OCR
Oxford Cambridge and RSA

Accredited

GCSE (9–1) Physics A (Gateway Science)

J249/03 Paper 3 (Higher Tier)

Sample Question Paper

H

Date – Morning/Afternoon

Time allowed: 1 hour 45 minutes

You must have:
- the Data Sheet

You may use:
- a scientific or graphical calculator
- a ruler

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First name	
Last name	

Centre number						**Candidate number**					

INSTRUCTIONS
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

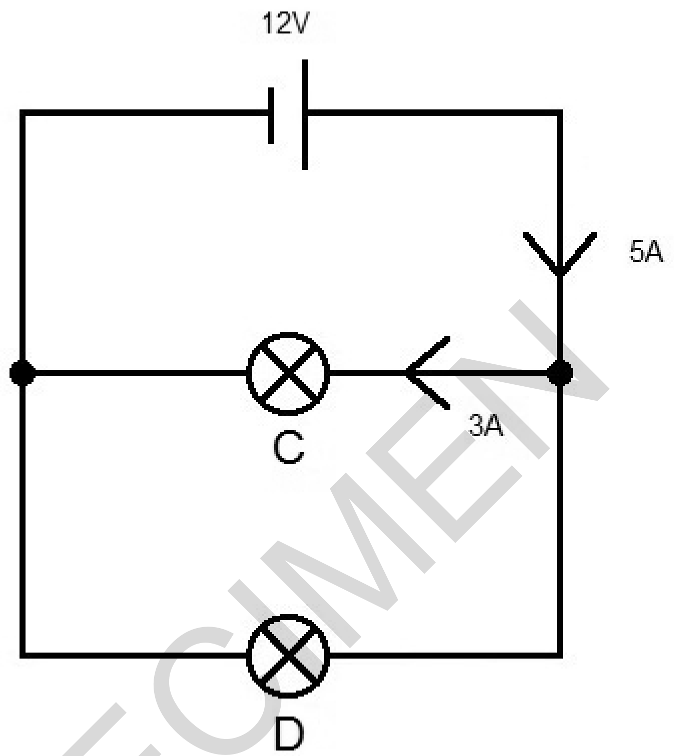
INFORMATION
- The total mark for this paper is **90**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- This document consists of **28** pages.

SECTION A

Answer **all** the questions.

You should spend a maximum of 30 minutes on this section.

1 Look at the circuit diagram.



Use the formula **resistance = potential difference ÷ current** to calculate the resistance of bulb **D**.

A 2 Ω

B 4 Ω

C 6 Ω

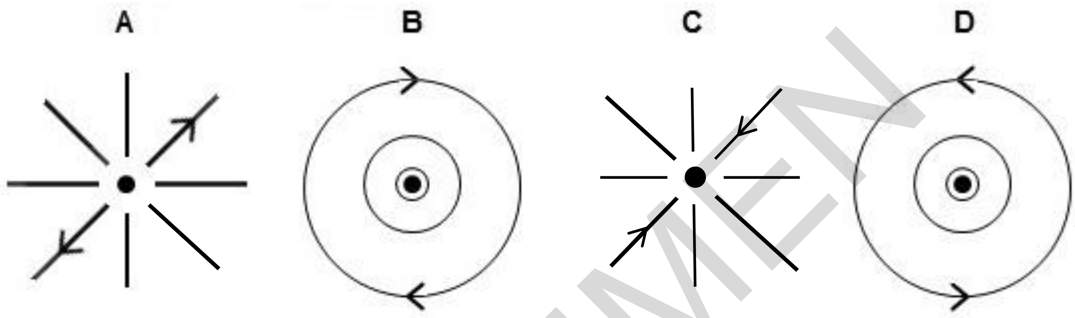
D 8 Ω

Your answer

[1]

2 The diagram shows a wire carrying an electric current.

Which diagram shows the magnetic field viewed from above, with the current coming towards you?



Your answer ☐

3 Which of the following is **not** needed to generate a.c. in an alternator?

A changing magnetic field

B coil of wire

C commutator

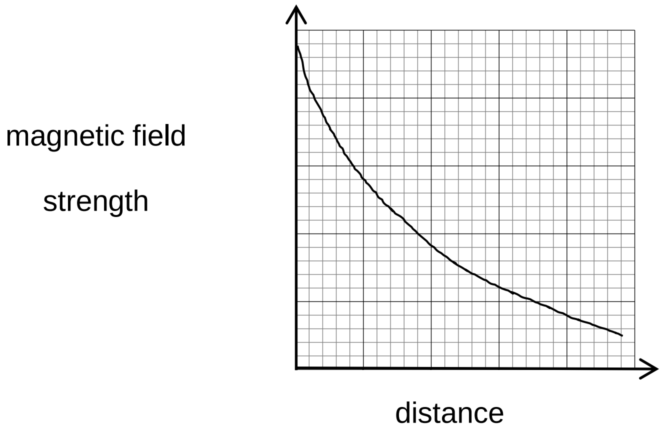
D rotating magnet

Your answer ☐

[1]

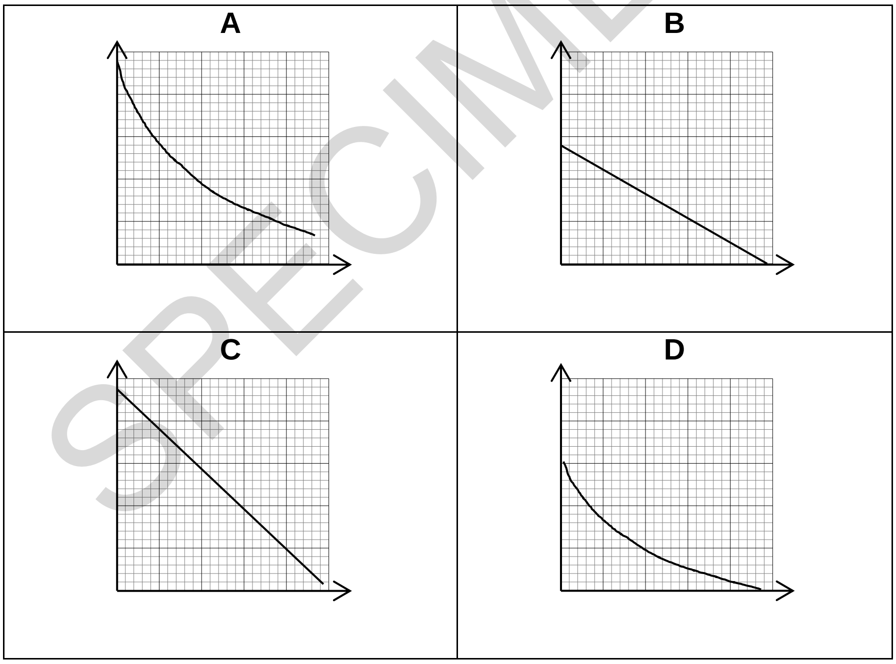
4 A student measures the magnetic field strength around a current carrying conductor at increasing distances from the conductor.

She plots her results.



The current in the conductor is decreased and a new graph plotted.

Which is the correct graph?



Your answer

[1]

5 A car travels 200 km in four hours.

If the car **doubles** its speed how long would it take to travel 50 km?

A 0.5 hours

B 1.0 hours

C 2.0 hours

D 4.0 hours

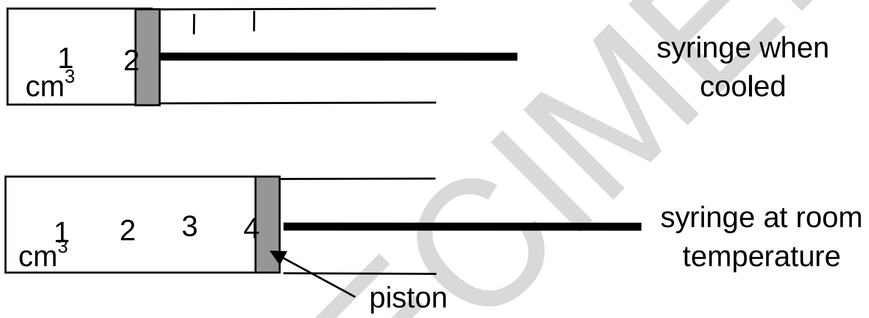
Your answer

[1]

6 A graduated syringe contains air.

It is put in a freezer to cool it down.

When it is removed from the freezer the piston has moved inwards.



The density of the air in the syringe when cooled is 2.4 kg/m^3.

What was the density of the air at room temperature?

A 0.6 kg/m^3

B 1.2 kg/m^3

C 2.4 kg/m^3

D 4.8 kg/m^3

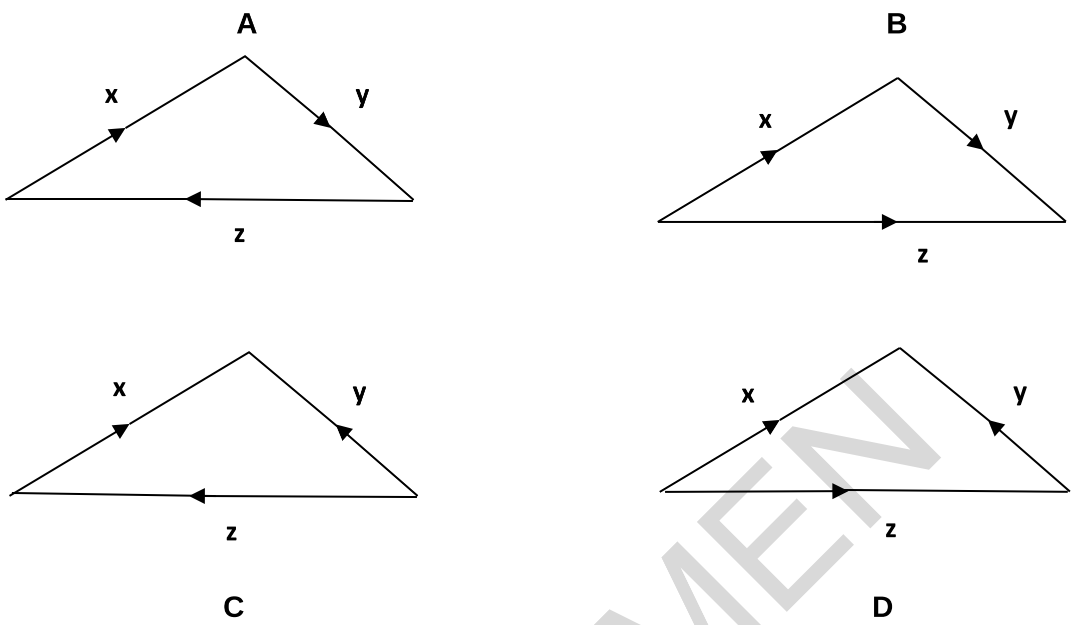
Your answer

[1]

7 A body has three forces, **x**, **y** and **z** acting on it.

The body is in **equilibrium**.

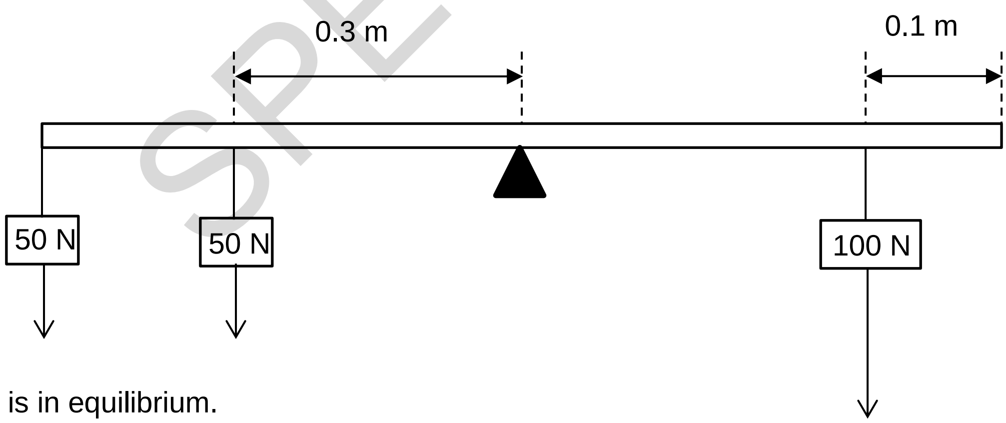
Which vector diagram represents this situation?



Your answer

[1]

8 A uniform 1.0 m rod is pivoted at its centre.



The rod is in equilibrium.

What is the value of the anti-clockwise moment about the pivot?

A 10 Nm

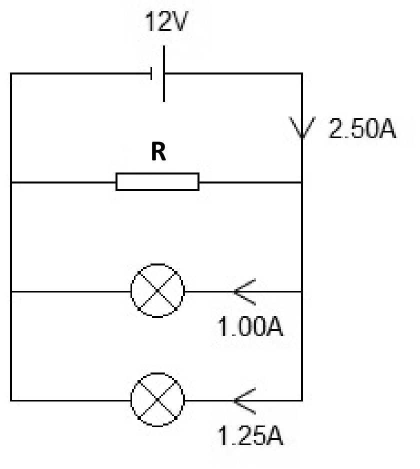
B 15 Nm

C 40 Nm

D 100 Nm

Your answer **[1]**

9



Calculate the power dissipated by resistor **R**.

A 30 W

B 15 W

C 12 W

D 3 W

Your answer

[1]

10 The diagram shows two poles of a magnet.

X is the position of a wire carrying a current perpendicularly into the paper.

Which direction does the wire move?

A ↓

B →

C ←

D ↑

Your answer

[1]

11 A piece of metal has a volume of 2.0×10^{-5} m^3.

The density of it is 8.0×10^{3} kg/m^3.

What is its mass?

A 2.5×10^{-3} kg

B 4.0×10^{-2} kg

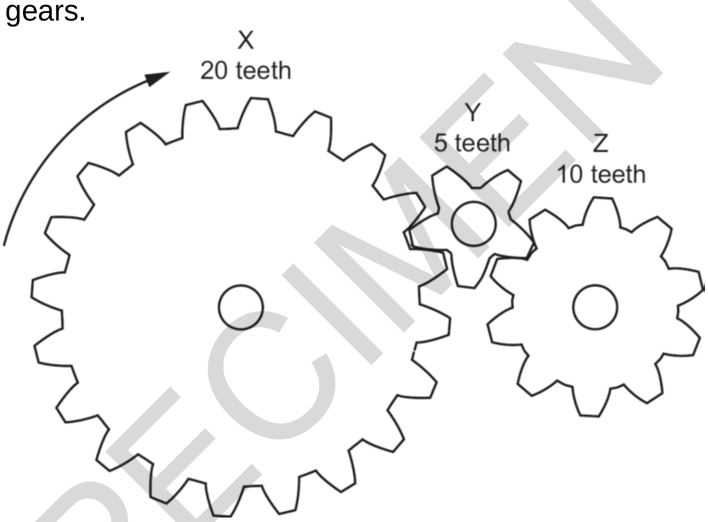
C 1.6×10^{-1} kg

D 1.6×10^{3} kg

Your answer ☐

[1]

12 The diagram shows 3 gears.



Gear **X** is rotated clockwise at 1.0 rotations per second.

Which row is the correct description of the movement of gear **Z**?

	direction of rotation	**rotations per second**
A	anticlockwise	0.5
B	anticlockwise	2.0
C	clockwise	0.5
D	clockwise	2.0

Your answer ☐

[1]

13 A car and driver with a total mass of 1000kg is travelling at 20 m/s.

The driver applies the brake and the car comes to a stop in 4 seconds.

What is the mean force on the car?

A 80 000 N

B 5 000 N

C 200 N

D 12.5 N

Your answer ☐

[1]

14 The current in a 12 Ω resistor is 9.0 A.

How much power is dissipated?

A 108 W

B 972 W

C 1 296 W

D 11 664 W

Your answer ☐

[1]

15 How much work is done on a spring, of spring constant 16 N/m, when it is stretched 50 cm?

A 2.0 J

B 8.0 J

C 12.5 J

D 25.0 J

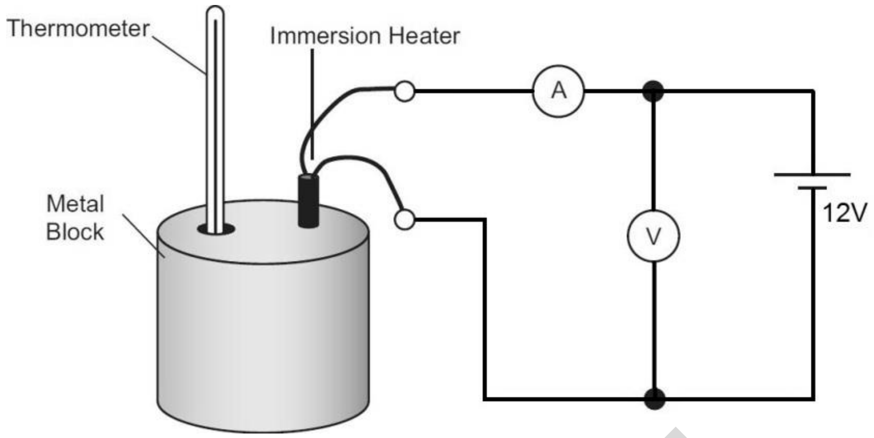
Your answer ☐

[1]

SECTION B

Answer **all** the questions.

16 A student completes an experiment to find the specific heat capacity of a metal.



(a) **(i)** The student takes voltage and current measurements.

Suggest **three** other measurements they need to take?

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.... **[3]**

(ii) Describe how these measurements could be used to determine the specific heat capacity of the metal.

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.... **[2]**

(b) The value obtained from the experiment is much higher than expected.

Suggest **two** reasons how this could have occurred and **two** improvements to the experimental procedure.

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.... **[4]**

17 A student rubs a balloon against a scarf.

(a)* Describe how the balloon has become charged.

Suggest a way to show that the balloon is charged. What would you expect to see and why?

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.... **[6]**

(b) The rate of flow of electrical charge in a circuit is a current.

A current of 40 mA transfers a charge of 3.6 C.

Calculate how long this takes.

Show your working.

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answer: .... seconds **[3]**

18 **(a)** A depth of 10 m of water exerts the same amount of pressure as the entire Earth's atmosphere which is ~120 km thick.

Suggest why.

.... **[1]**

(b) A diver takes some pressure readings.

Their results are in the table below.

Depth of water (m)	**Pressure (standard units)**
0	1
10	2
20	3
30	4
40	5
50	6

Use the data to describe the relationship between the depth of water and pressure.

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.... **[2]**

(c) Suggest why there is pressure at 0 metres.

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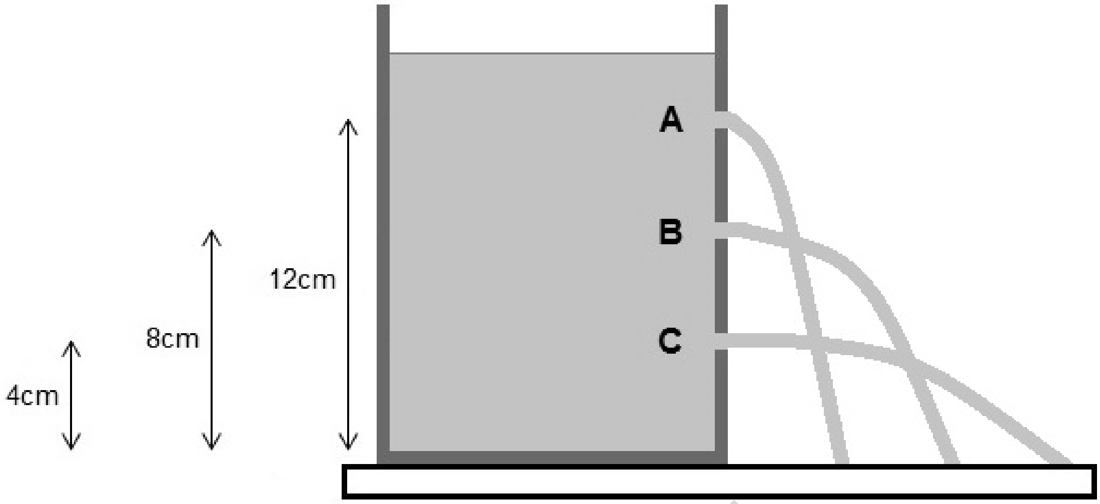
.... **[1]**

(d) A container of vegetable oil has 3 holes in it.



The vegetable oil has a density of 9.1×10^2 kg/m^3.

Calculate the change in pressure from **A** to **B**.

Show your working and give your answer to **2** significant figures.

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answer: .... Pa **[4]**

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TURN OVER FOR THE NEXT QUESTION

19 A student takes voltage and current measurements for four resistors.

The table shows the results from this experiment.

Resistor	Voltage (V)	Current (A)	Resistance (Ω)
A	12.0	2.0	
B	6.0	1.5	
C	7.5	1.5	
D	8.0	2.0	

(a) Which two resistors have the same resistance value?

Use the data to show this.

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.... **[2]**

(b) Calculate the maximum resistance that can be made using all four resistors.

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answer: .... Ω

[1]

(c) **(i)** Draw a circuit diagram that could be used to find out how the resistance of a filament bulb changes with current.

Describe the readings you need to take.

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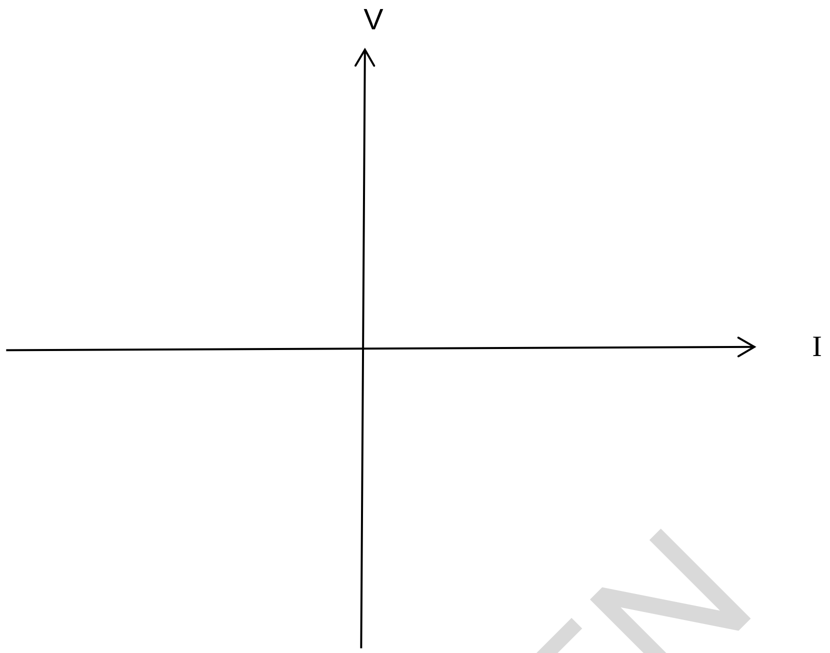
.... **[4]**

(ii) Sketch the shape of the graph using the axes below.



State how this graph can be used to calculate resistance at any specific value of current.

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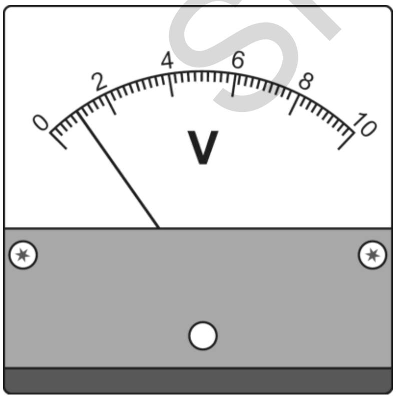
.... **[2]**

(d) A voltmeter is used to measure the output voltages produced from the circuit.

The voltmeter is not connected to a circuit and not recording a voltage.



Name the error on the voltmeter and suggest how it should be dealt with.

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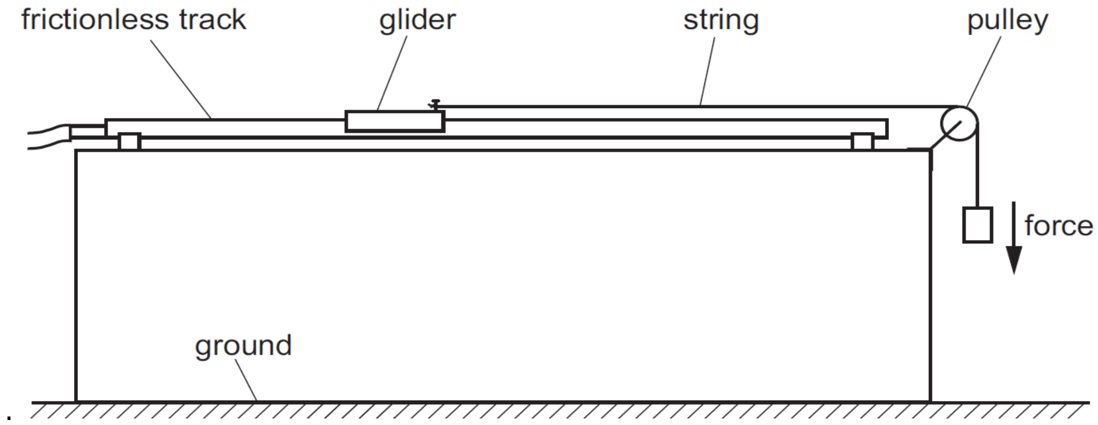
.... **[2]**

20 A student investigates the motion of a glider on a frictionless air track using the apparatus shown in the picture.



(a) **(i)** Explain how the student can use this apparatus to demonstrate Newton's Second Law.

Include details of any additional equipment required.

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.... **[3]**

(ii) A 0.25 kg glider is pulled by a 1.0 N force.

Calculate the acceleration of the glider using the formula:

force = mass x acceleration

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answer: .... m/s^2 **[1]**

(iii) Suggest reasons why the recorded value was less than your calculated value.

....

.... **[2]**

(b) The student repeats the experiment for 4 more forces.

Force (N)	Acceleration (m/s^2)			
	Attempt 1	**Attempt 2**	**Attempt 3**	**Mean**
1.0	3.8	3.9	3.7	3.8
2.0	7.8	7.7	7.7	7.7
3.0	11.2	11.4	11.6	11.4
4.0	12.0	14.9	15.1	13.8
5.0	19.0	18.9	19.1	19.0

There is an anomaly in the results.

Identify the anomaly and explain how the student could have dealt with it.

....

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.... **[2]**

(c) Explain what is meant by a reproducible experiment.

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.... **[1]**

21 **(a)** **(i)** Write down the name of the rule which can be used to predict the direction of the force perpendicular to a current-carrying conductor in a magnetic field.

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…………………………………………………………………………………………… **[1]**

A student places four wires of different lengths perpendicular to different magnetic fields with different currents flowing.

Look at the table of their results.

Wire	**Magnetic flux density (T)**	**Current (A)**	**Length (m)**
A	0.10	2.5	0.50
B	0.15	2.0	0.75
C	0.20	4.5	0.25
D	0.25	5.0	1.00

(ii) Use the data to show that wire **D** experiences the highest force.

Show your working.

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…………………………………………………………………………………………… **[2]**

(b) **(i)** The student decides to build a model transformer.

The transformer is a step-up transformer which doubles the input voltage.

Describe how they could build this step-up transformer in a science laboratory.

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…………………………………………………………………………………………… **[4]**

(ii) Suggest **one** risk associated with this experiment and how it can be reduced.

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.... **[2]**

(c) Describe how a microphone works.

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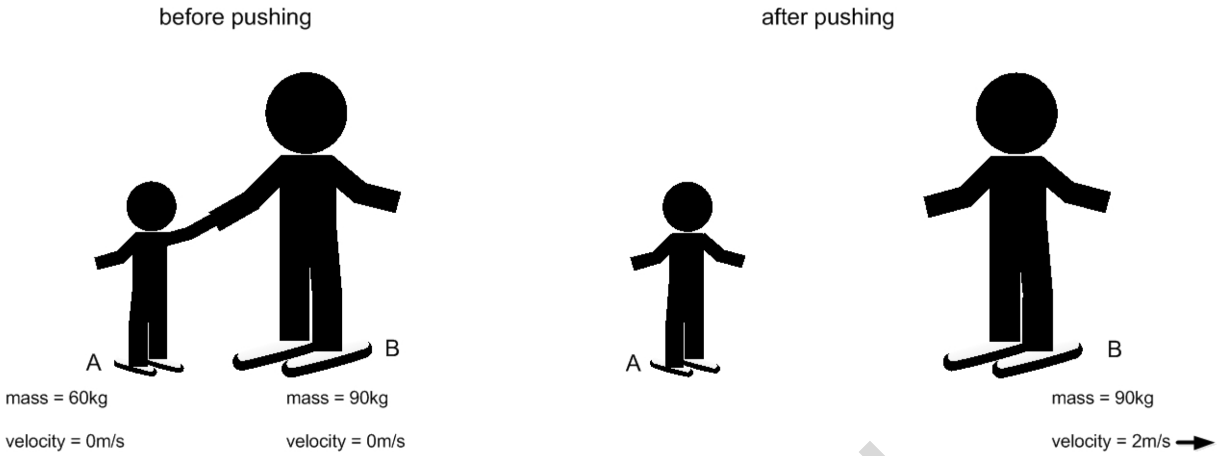
.... **[2]**

22 Two ice skaters A and B, at rest, start together on the ice.

The ice skaters push apart and they move off in opposite directions.



(a) State the law of conservation of momentum.

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.... **[1]**

(b) Use the data and your knowledge of momentum to calculate the velocity of skater **A** after pushing.

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.... **[2]**

23 A student researches potential and kinetic energy. She looks at some data from experiments with motion trolleys and energy.

The trolleys are stationary at the top of the ramp and have a gravitational potential energy of 8 J.

Each trolley has a mass of 1 kg.

Look at the research data on the trolleys.

Trolley	**Velocity at the bottom of the ramp (m/s)**
W	3
X	4
Y	5
Z	6

The student thinks the data is wrong.

Use the data and your understanding of energy transfer to justify why trolley W has the most likely velocity and why X, Y and Z do not.

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……… **[4]**

24 A free-fall skydiver falls from a plane and reaches terminal velocity after 15 seconds.

Look at the graph of her motion.

(a) Use the graph to find the acceleration at 5 seconds.

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answer: .... m/s^2 **[3]**

(b) Use the graph to find the distance travelled between 0 and 2.5 seconds.

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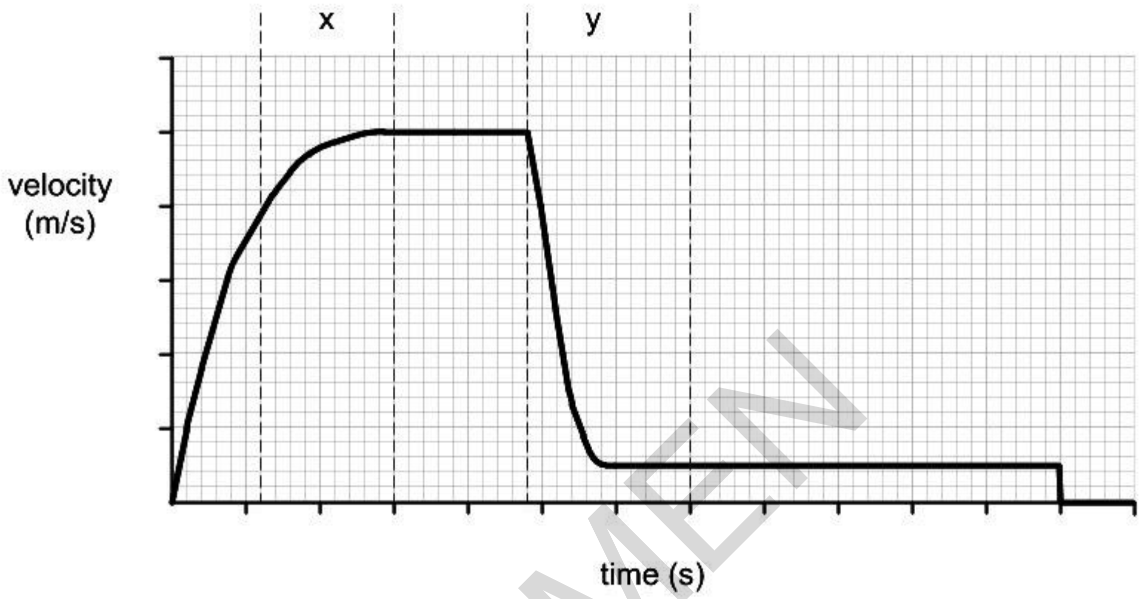
answer: .... m **[2]**

(c) A skydiver jumps from an aeroplane, falls towards the ground, opens her parachute and falls safely to earth.

Look at the graph of the velocity of the skydiver as she falls.



Look at these regions of the graph:

- **x**
- **y**

Use ideas about forces to explain the motion during **x** and **y**.

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.... **[6]**

END OF QUESTION PAPER

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Oxford Cambridge and RSA

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…day June 20XX – Morning/Afternoon

GCSE (9–1) Physics A (Gateway Science)
J249/03 Paper 3 (Higher Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 90

DRAFT

This document consists of 16 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to scoris and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the scoris messaging system.

5. Work crossed out:
   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)
   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The scoris **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
   If you have any questions or comments for your Team Leader, use the phone, the scoris messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance.

Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer. Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.
The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.
The communication statement determines the mark within a level.

11. **Annotations**

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

12. **Subject-specific Marking Instructions**

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9–1) in Physics A:

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

SECTION A

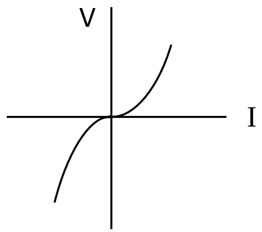
Question	Answer	Marks	AO element	Guidance
1	C	1	2.1	
2	D	1	1.1	
3	C	1	1.1	
4	D	1	2.2	
5	A	1	1.2	
6	B	1	1.2	
7	A	1	2.1	
8	C	1	2.1	
9	D	1	2.1	
10	A	1	1.2	
11	C	1	2.1	
12	D	1	2.1	
13	B	1	2.1	
14	B	1	1.2	
15	A	1	2.1	

SECTION B

Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	Temperature rise **or** start and end temperatures (1) Time that the heater is switched on (1) Mass of the block (1)	3	1.2 1.2 1.2	
		(ii)	Reference to: energy = voltage x current x time (1) SHC = energy / (mass x temp rise) (1)	2	2 x 2.1	
	(b)		Any two reasons and any two improvements <u>Reasons</u> Heat escapes to the surroundings (1) Part of the immersion heater is outside of the block (1) Poor thermal contact between the immersion heater and block (1) It takes time for the thermometer to reach its maximum temperature (once the heater is turned off) (1) <u>Improvements</u> Lag/insulate the aluminium block (1) Make sure all of the heater is in the block/use a smaller heater (1) Use petroleum jelly to transfer heat between the immersion heater and the block (1) Wait until the maximum temperature is reached (1)	4	2 x 3.2a 2 x 3.3b	Max 2 reasons and 2 improvements **ALLOW** (idea of) residual heat not reaching the block before the final temperature is recorded.

Question			Answer	Marks	AO element	Guidance
17	(a)*		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** **Detailed description of charging the balloon AND an experiment linked appropriately with an explanation of the observations.** *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** **Description of charging the balloon AND of an experiment to demonstrate.** *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** **Simple description of how the balloon may become charged OR a suggestion of an appropriate experiment.** *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** *No response or no response worthy of credit.*	6	3 x 1.2 3 x 2.2	**AO2.2: Description of an experiment with explanation** • Holding a charged balloon by water/paper/wall/hair/gold leaf electroscope/another charged balloon • Use of a gold leaf electroscope. A charged balloon causing the gold leaf to rise when the plate is touched by the balloon • Caused by charge moving down the leaf and metal plate with the same charge repelling one another • Idea of induction if relevant to investigation **AO1.2: Description of charging an insulator** • Mention of electrostatic forces • Attraction of opposite charges • Repulsion of like charges • Electrons are rubbed on/off the balloon from/to the scarf / **ORA** • Idea of negative charge linking to electrons • Removal of electrons result in positive charge

Question			Answer	Marks	AO element	Guidance
	(b)		Conversion of mA to A (40 mA = 0.04 A) (1) Use of Q = I x t: t = 3.6 / 0.04 (1) t = 90 (seconds) (1)	**3**	**3 x 2.1**	
18	**(a)**		Water is much denser than air/AW (1)	**1**	**2.1**	
	(b)		Pressure increases as depth increases (1) Each 10 metres of depth increases pressure by 1 AW (1)	**2**	**2 x 3.1b**	**ALLOW** direct/linear relationship
	(c)		It is the pressure of the atmosphere/AW (1)	**1**	**2.1**	
	(d)		Recall of 'g' (1) Substitution into equation (1) 364 / 360 (1) 2 significant figures quoted / 360 (1)	**4**	**1.1** **2.1** **2.1** **2.1**	9.8 or 10 m/s^2 **ALLOW** 356.72 (3)

Question			Answer	Marks	AO element	Guidance
19	(a)		B and D (1) resistance = voltage ÷ current (1)	2	2 x 3.1b	Both required for the mark. Either order. e.g. correct numbers substituted into correct equation
	(b)		19 (1)	1	3.1b	**ALLOW ECF** from (a)
	(c)	(i)	All correct circuit symbols (1) Circuit diagram with ammeter, lamp and power supply in series (1) Circuit diagram with voltmeter in parallel (1) Vary current, measure voltage / **ORA** (1)	4	1.1 3 x 1.2	To include ammeter, voltmeter, lamp and power supply/cell. Ignore variable resistor. **ALLOW** vary variable resistor and measure current and voltage if circuit includes a variable resistor
		(ii)	Correct curve shape (1)  use of graph to read values of V and I and description of use of R = V ÷ I (1)	2	1.2 2.2	
	(d)		Zero error (1) Reset the meter/subtract 1.0V from all readings (1)	2	2 x 1.2	**ALLOW** systematic error **ALLOW** subtract initial reading from all future readings

Question			Answer	Marks	AO element	Guidance
20	(a)	(i)	Change mass/Force applied (1) Release glider and idea of measuring acceleration with appropriate apparatus to do this stated (e.g. Light gates/datalogger) (1) Check results/plot graph to see if it matches F=ma formula (1)	3	3 x 2.2	e.g. Fprop a or m prop 1/a
		(ii)	4 m/s^2 (1)	1	2.1	
		(iii)	Any 2 from: The track is not perfectly frictionless/AW (1) Friction of the pulley (1) (Idea of) light gates incorrectly set up (1)	2	2 x 3.3a	
	(b)		Attempt 1 at 4 newtons/12.0 (1) Don't include it in the mean/repeat readings/repeat this reading during the experiment (1)	2	3.2a 1.2	
	(c)		Another person/group gets similar results/AW (1)	1	1.2	

Question			Answer	Marks	AO element	Guidance
21	**(a)**	**(i)**	Fleming's left hand rule (1)	**1**	**1.1**	**ALLOW** left hand rule / motor rule
		(ii)	Reference to B, I, L are the largest in the table (1) Some calculation to show the use of F=BIL e.g. one mark point for four correct calculations: A: 0.125 N B: 0.225 N C: 0.225 N D: 1.250 N (1)	**2**	**2 x 3.1b**	If no calculations are made pupils can only receive 1 mark
	(b)	**(i)**	Wind two coils of wire around an iron core / **AW** (1) Secondary coil has **twice**/**double** the number of primary turns / **ORA** (2) Connect primary coil to an a.c. supply (1)	**4**	**1.1** **2 x 1.2** **1.1**	**ALLOW** secondary coil has more turns than the primary coil / **ORA** (1)
		(ii)	High voltages can be produced / **AW** (1) Any 1 from: Insulate the secondary coil (1) Use very low voltages on the primary coil (1) Keep primary coil voltages low / **AW** (1)	**2**	**1.2** **3.3b**	**ALLOW** below 6 V
	(c)		Microphones convert pressure variations in sound waves (1) into variations in current/voltage in electrical circuits / **AW** (1)	**2**	**2 x 1.1**	

Question			Answer	Marks	AO element	Guidance
22	(a)		The momentum at the start and at the end will be equal as long as no external forces act / **AW** (1)	1	1.1	
	(b)		(90 x 2) + (60 x velocity) = 0 (1) Velocity = (-)3 (m/s) (1)	2	2 x 2.1	
23	(a)		Idea that the KE at bottom must be equal to or less than GPE at the top (1) W: KE = 4.5J and so is possible as it is likely that some energy will be lost / **AW** (1) X: KE = 8J and so is possible but it will not be 100% efficient/X is unlikely as it implies no energy is lost / **AW** (1) Y: KE=12.5J and Z: KE = 18J and so not possible (1)	4	1.1 3.1b 3.1b 3.1b	

Question			Answer	Marks	AO element	Guidance
24	(a)		Tangent drawn to the line at 5 seconds (1) Correct values read-off from triangle created (1) Correct value of acceleration calculated 4.0 (m/s^2) (1)	3	2.2 2.2 2.1	**ALLOW** 3.6–4.5 m/s^2
	(b)		Evidence of counting squares technique (1) Correct distance calculated 32 (m) (1)	2	2 x 1.2	**ALLOW** 30–35 m
	(c)		Part X: • Speed increases so drag increases (1) • resultant force reduces so acceleration is reduced(1) • Drag force approaches the weight until weight = drag and she moves at a terminal velocity (1) Part Y: • Speed deceases as drag > weight (1) • Larger resultant force gives a high deceleration to reach terminal velocity (1) • At Y larger surface area (from the parachute) gives drag=weight at a lower speed than part X / **ORA** (1)	6	6 x 2.1	Each set of 3 points must be in a logical order.