OCR
Oxford Cambridge and RSA

Accredited

GCSE (9–1) Physics B (Twenty First Century Science)
F
J259/01 Breadth in physics (Foundation Tier)
Sample Question Paper

Date – Morning/Afternoon
Version 2.2
Time allowed: 1 hour 45 minutes

You must have:
• a ruler
• the Data Sheet

You may use:
• a scientific or graphical calculator

First name	
Last name	
Centre number	Candidate number

INSTRUCTIONS
• Use black ink. You may use an HB pencil for graphs and diagrams.
• 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 **[ ]**.
• This document consists of **24** pages.

Answer **all** the questions.

1 Two students are investigating springs and forces.

(a) They measure how much a steel spring stretches when different weights are hung on it.

State **one** safety precaution the pupils should take when completing this experiment.

....

.... **[1]**

(b) They collect the results listed in **Table 1.1**.

Force (N)	Extension (cm)
0.0	0.0
1.0	1.6
2.0	3.2
3.0	6.0
4.0	6.4
5.0	8.0

Table 1.1

Circle the possible anomaly in the results for extension. **[1]**

(c) They start to plot a graph of their results.
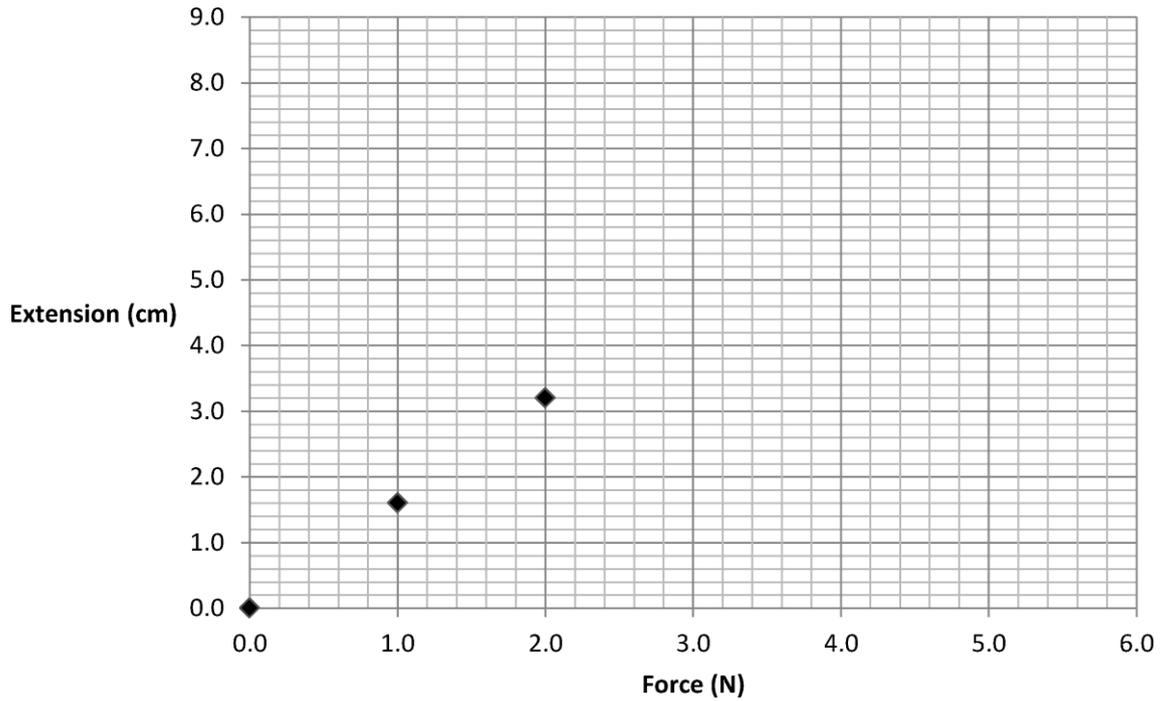
Plot the remaining points, **ignoring the anomaly**, and draw a line of best fit. **[3]**

(d) Using the results in **Table 1.1**, calculate the spring constant of the spring when the force is 4.0 N.

Force   =   extension   ×   spring constant

Spring constant = ………………………………. N/m   **[4]**

2 The demand for energy in the home keeps increasing.

**(a)** What does the **amount** of energy transferred electrically by an appliance depend upon?

Put ticks (?) in the boxes next to the **two** correct answers.

How much it cost to buy ☐

Its power rating ☐

The cost of one unit of electricity ☐

The frequency of the mains supply ☐

The time it is used for ☐ **[2]**

(b) Look at these Sankey diagrams for two different energy efficient bulbs.

(The diagrams are **not** drawn to scale.)
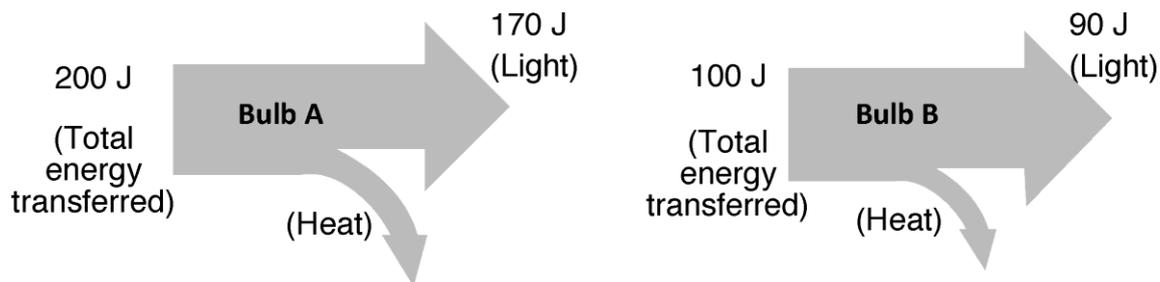
(i) Which **two** conclusions can be made from these diagrams?

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

Both bulbs transfer more energy by lighting than heating. ☐

Bulb **A** is more efficient. ☐

Bulb **B** produces 10 J by heating for every 100 J of energy transferred by the electric current. ☐

Bulb **B** will **not** last as long as bulb **A**. ☐
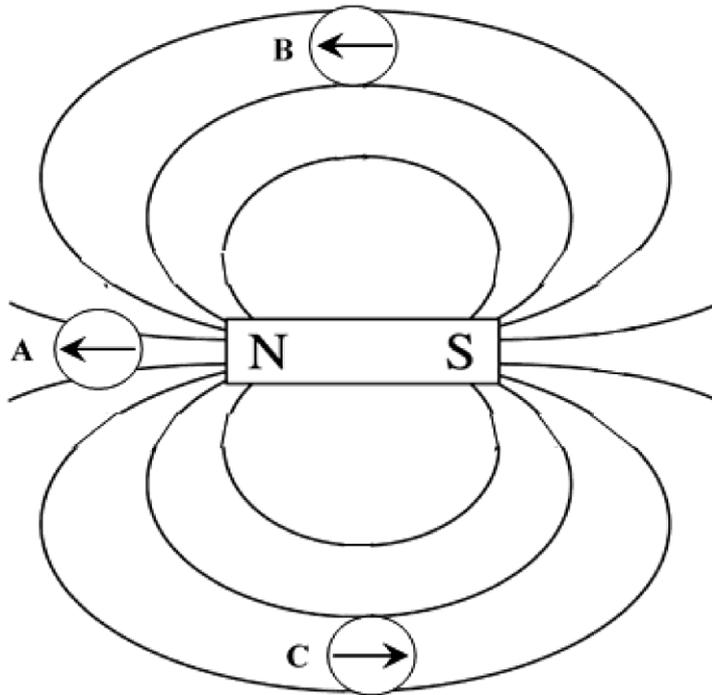
The bulbs do **not** waste any energy. ☐ **[2]**

(ii) Calculate the efficiency of bulb **A** as a percentage.

Efficiency = ………………………………… % **[3]**

3 Two students are investigating magnets and electromagnets.

(a) They use three plotting compasses (**A**, **B** and **C**) to examine the magnetic field around a bar magnet.

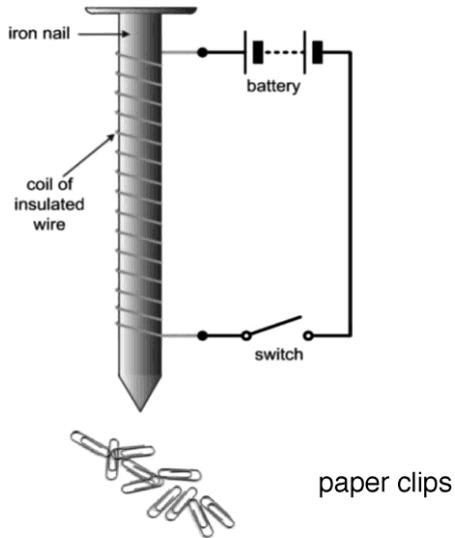(i) Which plotting compass (**A, B** or **C**) is faulty and pointing in the wrong direction?

…………………………………… **[1]**

(ii) At which **ONE** of the three positions (**A, B** or **C**) will the bar magnet's field be the **strongest**?

…………………………………… **[1]**

(b) They set up the apparatus below to test a simple electromagnet.

paper clips

(i) The students decided to change **one** factor and see how it affected the strength of the electromagnet.

They both repeated their tests. Here are their results.

Number of turns in coil	Number of paper clips attracted		Number of turns in coil	Number of paper clips attracted	
	Test 1	Test 2		Test 1	Test 2
0	0	0	0	0	0
10	6	5	10	2	4
20	13	14	20	5	9
30	22	20	30	11	17
Student **A**'s results			Student **B**'s results		

Student **B** used heavier paper clips.

In student **B**'s experiment, calculate the mean for the number of paper clips attracted when **30 turns** were used.

Mean = ...**[1]**

(ii) Which student, **A** or **B**, has collected better quality valid data?

Give **two** reasons to support your answer.

....

....

.... **[2]**

4   Here is a list of waves:

Infrared

Microwaves

Sound

Ultraviolet

X-rays

(a) Use waves from the list to answer the following questions.

You may use each wave once, more than once or not at all.

(i)   Which wave is **not** in the electromagnetic spectrum? ....**[1]**

(ii)   Which wave can be used to find metal objects in a suitcase?.....................**[1]**

5 **(a)** Nearly 200 years ago, an underwater bell was used to find the speed of sound under water in Lake Geneva, Switzerland.
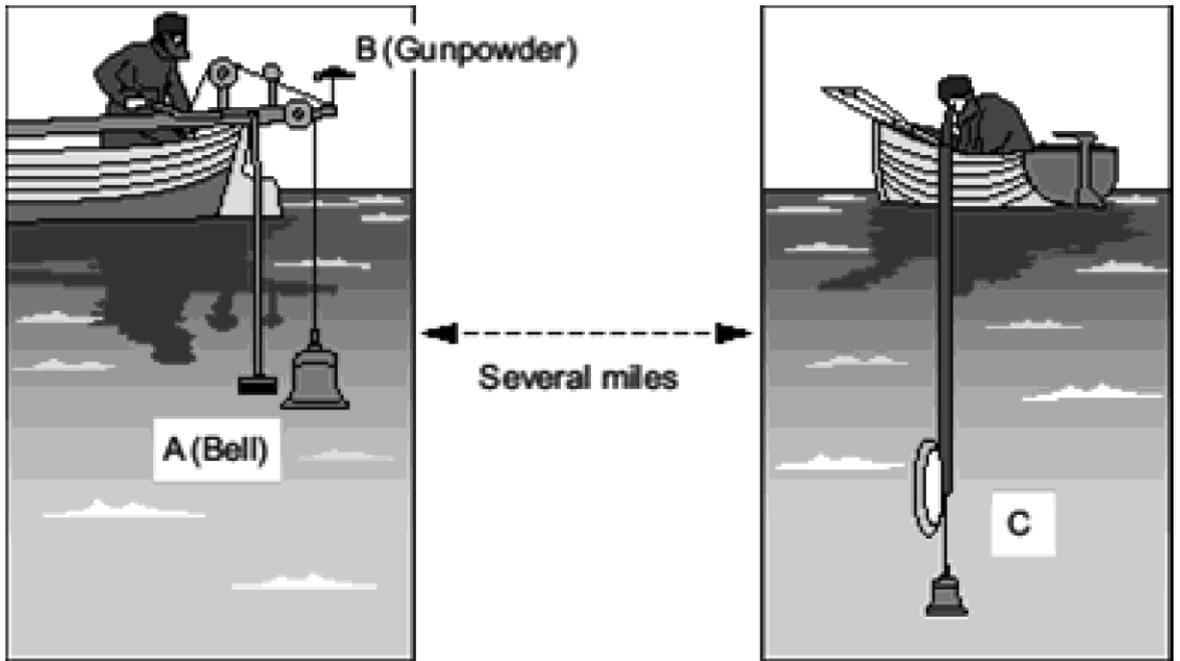
*   The bell (**A**) was struck and the gunpowder (**B**) ignited at the same time.

*   The flash from the gunpowder and the sound from the bell were detected several miles away (**C**).

What **two** measurements need to be taken in this experiment to calculate the speed of sound under water?

1 ....

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

(b) The flash from the gunpowder was seen before the sound from the bell was heard.

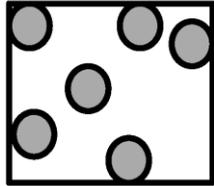Explain why this happened in terms of the speed that sound and light travel.

....

.... **[1]**

 Turn over

(c) (i) Below are diagrams showing the particle arrangements in solids, liquids and gases.
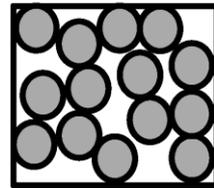
Draw lines to match the diagram to the correct label.
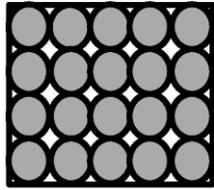
| Gas |
| Liquid |
| Solid |

[2]

(ii) Sound waves travel through materials by making the particles in the material vibrate.

Use this idea and your knowledge of the particle model of matter to explain why sound travels much faster through water than through air.

....

....

.... **[2]**

6 In 1913, Niels Bohr suggested a new model of the atom.

This model has been further developed over time.

(a) Complete the following sentences. Use words from the list.

electrons   negative   neutrons   nucleus   positive   protons

In the modern model of the atom, the mass of the atom is concentrated in the

....

This central part of the atom is made up of particles called ....and

.... and has an overall .... charge. **[4]**

(b) The element iodine has many **isotopes**.

A nucleus of the stable isotope of iodine can be represented as:

$$^{127}_{53}\text{I}$$

What is the difference between the nuclei of two isotopes of the same element.

.... **[1]**

(c) Radioactive isotopes are widely used in medicine to treat cancer. Some people are concerned that using radiotherapy treatment for cancer may itself cause a second cancer.

In a recent study of over 600 000 cancer patients who had been treated with radiotherapy, it was found that about **5 in 1 000** of them developed a further cancer within 15 years as a result of the treatment.

Calculate the number of cancer patients in this study that developed a further cancer within 15 years of treatment.
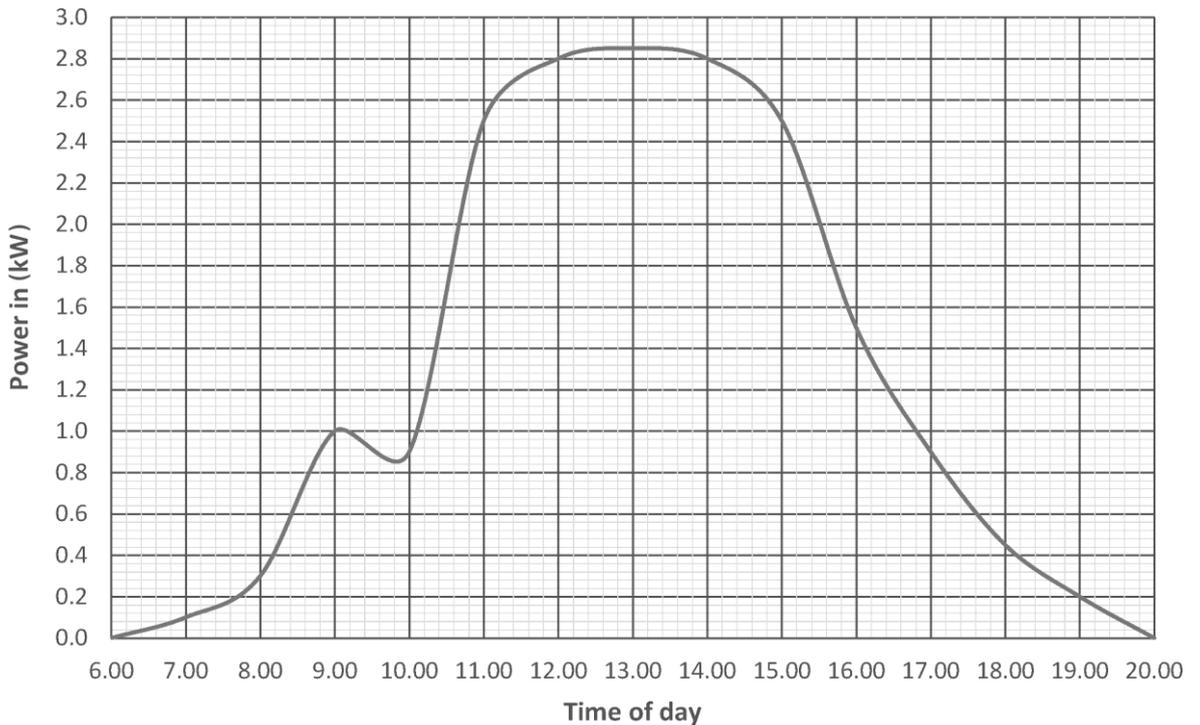
Use the data above in your answer.

.... **[2]**

7 (a) What is the difference between a renewable and a non-renewable energy resource?

....

.... **[1]**

(b) More and more homes are having solar panels fitted to reduce household electricity bills.

The graph shows how the power output from a solar panel varies during a typical summer day.

Using the graph, estimate the mean power output **between 11:00 and 15:00 hours**.

Mean power output = …………………………………. kW **[1]**

(c) The output from the solar panel is d.c.

This needs converting to the correct a.c. voltage for the household to use the electricity.

(i) What is the correct voltage and frequency of the UK mains electricity supply?

Put a (ring) around the **two** correct values.

Voltage			**Frequency**		
110 V	230 V	360 V	30 Hz	40 Hz	50 Hz

[2]

(ii) In the National Grid, what is the name of the device used to change the supply voltage before and after transmission?

.... **[1]**

(d) A new power station is being built in your town.

The table gives some information about three different types of power station.

Type of power station	Efficiency (%)	Cost per kWh in pence	Environmental factors
Wind	34	4 to 5.5	May damage local wildlife, e.g. birds
Nuclear	35	2 to 2.5	Produces radioactive waste
Gas	38	2 to 3	Produces carbon dioxide

Which type of power station would you recommend building?

Use information from the table to decide.

Explain your choice.

....

....

....

....

.... **[3]**
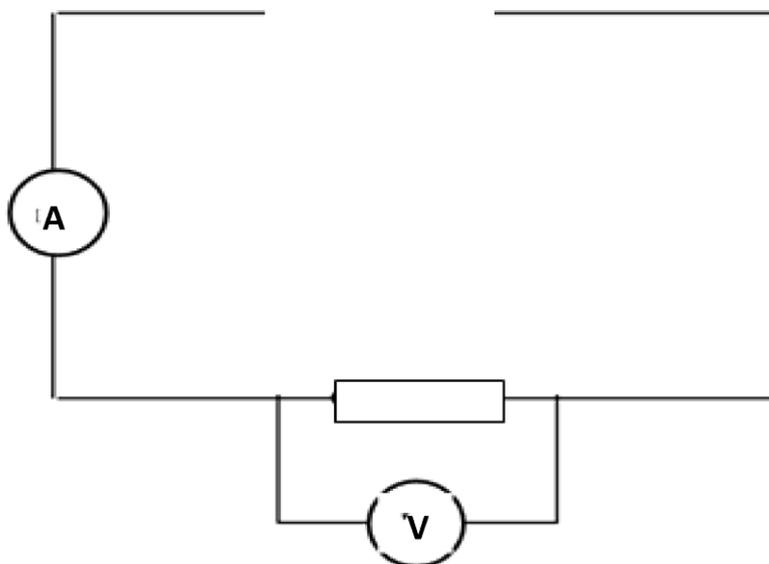
(e) Some power stations include boilers where the steam is used to turn a turbine.

Name an energy resource for a power station that does **not** have a boiler.

.... **[1]**

8 **(a)** Eve is learning about electric charge in circuits.

The diagram is an incomplete circuit showing a resistor, a voltmeter and an ammeter.

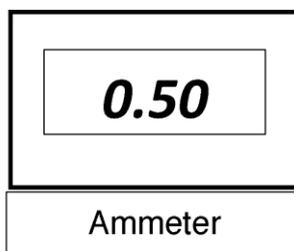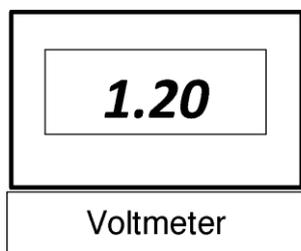**(i)** The diagram needs a switch and a single cell or battery.

Complete the diagram, using the correct symbols. **[1]**

Eve switches the circuit on and watches the voltmeter and ammeter readings carefully for **0.5 minutes**. She notices that both readings remain steady as shown below.
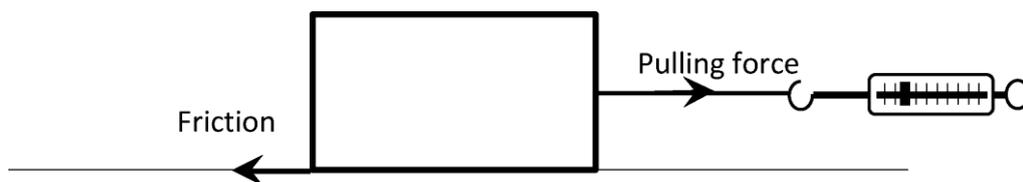
1.20	0.50
Voltmeter	Ammeter

(ii) Calculate the electric charge (in C) which flows through the resistor in 0.5 minutes.

Electric charge = ………………………………. C **[3]**

(iii) Calculate the resistance of the resistor in the circuit.

Resistance = ………………………………… Ω **[3]**

9 **(a)** This is an incomplete force diagram showing a block being slowly pulled horizontally along a flat surface.

(i) On the diagram **draw and label** arrows to represent the force of gravity and the reaction force (both acting on the block). **[2]**

(ii) The block is pulled with a force of 4 N.

Calculate the work done by this force on the block as it is pulled 30 cm along the surface for 5 seconds.

Work done = force × distance moved in the direction of the force.

Work done = ………………………………. J **[3]**

(iii) Originally the block was pulled at a steady speed. The pulling force is then changed.

Use lines to link each '**statement**' about the pulling and friction forces to the '**effect**' these new forces have on the motion of the block.

Statement   **Effect**

… the block will continue to move at a steady speed.

The pulling force is smaller than the friction force …

…the block will speed up.

The pulling force is greater than the friction force …

… the block will slow down.

The pulling force is equal to the friction force …

… the block will stand still.

… the block will move to the left.

[3]

10 Nina pulls toy cars along the floor in a laboratory.

She measures the force and distance moved each time.

Her results are shown in the table.

Toy car	Pulling force (N)	Distance moved (m)
A	10	2
B	5	6
C	4	5
D	2	7

(a) Which **two** cars do the same amount of work?

Show your working.

Car ……………………………… and Car..**[2]**

(b) Nina does another experiment to investigate work done.

Nina uses two different electric motors (**Q** and **R**) to lift a large mass. She wants to find out which motor is the most efficient.

She measures the input electrical energy and the work done on the mass.

Look at the table of her results.

Electric motor	Input energy (J)	Output energy (J)
Q	800	760
R	2000	1920

I think that motor **Q** wastes half as much energy as motor **R**.

So **Q** is the most efficient.
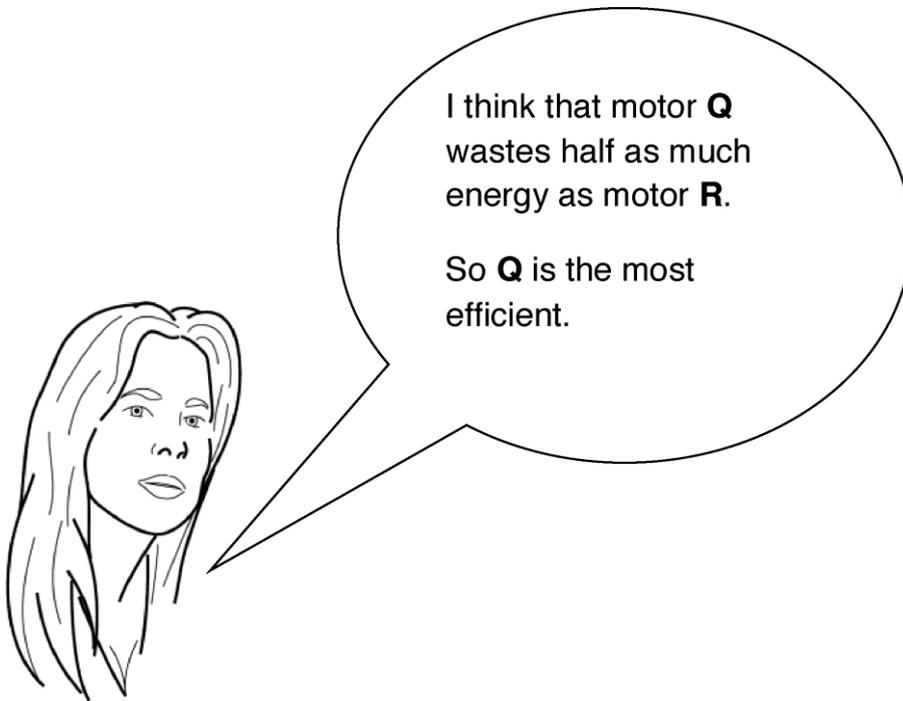
Nina's statement is partly correct and partly wrong.

Use the data in the table above and calculations to explain why.

....

....

.... **[2]**

(c) Motor **R** takes 20 seconds to lift the mass.

Calculate the **difference** between the input and output power of motor **R**.

Difference = …………………………………… W   **[3]**

11 **(a) (i)** Define density.

....

.... **[1]**

(ii) A 3.0 m³ volume of air has a mass of 3.9 kg.

Calculate the density of the air.

Density = ………………………………… kg/m³ **[2]**

(b) Layla does an experiment to test the hypothesis:

'the reason why a solid floats or sinks in a liquid depends upon both the density of the solid and the density of the liquid'.

She was given blocks of rubber and wood and bottles of maple syrup and baby oil.

The table shows the densities of the four materials.

Material	Density (g/cm³)
Rubber	1.52
Wood	0.85
Maple Syrup	1.37
Baby Oil	0.80

Layla's results are shown below.

Material	Floats in Maple Syrup	Floats in Baby Oil
Rubber	No	No
Wood	Yes	No

Layla concludes that the density of both the solid and the liquid affect whether the solid floats or sinks.

Use the data to justify Layla's conclusion.

....

....

....

.... **[2]**

Turn over

(c) A solid block is immersed in a liquid.

Which diagram, **A**, **B**, **C** or **D**, best shows the **direction** of all the force(s) on the solid caused by the liquid pressure?
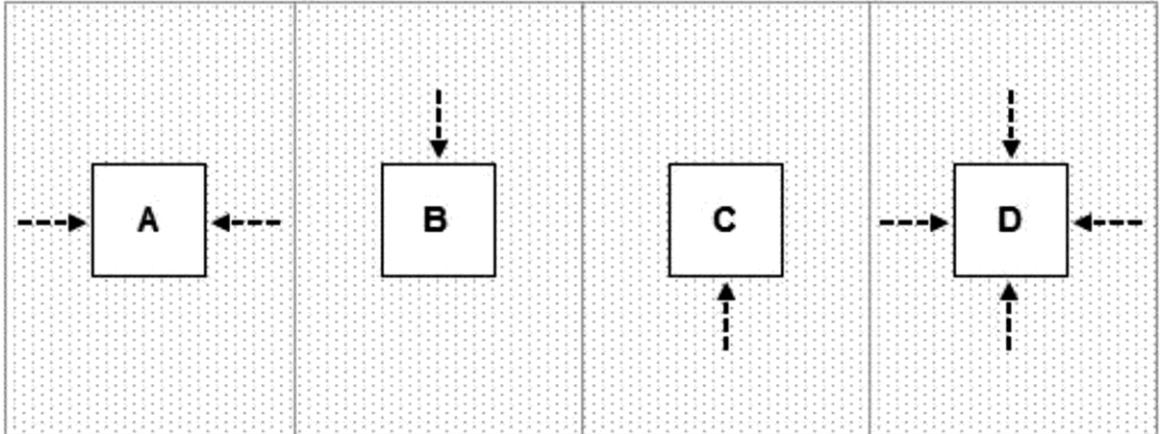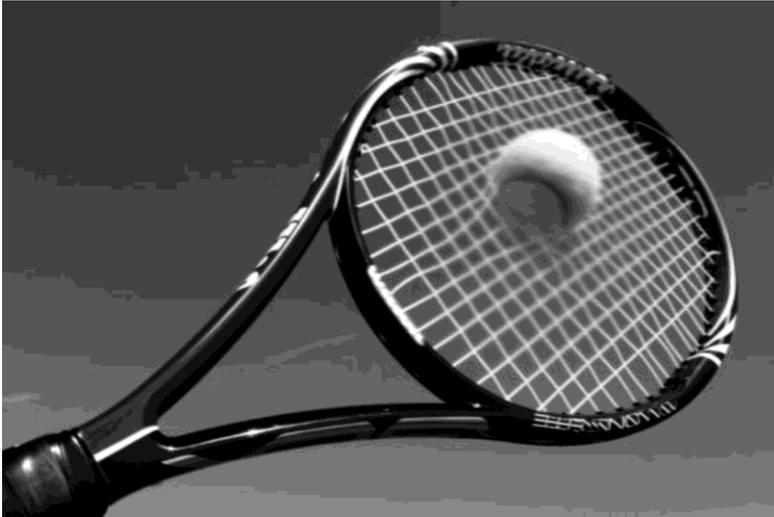

Diagram: ....[1]

12 This is a picture of a tennis ball being hit.

(a) The racket exerts an average force of 1000 N on the tennis ball.

Complete the table to show whether each statement about the average force exerted **by** the tennis ball **on** the racket is **true** or **false**.

Put ticks (✓) in the correct boxes.

	True	False
The average force is a vector quantity		
The average force acts in the same direction as the ball is moving		
The average force equals 1000 N		
The average force depends upon the weight of the ball		

[2]

(b) The tennis ball has a mass of 0.060 kg and travels at a speed of 51 m/s.

Calculate the kinetic energy of the ball.

Kinetic energy = …………………………………… J   **[3]**

(c) Calculate the weight (in newtons) of the tennis ball.

• Gravitational field strength = 10 N/kg.

Weight = …………………………………… N   **[3]**

13 **(a)** A coin is dropped to the floor.
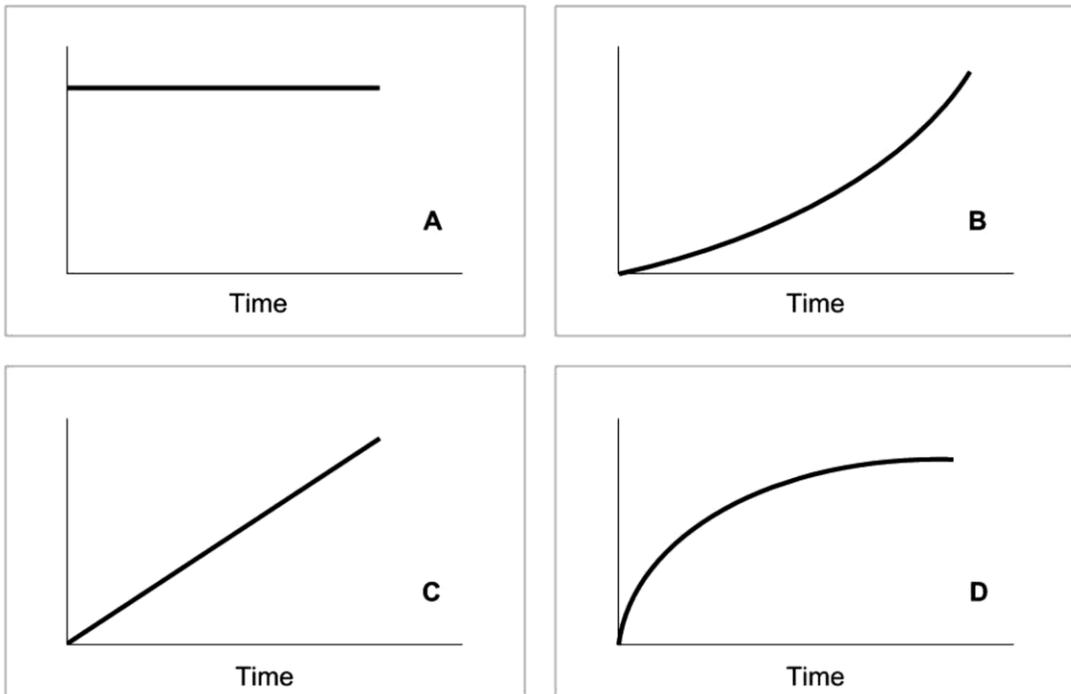
(i) Which graph represents the distance–time graph of the coin dropping?

Graph:...**[1]**

(ii) Which graphs represent the speed–time graph of the coin dropping?

Graph:...**[1]**

(b) The coin falls through a distance of 150 cm in a time of 0.8 seconds.

Calculate the average speed at which the coin falls.

Speed   =   distance   ÷   time

Average speed = ………………………………. m/s   **[3]**

(c) Explain the **difference** between vectors and scalars as it applies to velocity and speed.

....

....

.... **[3]**

END OF QUESTION PAPER

23

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Summary of updates

Date	Version	Details
October 2021	2.2	Updated copyright acknowledgements.

F

…day June 20XX – Morning/Afternoon

GCSE (9–1) Physics B (Twenty First Century Science)
J259/01 Breadth in physics (Foundation Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK   90

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. 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

11.   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.

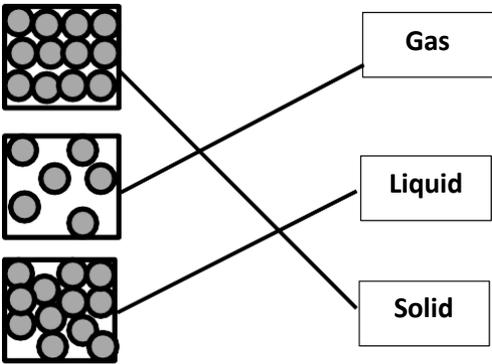The breakdown of Assessment Objectives for GCSE (9–1) in Physics B:

		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.

Question			Answer	Marks	AO element	Guidance
1	(a)		Not to hang too much weight so not to break spring / careful with dropping masses ✓	1	3.3a	**ALLOW** any sensible suggestion for safety precaution
	(b)		6.0 (cm) circled ✓	1	3.1a	
	(c)		Marks correctly plotted ✓✓ Correct best fit line ✓ 	3	2 x 2.2 1.2	If outlier plotted give 2 marks only. **ALLOW** ECF from (b)
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 62.5 (N/m) award 4 marks** Re-arrange equation to give spring constant = force ÷ extension ✓ Use the table to find extension at 4N = 6.4 cm ✓ Convert cm into m = 0.064m ✓ 4N ÷ 0.064 m = 62.5 (N/m) ✓	4 1.2 2.1 1.2 2.1		**ALLOW** any other pair of numbers from table / graph that gives same answer

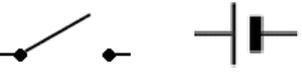| Question			Answer	Marks	AO element	Guidance
2	(a)		Its power rating ✓ How long it is used ✓	2	2.1	
	(b)	(i)	Bulb B produces 10 J by heating for every 100 J of energy transferred by the electric current ✓ Both bulbs transfer more energy by lighting than heating ✓	2	3.1a	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 85(%) award 3 marks** Recall: efficiency = useful energy transferred ÷ total energy transferred ✓ 170 J / 200 J = 0.85 ✓ = 85(%) ✓	3	 1.1 2.1 2.1	correct substitution gains first 2 marks (if equation is missing)

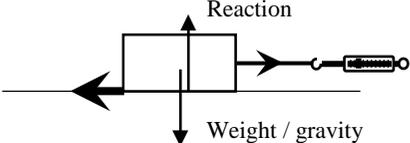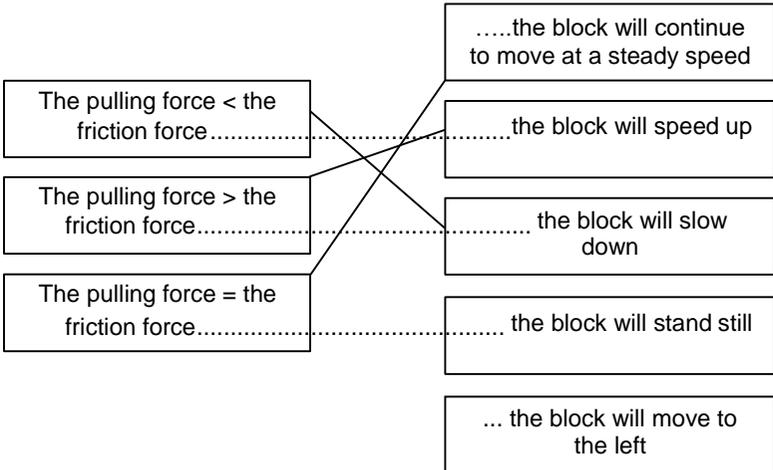| Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	B ✓	1	1.1	
		(ii)	A ✓	1	1.1	
	(b)	(i)	14 ✓	1	2.2	
		(ii)	Student A's data is more repeatable / shows less scatter ✓ Data is more precise as lighter paper clips used ✓	2	3.1 b 3.2 b	**DO NOT ALLOW** 'less range'; **ALLOW** 'repeats show less range'. **ALLOW** 'more accurate' **ORA**

Question			Answer	Marks	AO element	Guidance
4	**(a)**	**(i)**	Sound ✓	**1**	**1.1**	
		(ii)	X-rays ✓	**1**	**1.1**	

Question			Answer	Marks	AO element	Guidance
5	**(a)**		Distance from A to C ✓ Time taken for sound to reach C (between flash and sound being picked up) ✓	**2**	**1.1**	Unqualified 'distance' and 'time' = 1 mark only
	(b)		Light travels faster than sound	**1**	**1.1**	**ALLOW** reverse argument
	(c)	**(i)**		**2**	**1.1**	1 correct 1 mark 2/3 correct 2 marks
		(ii)	In water (liquids) the particles are closer together…..✓ ….makes it easier for vibrations to be transmitted ✓	**2**	**1.2**	Must be comparative e.g. less separation Must be comparative e.g. more easily

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	Nucleus ✓ Protons/neutrons ✓ Neutrons/protons ✓ Positive ✓	4	1.1	**DO NOT ALLOW** PROTON or NEUTRONS written twice
	(b)		Different (nuclear) mass / Different number of neutrons ✓	1	1.1	**ALLOW** 'different mass number'
	(c)		**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 3000 award 2 marks** 600 000 x (5 ÷ 1000) ✓ = 3000 ✓	2	2.2	

Question			Answer	Marks	AO element	Guidance
7	(a)		A renewable energy resource will not run out / is not finite ✓	1	1.1	**ORA** **DO NOT ALLOW** 'can be used again'
	(b)		2.7 (kW) ✓	1	3.1a	**ALLOW** answers between 2.6 and 2.8
	(c)	(i)	230 v ✓ 50 Hz ✓	2	1.1	Mark voltage and frequency responses independently
		(ii)	Transformer ✓	1	1.1	**IGNORE** references to step up / down
	(d)		(Choice clearly stated.) Comparative comments made regarding: Efficiency ✓ Cost ✓ Environmental ✓ Consistent with the choice made.	3	3.1b	Answers must only be based on the information in the table Answers where no clear choice is made but the candidate has made a valid comparative comment can score a maximum of 1 mark The environmental mark can be awarded if the candidate has either acknowledged concerns regarding the environmental problem or suggested a means for mitigating the environmental problem e.g. careful management of nuclear waste etc. **ALLOW** gas has 38% efficiency to imply most efficient **ALLOW** nuclear costs 2 to 2.5 p per kWh to imply cheapest
	(e)		Wind / water / wave / hydroelectric / tidal / solar / geothermal ✓	1	1.1	**DO NOT ALLOW** nuclear or biomass. **ALLOW** gas turbine

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	Correct symbols for battery/single cell **and** switch. ✓	1	1.2	At least one of them must be correctly labelled
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 15 (C) award 3 marks**	3		Correct substitution gains first 2 marks (if equation is missing)
			Recall: Charge = current x time; ✓		1.1	
			= 0.5 mins = 30 secs ✓		2.1	
			= 0.5 x 30 = 15 (C) ✓		2.1	
		(iii)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 2.4 (Ω) award 3 marks**	3		Correct substitution gains first 2 marks (if equation is missing)
			Recall: Resistance = voltage ÷ current ✓		1.1	
			= 1.20 ÷ 0.50 ✓		2.1	
			= 2.4 (Ω) ✓		2.1	

Question			Answer	Marks	AO element	Guidance
9	(a)	(i)	Downward arrow drawn and labelled; ✓ Upward arrow of **same length** drawn and labelled ✓	2	1.2	'Length' judged by eye 'Start point' for arrows can be anywhere near *central area* of the block (otherwise 1 mark max)
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 1.2 (J) award 3 marks** Convert cm into m 30 cm = 0.30 m✓ Work done = 4 N x 0.30 m ✓ =1.2 J ✓	3	2.1	
		(iii)		3	1.1	1 mark per correct line drawn

Question			Answer	Marks	AO element	Guidance
10	(a)		**FIRST CHECK ANSWER ON ANSWER LINE. If answer = A and C award 2 marks**	2	3.2b	
			A and C ✓		2.1	
			Calculations applying equation: ✓			
			work done = force x distance shown			
			A = 20 J			
			B = 30 J			
			C = 20 J			
			D = 14 J			
	(b)		Q wastes 40 J and R wastes 80 J ✓	2	3.1b	**ALLOW** R is 1% more efficient (1)
			Q is 95% efficient and R is 96% efficient ✓		2.1	
	(c)		**FIRST CHECK ANSWER ON ANSWER LINE. If answer = 4 W award 3 marks**	3		
			Use of: power = energy / time:			
			Input power = 2000/20 = 100 W ✓		2.1	
			Output power = 1920/20 = 96 W ✓		2.1	
			Difference: 100 – 96 = 4W ✓		1.2	

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	Density = mass ÷ volume ✓	1	1.1	
		(ii)	**FIRST CHECK ANSWER ON ANSWER LINE.** **If answer = 1.3 (kg / m³) award 2 marks.** 3.9 ÷ 3.0 ✓ = 1.3 (kg / m³) ✓	2	2.1	
	(b)		She is correct: Density of solid > density of liquid → solid sinks ✓ Quotes data from the table in support of claim ✓	2	1.1 3.2b	(No mark for just stating Layla is correct) **ALLOW** Rubber greater density than both liquids so does not float **ORA** **ALLOW** wood density 0.85 floats in maple syrup > density of 1.37 but sinks in baby oil < density of 0.80.
	(c)		D ✓	1	1.1	

Question	Answer	Marks	AO element	Guidance
12 (a)	<table><tr><td></td><td>True</td><td>False</td></tr><tr><td>It is a vector quantity</td><td>✓</td><td></td></tr><tr><td>The force acts in the same direction as the ball…..</td><td></td><td>✓</td></tr><tr><td>The force equals 1000 N</td><td>✓</td><td></td></tr><tr><td>The force depends upon the weight of the ball</td><td></td><td>✓</td></tr></table>	2	2.2	4 correct = 2 marks 2 or 3 correct = 1 mark 1 or 0 correct = 0 marks
(b)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 78.03 (J) award 3 marks** Recall: Kinetic Energy: 0.5 x mass x velocity^2 ✓ = 0.5 x 0.06 x 51^2 ✓ = 78.03 (J) ✓	3	 1.1 2.1 2.1	Correct substitution gains first 2 marks (if equation is missing) **ALLOW** 78 (J) for 3 marks
(c)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 0.6 (N) award 3 marks** Recall: Weight (N) = mass (kg) x gravitational field strength (N / kg) ✓ = 0.06 kg x 10 N / kg ✓ = 0.6 (N) ✓	3	 1.1 2.1 2.1	Correct substitution gains first 2 marks (if equation is missing)

Question			Answer	Marks	AO element	Guidance
13	(a)	(i)	B ✓	1	3.2a	
		(ii)	C ✓	1	3.2a	
	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 1.88 (m/s) award 3 marks** Converts cm into m = 150 cm = 1.5 m ✓ 1.5 m ÷ 0.8 s ✓ = 1.88 (m/s) ✓	3	1.1 2.1 2.1	
	(c)		The speed of an object does not give indication of a direction. ✓ The velocity of an object at a given moment is its speed, together with an indication of its direction. ✓ Velocity is a vector and speed is a scalar ✓	3	1.1	

Summary of updates

Date	Version	Change
May 2018	2	We've reviewed the look and feel of our papers through text, tone, language, images and formatting. For more information please see our assessment principles in our "Exploring our question papers" brochures on our website
October 2019	2.1	Question 3 (b)(ii)– There has been a change to the Mark Scheme. Addition to guidance column: **Allow** "more accurate"