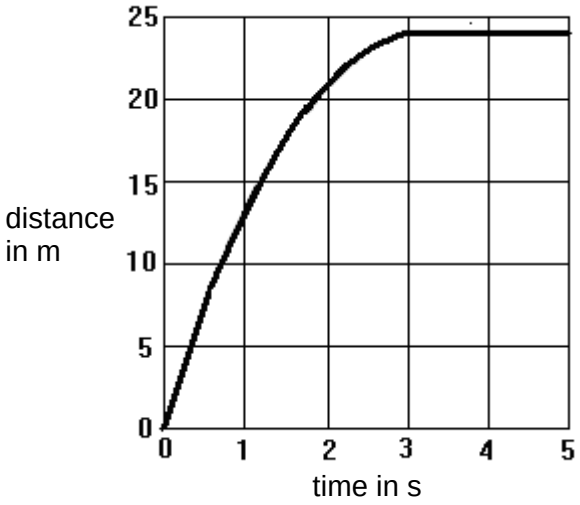
[1]

(b) Paul's momentum is 900 kg m s^{-1} when he is travelling at 50 kph.

He slams on the brakes and stops the car in 3.0 s, moving a distance of 18 m.

Which is the correct distance-time graph for Paul as he stops?

A



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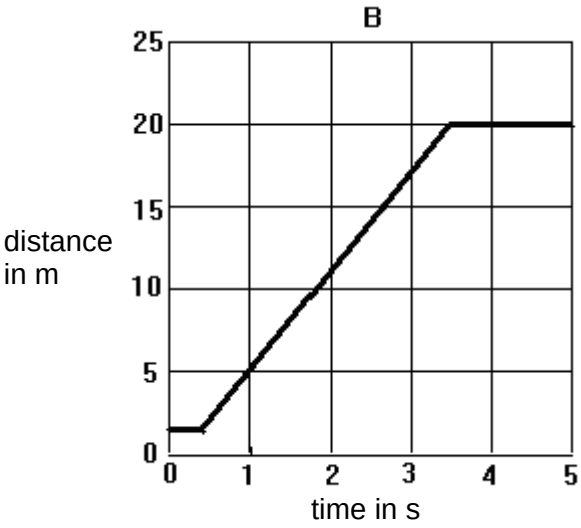
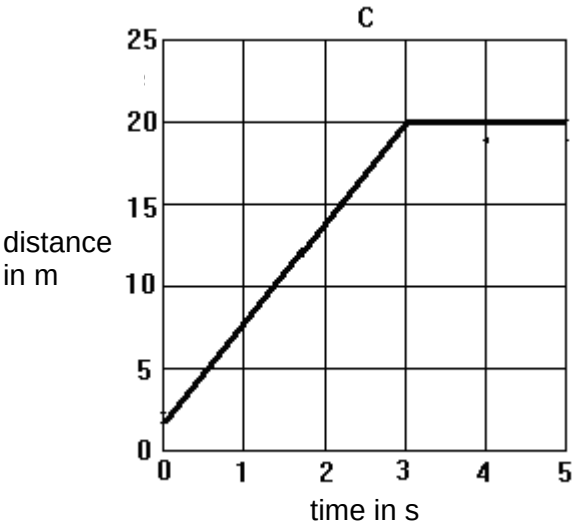
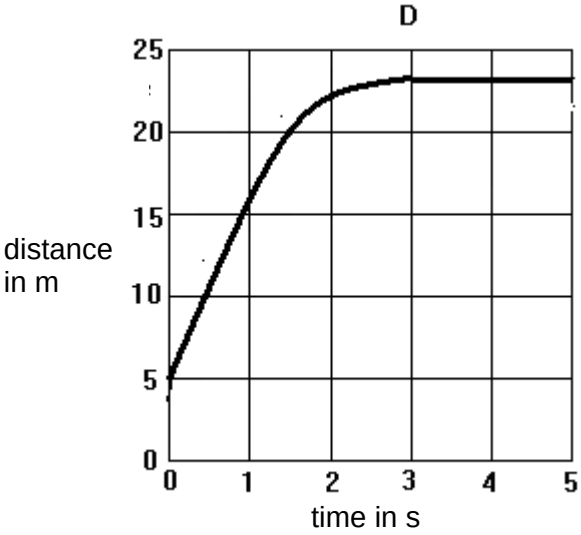


C



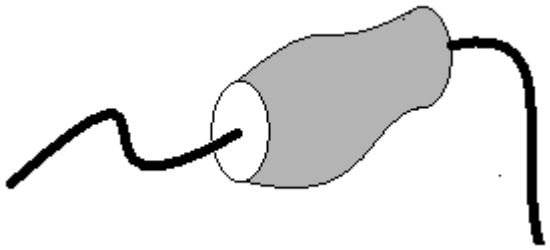
D



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

[Total: 2]

6 Jeff investigates a new component.



He connects it to three different batteries, measuring the current and voltage each time.

Here are his results.

voltage in volts	current in amps	resistance in ohms
2.8	0.70	
5.9	1.2	4.9
12	1.8	

(a) Complete the table by filling in the two missing values for resistance.

[1]

(b) Jeff says that any changes in the resistance are caused by changes in the current.

Explain whether Jeff's explanation is supported by the results.

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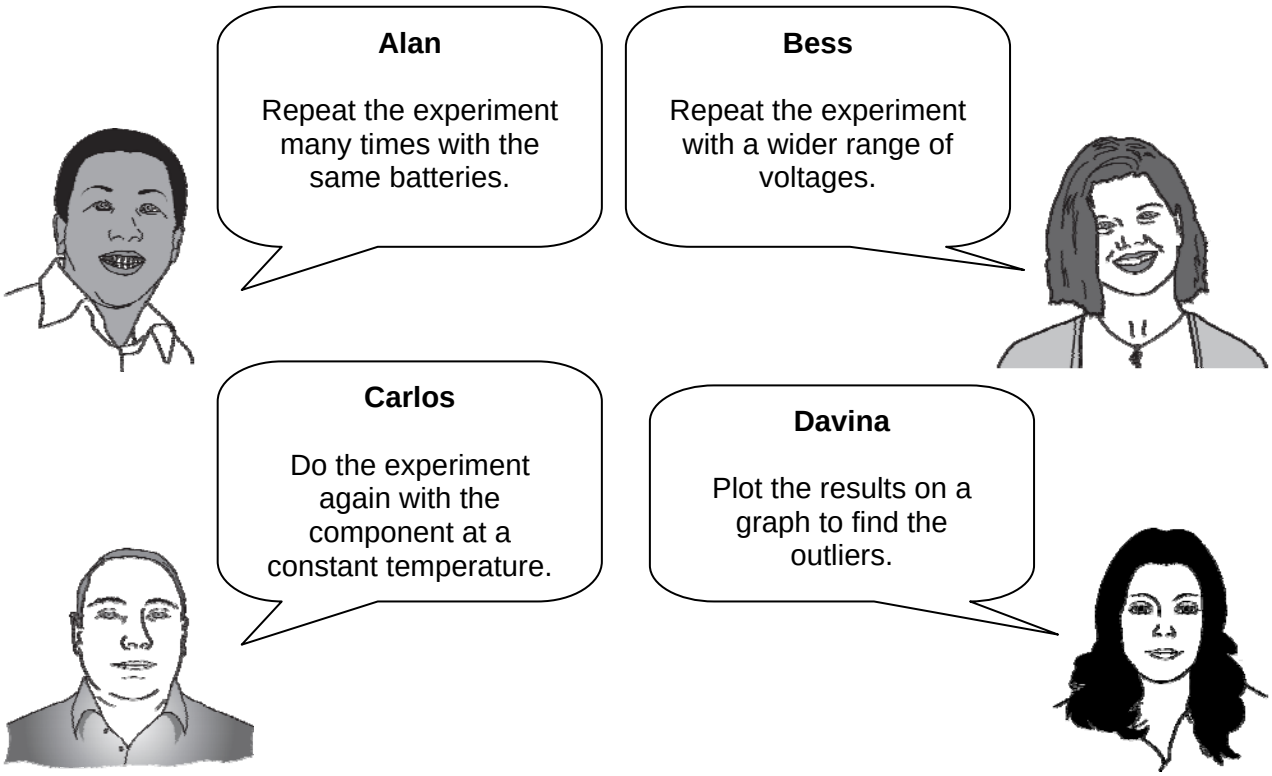
..... **[2]**

(c) Jeff decides to take some more measurements to test his idea.

He asks his colleagues for advice.



Who has the best advice?

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

(d) After making more measurements, Jeff decides that there is enough evidence to say that the resistance of the component depends on its current.

Explain what he needs to do before publishing his theory.

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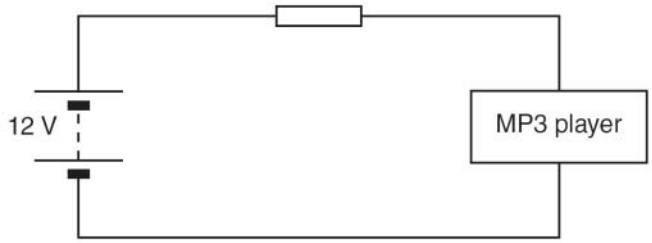
..... **[2]**

[Total: 6]

7 Jo likes to listen to her MP3 player.

She uses this circuit to connect her MP3 player to a 12 V battery.



(a) Here are some data about the MP3 player.

electrical property	value
operating power	0.45 W
working voltage	3.0 V
current	

Complete the table by filling in the empty box.

[2]

(b) The battery supplies a potential difference of 12 V for the circuit.

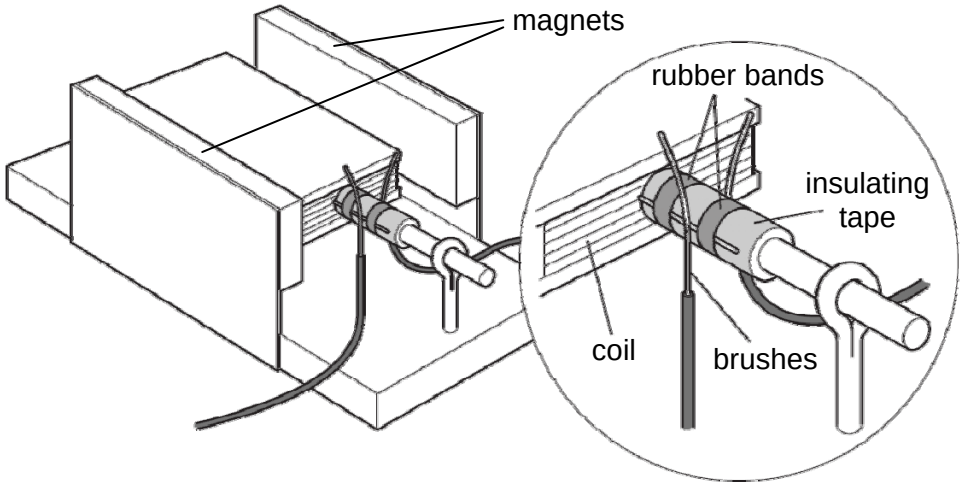
The potential difference across the MP3 player is only 3 V.

What is the potential difference across the resistor?

potential difference = …… **V** **[1]**

[Total: 3]

8 Here is a diagram of a simple electric motor.



The motor is made of a coil of wire that is suspended between a pair of magnets.

The coil starts off in a horizontal position, as shown in the diagram.

The close-up shows the electrical contacts (labelled 'brushes').

When a potential difference is applied to the brushes, the coil rotates.

Select 3 statements from the list below, which when taken together, help to explain how this motor works.

A When the coil rotates it generates a potential difference.

B When the coil is connected to the brushes there will be a current flowing in the coil.

C The current in the coil exerts a force on the magnets which makes it move.

D A voltage will produce a current in the wire when there is a complete circuit.

E A current carrying conductor will always experience a force.

F The resistance of the wire in the coil reduces the current passing through it.

answer ..... and ..... and ..... **[3]**

[Total: 3]

9 A generator is made using a magnet which spins near a coil of wire.

The generator produces a changing voltage.

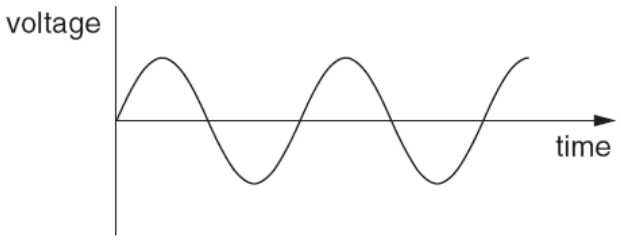
(a) Which of the following words describes this process?

Put a ring around the correct answer.

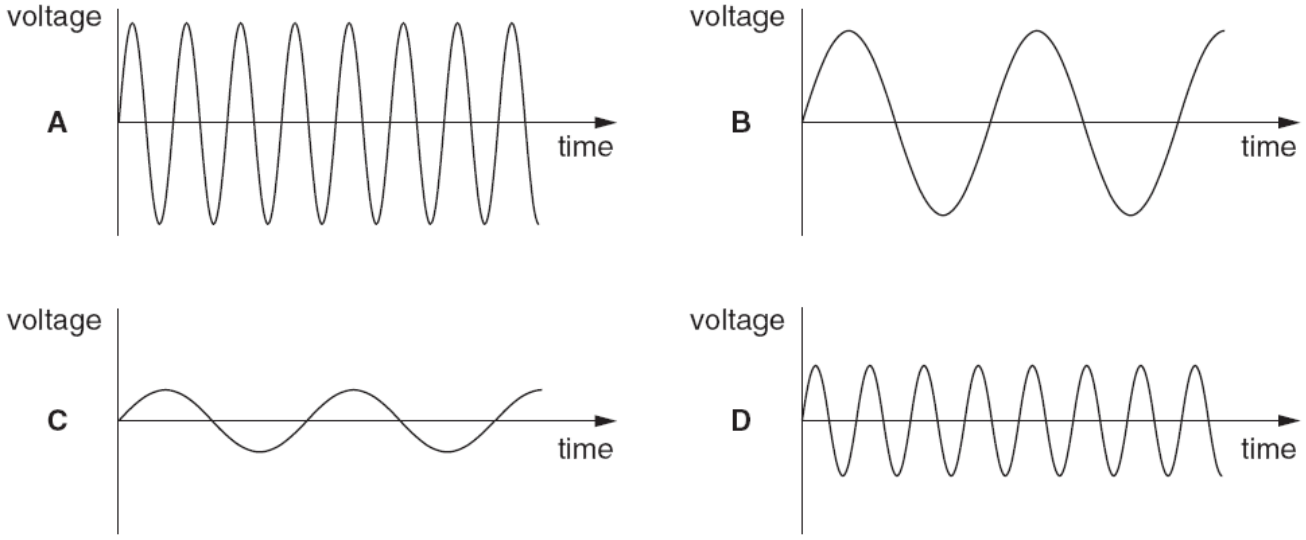
deduction **formation** **induction** **reduction** **transformation**

[1]

(b) The graph shows how the voltage produced by the generator changes with time when the magnet spins at a particular speed.



The following graphs all have the same scales as the graph above.

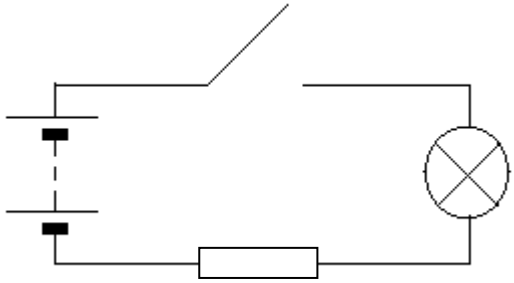


Which graph shows what happens when the magnet is spun round **faster**?

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

[Total: 2]

10 Bill assembles this circuit.



Explain why the lamp glows when Bill presses the switch.

✎ *The quality of written communication will be assessed in your answer to this question.*

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..... **[6]**

[Total: 6]

11 A nuclear reactor produces radioactive materials for use in hospitals. The radioactive materials are used to treat patients.

Identify the different types of radioactive waste generated by the production and use of these radioactive materials and describe how the waste should be dealt with.

✎ *The quality of written communication will be assessed in your answer to this question.*

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..... **[6]**

[Total: 6]

12 Hospitals use a generator containing a radioactive substance called Mo – 99 to make an isotope called Tc – 99 m.

Mo – 99 has a half life of 66 hours.

Tc – 99 m has a half life of 6 hours.

The technician tests a sample from the generator to find out what it contains.

He measures its activity at seven different times.

Here are the results.

time of measurement	activity of sample in Bq
08:00 h	5624
10:00 h	4603
12:00 h	3740
14:00 h	3078
16:00 h	2598
18:00 h	2083
20:00 h	1757

What does the sample contain? Use the data from the table to justify your answer.

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.....**[3]**

[Total: 3]

13 Read the newspaper article about a new treatment for breast cancer.

New treatment for breast cancer

The cancer is cut out by the surgeon. Then a radioactive rod is placed in the wound by the radiographer. Ionising radiation from the rod kills any cancer cells that the surgeon has missed. After a few hours the rod is removed and the wound is stitched up. No further treatment is needed.

Discuss the risks and benefits of the new treatment to **all** the people involved.

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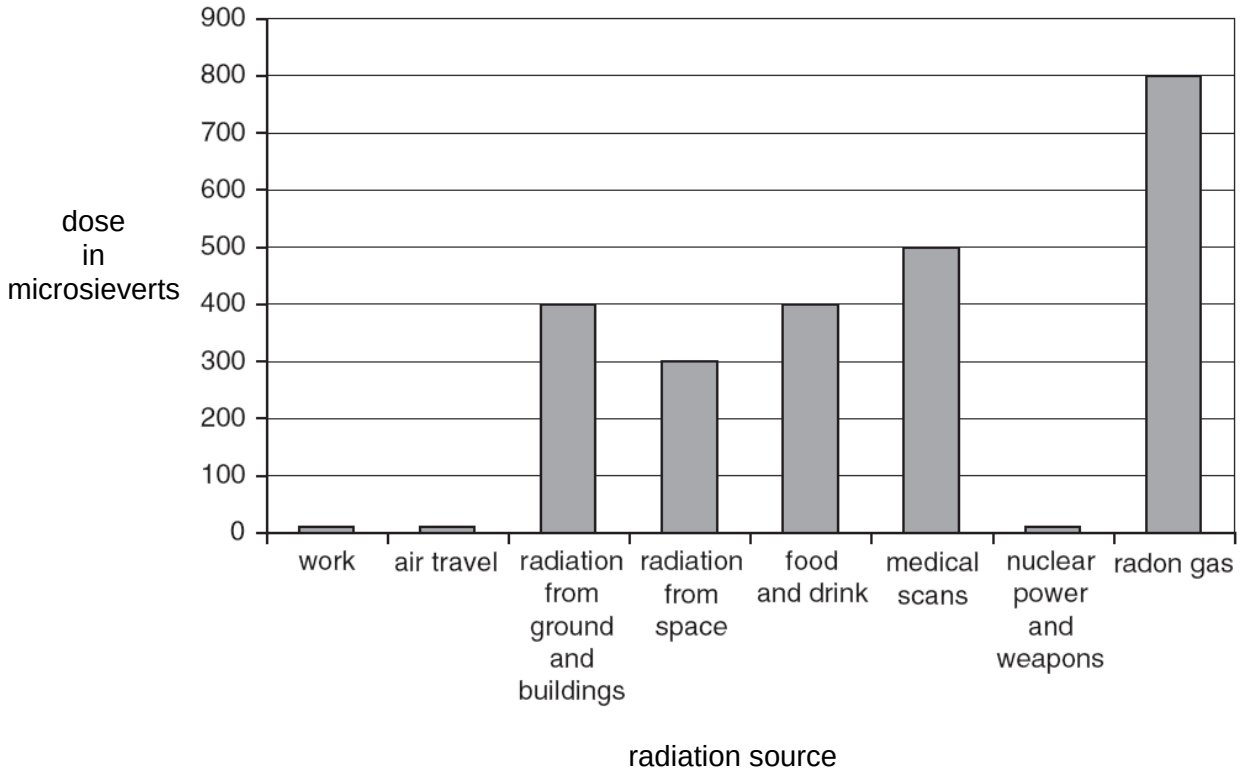
..... **[3]**

[Total: 3]

14 The bar chart shows the typical yearly radiation dose for a person in Britain from different sources.



(a) Radon gas provides the largest percentage of the total yearly dose of radiation.

What percentage of the total yearly dose comes from radon gas?

Write down your answer to the nearest whole number.

answer = ……. % **[1]**

(b) The total for all sources is 2430 microsieverts.

Which of the following statements are correct conclusions **from the bar chart**?

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

Not everyone will have medical scans. ☐

Radon gas provides more than half the total dose. ☐

The fraction of dose received from nuclear power stations is very small. ☐

The dose from radon gas will be different in different parts of Britain. ☐

The dose from food and drink is less than a quarter of the total dose. ☐

[2]

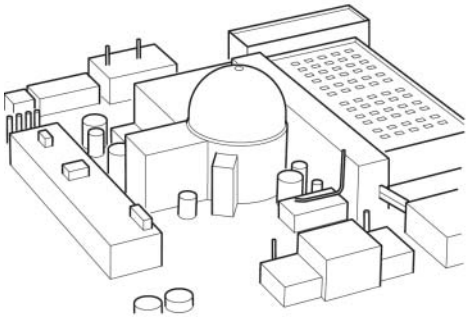
[Total: 3]

15 Read the article about nuclear power stations.

Nuclear power stations use uranium as a fuel.

Energy is released from the uranium by the process of nuclear fission.

Some people object to nuclear power stations because they produce radioactive waste.



(a) The nuclear fission process needs to be controlled to release the energy safely.

The following statements describe this control process. They are in the wrong order.

A Coolant is used to carry the heat energy away from the reactor.

B More neutrons are released.

C The uranium undergoes fission.

D Neutrons in the reactor collide with uranium.

E Some of these neutrons are absorbed by control rods.

Fill in the boxes to show the correct order. One has been done for you.

				A

[2]

(b) The process of nuclear fission can continue unaided once it has started.

Write the name for this type of reaction.

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

(c) A nuclear power station has to release 4.5×10^7 J of energy to provide one person with their daily electricity needs. Use the formula $m = \frac{E}{c^2}$ to calculate the mass of fuel which must be lost to provide this energy.

$c = 3.0\times10^8$ m/s

mass of fuel lost =..... kg **[1]**

(d) The maximum annual risk of developing cancer from exposure to radiation for a worker in a nuclear reactor is 0.1%. This is approximately 40 times greater than the annual risk for a member of the public.

Why might this increased risk not be seen as a problem for the owners of the power station?

Put a tick (✓) in the box next to the correct answer.

The owners are not required to consider the safety of their workers.	☐
The risk to a worker would still be very low.	☐
The owners supply their workers with protective clothing.	☐
The power stations are normally built far from major centres of population.	☐

[1]

[Total: 5]

[Paper Total: 60]

END OF QUESTION PAPER

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OCR
RECOGNISING ACHIEVEMENT

SPECIMEN H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

PHYSICS A **A182/02**

Unit A182: Modules P4, P5, P6 (Higher Tier)

MARK SCHEME

Duration: 1 hour

MAXIMUM MARK 60

This document consists of 16 pages

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, eg 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
words	=	underlined words must be present in answer to score a mark
ecf	=	error carried forward
AW/owtte	=	alternative wording
ORA	=	or reverse argument

Eg 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. Annotations:
The following annotations are available on SCORIS.

✓	=	correct response
✖	=	incorrect response
bod	=	benefit of the doubt
nbod	=	benefit of the doubt **not** given
ECF	=	error carried forward
^	=	information omitted
I	=	ignore
R	=	reject

6. If a candidate alters his/her response, examiners should accept the alteration.

7. 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.

   Eg
   For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	✓
☐	☐	✓
✓	✓	✓
✓	✓	✓
☐	☐	☐
This would be worth 0 marks.	This would be worth one mark.	This would be worth one mark

8. 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, eg 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.

9. 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, eg 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.

   Eg 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

10. Three questions in this paper are marked using a Level of Response (LoR) mark scheme with embedded assessment of the Quality of Written Communication (QWC). When marking with a Level of Response mark scheme:

- Read the question in the question paper, and then the list of relevant points in the 'Additional guidance' column of the mark scheme, to familiarise yourself with the expected science. The relevant points are not to be taken as marking points, but as a summary of the relevant science from the specification.
- Read the level descriptors in the 'Expected answers' column of the mark scheme, starting with Level 3 and working down, to familiarise yourself with the expected levels of response.
- *For a general correlation between quality of science and QWC*: determine the level based upon which level descriptor best describes the answer; you may award either the higher or lower mark within the level depending on the quality of the science and/or the QWC.
- *For high-level science but very poor QWC*: the candidate will be limited to Level 2 by the bad QWC no matter how good the science is; if the QWC is so bad that it prevents communication of the science the candidate cannot score above Level 1.
- *For very poor or totally irrelevant science but perfect QWC*: credit cannot be awarded for QWC alone, no matter how perfect it is; if the science is very poor the candidate will be limited to Level 1; if there is insufficient or no relevant science the answer will be Level 0.

Question			Expected answers	Marks	Additional guidance
1	(a)	(i)	speed = 250/20 = 12.5 m/s, so below the speed limit	[1]	
		(ii)	the calculated speed is an average (so the lorry could have exceeded the limit at certain points in the journey) but the graph shows that the speed was constant during the time period	[2]	
	(b)		mean on day one = 24.9 m/s, day two = 24.5 m/s minimum on day one less than maximum day two/ranges overlap difference in means (0.4) compared with each of the days variation (0.3)	[3]	**ignore** final conclusion, award marks for processing
			Total	[6]	

Question			Expected answers	Marks	Additional guidance
2	✎		**[Level 3]** Answer includes all relevant points, with all four steps of the explanation, including correct directions and technical terms. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks) **[Level 2]** Answer includes most relevant points, perhaps omitting / confusing some quantitative or directional details. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks) **[Level 1]** Answer includes some relevant points, perhaps with some irrelevant details. No major errors of physics. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	**[6]**	**relevant points include:** To start the astronaut moving: • rocket pushes on gas to give it backwards momentum • gas and rocket are an interaction pair • gas applies equal forwards force on rocket • giving it and astronaut forwards momentum Astronaut moves at a steady speed when rocket switches off. **reject** astronaut stops moving when rockets turned off (major error of physics) **ignore** references to kinetic energy, work and power
			Total	**[6]**	

Question			Expected answers	Marks	Additional guidance
3			momentum change = 1200×20 = 24 000 kg m s^{-1} force = 24 000 / 1.2 = 20 000 N	[2]	**allow** ecf on incorrect momentum change
			Total	[2]	

4	(a)		forwards 1 kN	[2]	
	(b)		**momentum** **kinetic energy**	[2]	
			Total	[4]	

5	(a)		a seatbelt increases the time it takes … ☐ ☐ ✓ ☐	[1]	
	(b)		**D**	[1]	
			Total	[2]	

Question			Expected answers	Marks	Additional guidance
6	(a)		0.70 A gives 4.0 Ω, 1.8 A gives 6.7 Ω,	[1]	
	(b)		the results show that resistance increases with increasing current / there is a correlation between resistance and current but this (correlation) does not prove Jeff's explanation (without a causal link)	[2]	'**accept** resistance depends on current for (1)'
	(c)		Carlos	[1]	
	(d)		he needs to think of a causal link / mechanism which links cause and effect and have the experiment repeated by other scientists	[2]	
			Total	[6]	

7	(a)		0.15 (1) A or amps (1)	[2]	award (1) for evidence of using $I = P/V$ if no units shown
	(b)		9 V	[1]	
			Total	[3]	

8			**B** **C** **D**	[3]	in any order
			Total	[3]	

Question			Expected answers	Marks	Additional guidance
9	(a)		**induction**	[1]	
	(b)		**A**	[1]	
			Total	[2]	

10	✎		**[Level 3]** Includes all of the relevant points. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks) **[Level 2]** Includes most of the relevant points. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks) **[Level 1]** Includes some of the relevant points. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	[6]	**relevant points include:** • wires / components contain mobile charges / electrons • pressing the switch completes the circuit • which allows charges/electrons to move around the circuit / allows the battery to push charges/electrons around the circuit • in a continuous loop • energy is transferred from the power supply/electrons/charges to the lamp • as electrons collide with ions in the lamp filament • the filament gets hot • lamp gets hot enough to emit light **accept** battery does work on electrons / charge **ignore** references to the resistor
			Total	[6]	

Question			Expected answers	Marks	Additional guidance
11	✎		**[Level 3]** Evaluates production and use of the radioactive materials, and correctly identifies sources for all three types of waste. Suggests how to dispose of them safely. Will give a valid reason why waste needs to be stored carefully. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks) **[Level 2]** Evaluates production and/or use of the radioactive materials, and correctly identifies sources for at least two types of waste, perhaps omitting some important details. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks) **[Level 1]** Refers to at least one type of waste and valid disposal method for it. May not give a reason for the need for careful disposal. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	**[6]**	**relevant points include:** • high level <u>only</u> produced in reactor • high level waste is very radioactive • so is stored in ponds of water • until it becomes intermediate waste / less radioactive • hospital produces mostly intermediate • intermediate waste is encased in concrete / glass • and stored in metal drums • under guard / in secure conditions • low level produced at both hospital and reactor • low level waste is put in landfill • with waterproof linings • to keep radioactivity out of ground water • all radioactive waste is harmful / cancerous • becoming less harmful as time goes on **accept** descriptions of type / source of waste instead of names eg nuclear power station giving high level waste **accept** references to underground burial for intermediate waste
			Total	**[6]**	

Question			Expected answers	Marks	Additional guidance
12			3078/5624 = 0.55 1757/3078 = 0.57 mostly Tc-99 m because half-life much shorter than 66 h / close to 6 h	[3]	**accept** attempt to calculate half-life by considering activities 6 h apart **accept** cannot say whether Mo is present, as sample only tested for 24 hours for (1)'
			Total	[3]	

13			health/cancer risk for all participants due to irradiation by the rod this risk is greatest for the radiographer who will repeat the procedure many times patient will benefit if their existing cancer is cured, but the risk of patient and radiographer developing a new cancer may outweigh the benefits of the procedure	[3]	
			Total	[3]	

14	(a)		33	[1]	
	(b)		The fraction of dose … ☐ ☐ ☑ ☐ The dose from food and drink … ☑	[2]	
			Total	[3]	

Question			Expected answers	Marks	Additional guidance
15	(a)		**D C B E**	[2]	ecf: **C** before **B** before **E** for (1)
	(b)		chain reaction	[1]	
	(c)		5.0×10^{-10} kg	[1]	**allow** $0.5\text{x}10^{-9}$ kg'
	(d)		… still be very low … ☐ ☑ ☐ ☐	[1]	
			Total	[5]	

Assessment Objectives (AO) Grid

(includes quality of written communication ✎)

Question	AO1	AO2	AO3	Total
1(a)(i)		1		**1**
1(a)(ii)			2	**2**
1(b)		3		**3**
2✎	4	2		**6**
3		2		**2**
4(a)		2		**2**
4(b)		2		**2**
5(a)	1			**1**
5(b)		1		**1**
6(a)		1		**1**
6(b)		1	1	**2**
6(c)	1			**1**
6(d)	2			**2**
7(a)	1	1		**2**
7(b)		1		**1**
8	2	1		**3**
9(a)	1			**1**
9(b)		1		**1**
10✎	6			**6**
11✎	3	2	1	**6**
12			3	**3**
13	1	2		**3**
14(a)		1		**1**
14(b)			2	**2**
15(a)		2		**2**
15(b)	1			**1**
15(c)		1		**1**
15(d)		1		**1**
Totals	**23**	**28**	**9**	**60**

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