OCR
Oxford Cambridge and RSA

…day June 20XX – Morning/Afternoon
GCSE (9–1) Physics B (Twenty First Century Science)
J259/03 Breadth in physics (Higher Tier)

SPECIMEN MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 90

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.

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

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.

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td>Density = mass ÷ volume ✓</td><td>1</td><td>1.1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>FIRST CHECK THE ANSWER ON ANSWER LINE.
If answer = 1.3 (kgm/s) award 2 marks

3.9 ÷ 3.0 ✓

=1.3 (kg/m^3) ✓</td><td>2</td><td>2.1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>She is correct:
Density of solid > Density of liquid → Solid sinks ORA; ✓

Quotes data from the table in support of claim ✓</td><td>2</td><td>1.1

3.2b</td><td>No mark for just stating Beth is correct</td></tr>
<tr><td></td><td>(c)</td><td></td><td>D ✓</td><td>1</td><td>1.1</td><td></td></tr>
<tr><td>2</td><td>(a)</td><td></td><td><table><tr><th></th><th>True</th><th>False</th></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></td><td>2</td><td>2.2</td><td>4 correct = 2 marks
2 or 3 correct = 1 mark
1 or 0 correct = 0 marks</td></tr>
<tr><td></td><td>(b)</td><td></td><td>FIRST CHECK THE ANSWER ON ANSWER LINE.
If answer = 3.0 (kgm/s) award 3 marks

Recall: Momentum = mass x velocity ✓

= 0.06 x 50 ✓

= 3.0 (kgm/s) ✓</td><td>3</td><td>1.1

2.1

2.1</td><td>Correct substitution gains first 2 marks (if equation is missing)</td></tr>
<tr><td></td><td>(c)</td><td></td><td>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 ✓</td><td>3</td><td>1.1

2.1</td><td>Correct substitution gains first 2 marks (if equation is missing)</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
			= 0.6 (N) ✓		2.1	

Question			Answer	Marks	AO element	Guidance
3	(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** Recall speed = distance ÷ time ✓ Converts cm into m = 150cm = 1.5m ✓ 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	

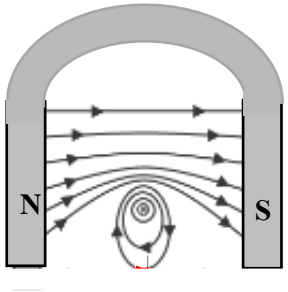
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>(V) connected in parallel with battery in circuit A ✓</td><td>1</td><td>2.2</td><td>Correct symbol needed and across battery ONLY ALLOW if correctly drawn in circuit A</td></tr>
<tr><td></td><td>(b)</td><td></td><td>The reading on A_1 is less than the reading on A_2 . ✓</td><td>1</td><td>2.1</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td>
<table>
<tr><th>Statement</th><th>True for circuit A</th><th>True for circuit B</th><th>True for both</th></tr>
<tr><td>The current from ……</td><td></td><td></td><td>✓</td></tr>
<tr><td>Each unit of charge does ……</td><td>✓</td><td></td><td></td></tr>
<tr><td>The current in the 8……</td><td></td><td>✓</td><td></td></tr>
</table>
</td><td>3</td><td>1.1
2.1
2.1</td><td>One mark for each correct row</td></tr>
<tr><td>5</td><td>(a)</td><td></td><td>FIRST CHECK THE ANSWER ON ANSWER LINE.
If answer = 3.3 x 10^{-3} (m) award 4 marks

Recall and apply v = f x λ ✓

Rearrange to get λ = v ÷ f ✓

Convert kHz to Hz 100 kHz = 100000 Hz ✓

330 m/s ÷ 100000 Hz = 3.3 x 10^{-3} (m) ✓</td><td>4</td><td>1.1
1.1
2.1
2.1</td><td></td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	B ✓	1	2.1	
		(ii)	N and S pole correctly labelled; ✓ Magnetic field pattern correct direction between poles **and** over the top of the wire ✓  	2	2.1	
		(iii)	**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 7.5 x 10^{-2} (m) award 3 marks** Select F=BIL Rearrange to get L = F ÷ (BI) ✓ 5.4 x 10^{-4} N ÷ (0.036 x 0.2) ✓ 7.5 x 10^{-2} (m) ✓	3	 1.1 2.1 2.1	
	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE.** **If answer = 1 440 (turns) award 2 marks** $\frac{230}{27600} = \frac{12}{X}$ ✓ **OR** $\frac{230 \times 12}{27600}$ / **AW** ✓	2	1.2 2.1	

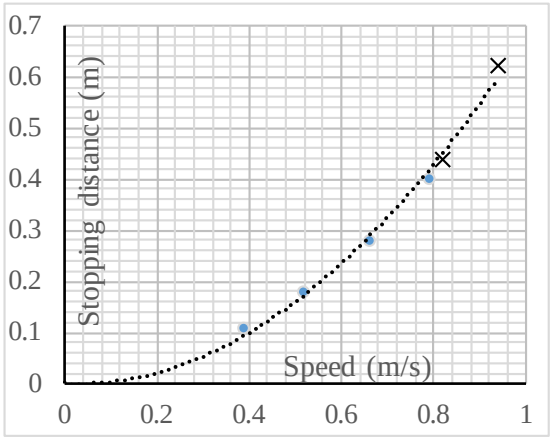
Question			Answer	Marks	AO element	Guidance
			1 440 (turns) ✓			
	(c)		Energy dissipated in transformer will result in heat up of substation. If not removed it will result in a meltdown. ✓ Large amount of energy justified by estimate e.g. 1 to 5kW per person. Typical output current at 230V of 200 - 10 000 A ✓	**2**	**2.1**	
7	**(a)**		(The student is incorrect / partly correct) Springs A **and** C follow a linear relationship / spring B does not follow a linear relationship; ✓ In a linear relationship the extension increases in equal amounts (as the force does) / the graph is a straight line from the origin ✓	**2**	**3.1a**	Marks are for the **explanation**
	(b)		Area under graph OR 0.5 x 5 x 0.08 ; ✓ 0.2 (J) ✓	**2**	**2.2**	
	(c)		Curve line drawn starting 0,0 parabola-like curve with increasing gradient.	**1**	**2.2**	

Question			Answer	Marks	AO element	Guidance
8	(a)		Gravity would cause the universe to contract / collapse ✓	1	2.1	**ALLOW** galaxies would move towards each other
	(b)	(i)	Light (from distant galaxies) is shifted towards the red end of the spectrum ✓ Wavelengths are increased / frequencies are decreased ✓	2	1.1	**DO NOT ALLOW** 'light is redder'
		(ii)	Further galaxies are moving away faster; ✓ Space (or universe) is expanding; ✓ **Any one from:** Universe was much smaller in the past ✓ Universe may have started from a single point ✓	3	1.1 1.1 2.1	**ALLOW** the relationship is proportional
		(iii)	Read distance and speed data from graph ✓ Calculate time = distance ÷ speed ✓	2	3.1a 2.1	
		(iv)	**Any two from:** More observations/more precise measurements have been made; ✓ Telescopes / technology has improved; ✓ Observations can be made from outside the earth's atmosphere / radiations other than visible light can be observed. ✓	2	1.2 1.1	

Question			Answer	Marks	AO element	Guidance
9	(a)	(i)	Gamma radiation penetrates tissue, so can be detected outside the body / Beta radiation is absorbed in the body and cause more damage to cells; ✓ Isotope needs to have a short half-life to reduce the length of time of exposure to the radiation ✓	2	1.1 3.2a	
		(ii)	Kinetic energy of the particles / fission products (and neutrons); ✓ Gamma / ionising radiation ✓	2	1.1	**IGNORE** K.E. of neutrons 'Radiation' is insufficient
	(b)		Hydrogen nuclei can fuse into helium nuclei ✓ Releasing energy ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
10	(a)	(i)	Risk from burning from hot water/heating element ✓ Prevent risk by using care when around hot water/putting lid on the beaker/putting heating element in the water before turning it on and waiting for it to cool before removing it. ✓	2	2.2 3.3a	**ALLOW** any other sensible risk and linked precaution
		(ii)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE.** **If the answer = 4300 (J/kg°C) award 3 marks.** Select: E = m x c x θ Rearrange to get θ = E ÷ m x c ✓ = 12 900 J ÷ (0.1kg x 30°C) ✓ =4300 (J/kg°C)✓	3	1.1 2.1 2.1	
		(iii)	Any reference to insulation/lagging ✓ Reduce heat transfer to surroundings✓	2	3.3b	
	(b)		They stay at 55 °C for the same amount of time ✓ X (solidifies) before Y ✓ At 55 °C both X and Y solidify / freeze ✓	3	3.1b 3.2b 3.2b	
	(c)		Same temperature for solidification/freezing ✓	1	3.2b	
	(d)		Specific heat capacity (of water) ✓ Mass of hot water ✓ Temperature change ✓	3	3 x 1.2	**ALLOW** initial and final temperatures

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	Wind / tidal / wave / HEP ✓	1	1.1	**DO NOT ALLOW** 'solar'
		(ii)	Any suitable advantage relating to d(i) – renewable/sustainable/no greenhouse gases during power generation/no emissions that cause acid rain. ✓ Any suitable disadvantage ✓ e.g. damage to habitats	2	1.1	**DO NOT ALLOW** 'cleaner'
	(b)		Town D ✓	1	3.1a	

Question			Answer	Marks	AO element	Guidance
12	(a)		Light gate / electronic timer / data logger; ✓ Measures the time for trolley to travel a (known) distance ✓ Use speed = distance ÷ time ✓	3	1.2	
	(b)		 Last two points both plotted correctly; ✓ Smooth curve drawn going through (0.0) ✓	2	1.2	
	(c)		As the speed of the trolley increases, the stopping distance increases; ✓ The stopping distance increases more quickly at higher speeds ✓	2	1.2	**ALLOW** 'the braking force is proportional to speed' for 1 mark
	(d)		(More gpe to start with i.e.) more ke when reaching carpet ✓ The resistive force of the carpet would be unchanged ✓ The stopping distance would be greater at each speed ✓	3	1.2	**ALLOW** wrong answer to force but must be consistent. **ALLOW** attempts to quantify

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