Mark Scheme (Results)

Summer 2023

Pearson Edexcel GCSE
In Physics (1PH0)
Paper 2H

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2023
Publications Code 1PH0_2H_2306_MS

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

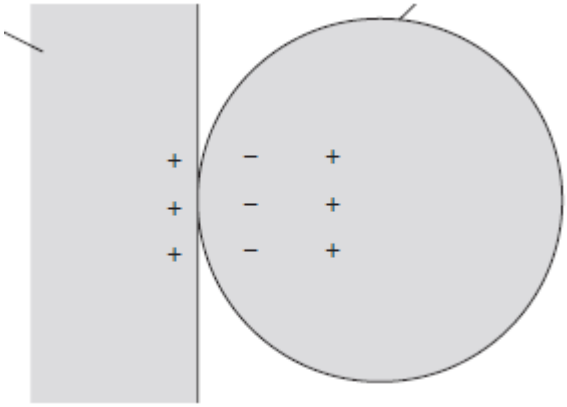
Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.
Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.
When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

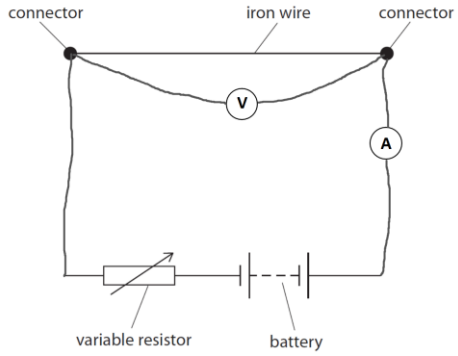
Question number	Answer	Additional guidance	Mark
1(a)(i)	C lost electrons A is incorrect because it would give the base a negative charge B and D are incorrect because protons do not move in this situation.		(**1**) AO1

Question number	Answer	Additional guidance	Mark
1 (a) (ii)	any **two** from electrons have been transferred / moved (1) by friction (1)	 cloth has gained electrons accept negative charge for electrons do not credit positive electrons / protons	(**2**) AO1

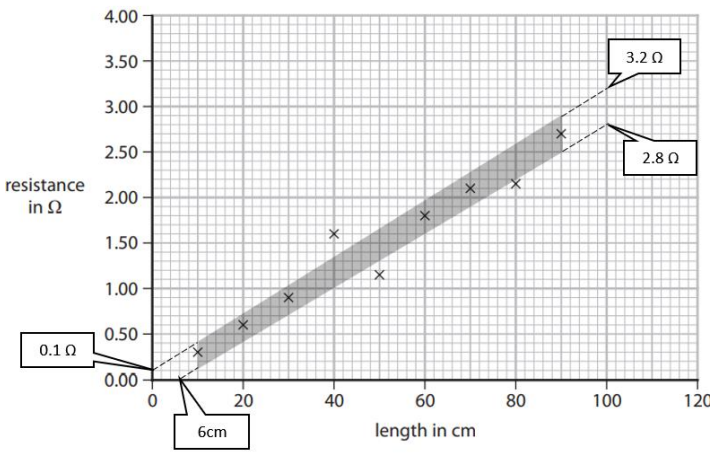
Question number	Answer	Additional guidance	Mark
1 (b)	An explanation linking **two** from electrons transferred (from the cloth) to the metal (1) metal is a conductor (1) electrons travel through person / to earth (1)	accept <u>negative charge</u> for electrons accept star for metal electrons move through metal (metal is) earthed / grounded	(**2**) AO1

Question number	Answer	Additional guidance	Mark
1 (c)	 at least one negative charge on left hand side of dust particle (1) at least one positive charge to the right of the negative charge(s) (1) net negative charge on left hand side / near to base (1) net positive charge to the right of the negative charge / further from base than negative charge (1)	ignore charges drawn on base	(**2**) AO1

Total 7 marks

Question number	Answer	Additional guidance	Mark
2 (a)	voltmeter connected in parallel with the iron wire / any part of the iron wire (1) ammeter connected in series with the iron wire (1) example:  	accept any recognisable symbols. accept symbol drawn over connecting wire do not credit the same type of meter shown in contradictory positions	(**2**) AO1

Question number	Answer	Additional guidance	Mark
2 (b) (i)	**one** from (1) metre rule / metre stick / ruler / (measuring) tape / crocodile clip / other clip / wire cutters / pliers / sliding contact jockey / more (iron) wire	accept scissors ignore additional electrical devices such as ohmmeter / multimeter	(**1**) AO1

Question number	Answer	Additional guidance	Mark
2 (b) (ii)	(ii) Figure 4 shows a graph of the results.  	accept any straight line within the shaded range judge by eye. ignore extrapol-ation for this marking point	(**1**) AO2

Question number	Answer	Additional guidance	Mark
2 (b)(iii)	any number between 2.7 and 3.3 inclusive	allow ecf from (ii) ±0.1Ω	(**1**) AO2

Question number	Answer	Additional guidance	Mark
2 (b) (iv)	explanation linking any **two** from: (variable) resistor increases the resistance (of the circuit) (1) (therefore) keeps the current constant / small(er) (1) because **current** increases temperature of the (iron) wire (1)	accept flow of electrons / charge for current in this context reduces current / limits the current ignore slows the current / charge accept current heats up (iron) wire accept for two marks: adjust variable resistor to keep current constant / small	(**2**) AO2

Question number	Answer	Additional guidance	Mark
2 (c)	substitution (1) 1.56 = 0.45 x R rearrangment and evaluation (1) (R =) 3.5 (ohms)	alternative method rearrangement (1) (R =) $\frac{V}{I}$ **or** (R=) $\frac{1.56}{0.45}$ (substitution and) evaluation (1) (R =) 3.5 (ohms) allow values that round to 3.5 e.g. 3.46(666) 3.47 etc award full marks for the correct answer without working	(**2**) AO2

Total 9 marks (H paper)

Question number	Answer	Mark
3 (a)	☒ D sublimating A is incorrect because it describes a change of state from gas to liquid. B is incorrect because it describes a change of state from liquid to solid C is incorrect because it describes a change of state from solid to liquid	(**1**) AO1

Question number	Answer	Additional guidance	Mark
3 (b)	substitution (1) $(r) = \frac{7.22(\times 10^{-2})}{2.69(\times 10^{-5})}$ evaluation (1) (ρ =) 2680 unit (1) kg / m^3	 2.68 to any power of ten seen allow any value that rounds to 2680; e.g. 2684 accept 2700 allow values in standard form e.g. 2.68 x 10^3 kg m^{-3} allow for three marks: 2.68 to any power of ten **with** a consistent unit, e.g. 2680 kg/m^3 2680 g/dm^3 2.68 g/cm^3 2.68 kg/dm^3 0.00268 kg/cm^3 2 680 000 g/m^3 allow for two marks: • 2680 with no or incorrect unit • 2.68 to any other power of 10 **with** an inconsistent unit of density • correct substitution **with** an inconsistent unit of density allow for one mark: • 2680 to any other power of ten with no or incorrect unit • appropriate unit of density with no or an incorrect value	(**3**) AO2

Question number	Answer	Additional guidance	Mark
3 (c) (i)	933 (1)	do not accept -933 ignore K ignore degrees ignore ^{o}	(**1**) AO2

Question number	Answer	Additional guidance	Mark
3 (c)(ii)	A description to include any **two** from: (motion is) random (1) various {speeds / velocities / kinetic energies} (1) bump into each other / collide (1) fast(er than solid) (1)	 move freely / move in any direction / move around different speeds range of speeds slide over / past each other / touch each other / in contact with each other more kinetic energy (than in solid) ignore bulk properties of liquids e.g. take shape of container. ignore vibrate "random speeds" on its own scores 1 mark	(**2**) AO1

H paper only:

Question number	Answer	Additional guidance	Mark
3 (d)	Any **two** from the following in any order (I took a) reading of the water level in the measuring cylinder without the metal. (1) (I made sure that) the metal was fully immersed / submerged (1) (I) subtracted the two readings / volumes (1)	Answers need not be exactly the same as those given here provided that the meaning is clear. accept measured / read for take a reading accept reading of original level / volume accept starting with a specified amount e.g. 50ml all the metal was under water took one from the other / found the difference ignore: repeat and/or average other measurements such as mass other methods such as Eureka can ideas of spillage reading from bottom of meniscus	(**2**) AO1

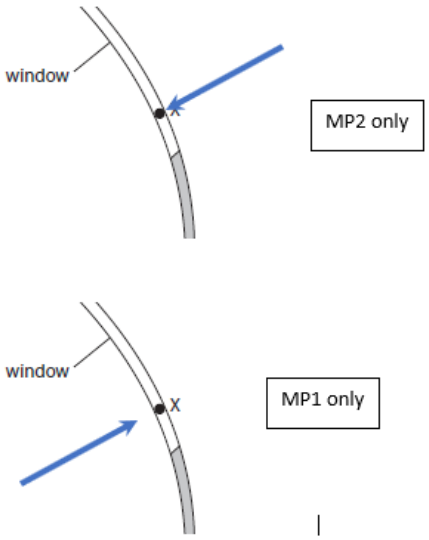
Total 9 marks

Question 4 H paper (question 10 F paper)

Question number	Answer	Additional guidance	Mark
4 (a) (i)	(80 000 – 23 000) 57 000 (Pa) (1)	 -57 000 (Pa)	(**1**) AO2

Question number	Answer	Additional guidance	Mark
4 (a) (ii)	substitution (1) 80 000 = $\frac{F}{0.094}$ rearrangement and evaluation (1) (F=) 7500 (N)	alternative method re-arrangement (1) (F =) P x A **or** (F=) 80 000 x 0.094 (substitution and) evaluation accept 7520 (N), award full marks for correct answer without working. allow 1 mark max for substitution using pressure of 57 000 **or** an answer that rounds to 5400 e.g. 5358 (calculated net force)	(**2**) AO2

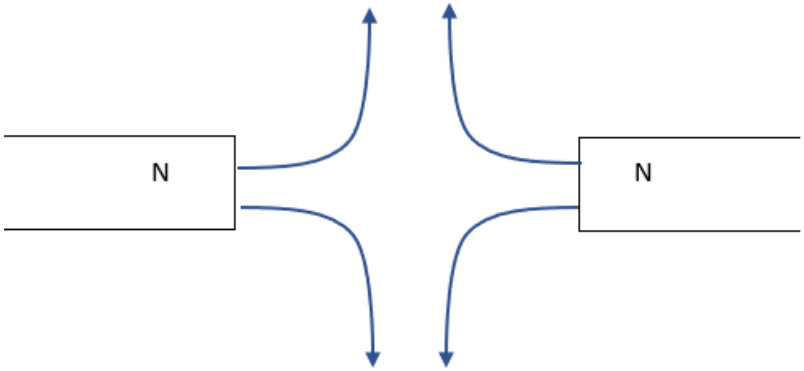
Question number	Answer	Additional guidance	Mark
4 (a) (iii)	force is less (on small window) (1) pressure is the same (1)	force is greater on large window	(**2**) AO1

Question number	Answer	Additional guidance	Mark
4 (a) (iv)	arrow pointing towards outside of aeroplane (1) arrow is normal to surface at X (judge by eye) (1) Examples:  	may be inside or outside of aeroplane. need not touch X do not award if two or more conflicting arrows drawn must touch X or dot at X independent marks	(**2**) AO1

Question number	Answer	Additional guidance	Mark
4 (b) (i)	increase in height results in decrease in pressure (1) non-linear relationship (1) use of numerical data (1) at least two different pressure and height values from the graph	pressure decreases with height accept inversely proportional in this context accept negative correlation double the height does not result in half the pressure pressure not does change evenly description of graph e.g. curved / not straight calculation of change in pressure e.g. 5000m to 10000 m pressure went down by 22	(**3**) AO3

Question number	Answer	Additional guidance	Mark
4 (b) (ii)	any **one** from air becomes less dense (1) smaller weight (of air) above (1) lower temperature (1)	accept oxygen / atmosphere for air air gets thinner / (air) particles further apart / fewer particles / less particles less air above / smaller height of air above ignore change in value of g with height	(**1**) AO1

Total 11 marks

Question number	Answer	Additional guidance	Mark
5 (a)	at least four lines as shown (1) at least two arrows directed away from N poles (1)  	lines must not intersect (cross over) ignore continuation of lines to S of a magnet independent mark do not award if one or more arrows shown pointing towards N pole	(**2**) AO1

Question number	Answer	Additional guidance	Mark
5 (b)	any **three** from	marks can be awarded from a correctly labelled diagram	(**3**) AO1
	magnetic **fields** interact (1)	magnets are in each other's magnetic **field**	
	(force due to) repulsion (between magnets) (1)	repel / push away	
	(repulsion) force upwards (on upper magnet) (1)		
	weight / gravitational force (downwards on upper magnet) (1)	accept gravity (acts downwards)	
	forces equal size / in equilibrium (1)	forces are balanced	
		ignore references to charge	

Question number	Answer	Additional guidance	Mark
5 (c) (i)		independent marks	(**2**) AO1
	1 up(wards) (1)	accept out(wards from the magnet)	
	2 down(wards) (1)	accept in(wards) / into (magnet)	
		allow 1 mark for 1 down / in(wards) AND 2 up / out(wards)	

Question number	Answer	Additional guidance	Mark
5 (c) (ii)	substitution (1) 0.15 = 0.5(0) x 2.7 x L(ength) rearrangement and evaluation (1) (length =) 0.11 (m)	alternative method re-arrangement (1) (length =) $\frac{F}{B \times I}$ Or (length =) $\frac{0.15}{0.5(0) \times 2.7}$ (substitution and) evaluation (1) (length =) 0.11 (m) allow any values that round to 0.11 e.g 0.111 accept 0.1 or 0.i̇ (m) allow 1 mark for answer of 9 (with or without working) award full marks for correct answer without working.	(**2**) AO2

Total 9 marks

Question number	Answer	Additional guidance	Mark
6 (a)	B arms provide an upward force and feet act as a pivot A and C are incorrect because the rotation is not around the hands. D is incorrect because the legs are not providing an upward force that causes rotation		(**1**) AO3

Question number	Answer	Additional guidance	Mark
6 (b) (i)	calculation of both moments (1) moments are equal (size) and opposite direction (1)	4 x 92 and 16 x 23 seen comparison of both moments 368 (=) 368 **or** 4 x 92 = 16 x 23 **or** $16=\frac{4\times92}{23}$ **or** $4=\frac{16\times23}{92}$ accept calculations in Nm	(**2**) AO1, AO2

Question number	Answer	Additional guidance	Mark
6 (b) (ii)	calculation of moment of ball (1) 480 (Ncm) calculation of total clockwise moment (1) 848 (Ncm) calculation of bicep force needed (1) 212 (N) **OR** calculation of moment of ball (1) 480 (Ncm) calculation of additional force from bicep (1) 120 (N) calculation of total bicep force (1) 212 (N)	 15 x 32 seen 368 + 480 seen 848/4 seen 15 x 32 seen 480/4 seen 120 + 92 seen award full marks for correct answer without working. accept conversion of cm to m throughout	(**3**) AO2

Question number	Answer	Additional guidance	Mark
6 (c) (i)	(upthrusts in each case) are equal (1)		(**1**) AO3

Question number	Answer	Additional guidance	Mark
6 (c) (ii)	an explanation linking any **three** of weight of ball = weight of water displaced (1) seawater more dense than fresh water (1) smaller volume of seawater (needs to be) displaced (1) to produce same weight of water (displaced) (1)	accept reverse arguments accept saltwater for seawater upthrust = weight of water displaced accept less seawater displaced to produce same upthrust	(**3**) AO1

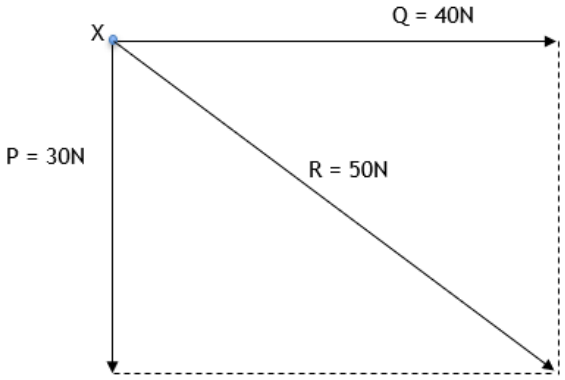
Total 10 marks

Question number	Answer	Additional guidance	Mark
7 (a) (i)	selection and substitution (1) (F=) 260 x 6.2 (x 10^{-3}) evaluation (1) (F=) 1.612 (N) or 1.61 (N) answer to 2 s.f. (1) 1.6 (N)	award 1 mark only for answer of 1.61(2) to any other power of ten, e.g. 1612 (N) independent mark for any answer given to 2 significant figures allow 2 marks for answer of 1600 (N) with or without working 1.60 scores 2 marks award full marks for correct answer without working.	(**3**) AO2

Question number	Answer	Additional guidance	Mark
7 (a) (ii)	a description including read position of top of spring against the ruler (1) read position of top of spring when pressed down (1) subtract the two readings (1) **OR** substitution (1) 0.39 = 260 x change in length rearrangement (1) (change in length =) $\frac{0.39}{260}$ evaluation (1) 1.5 mm unit must be shown	May be seen drawn in figure 17 measure **length** at the start allow value from ruler e.g. 2.9 (cm) measure the **length** when pressed down allow value from ruler e.g. 2.0 (cm) subtract the two measurements allow find the difference for subtract allow calculated value from diagram e.g. 0.9 (cm) ignore repeat (0).0015m unit must be shown	(**3**) AO1

Question number	Answer	Additional guidance	Mark
7 (a) (iii)	description to include change to enable accurate location of top of spring (1) for example: pointer, set square, thin sheet / another ruler (under finger) description of how the change is used (1)	may be seen drawn in Figure 17 move ruler closer to spring compress spring with weight rather than finger ignore photographs make measurements from where pointer / set square / thin sheet / other ruler touches the ruler reduce parallax error prevents fluctuations while measuring ignore repeats ignore unqualified references to accuracy or precision	(**2**) AO3

Question number	Answer	Additional guidance	Mark
7 (b)	D 6 N up A and C are incorrect because the force is upwards B is incorrect because the force is the sum of the two weights given.		(**1**) AO3

Question number	Answer	Additional guidance	Mark
7 (c)	**<u>arrow</u>** (any length) (labelled R) in correct direction (judge by eye) (1) (size of R =) 50N (1)	independent marks  construction lines need not be shown arrow head must be present for MP1 accept answers in range 48N to 52N obtained from scale drawing working need not be shown	(**2**) A01

Total 11 marks

Question number	Answer	Additional guidance	Mark
8 (a) (i)	selection and substitution (1) (KE =) ½ x 1200 x 16(.0)^2 evaluation in kJ (1) (KE =) 150 (kJ)	(KE =) ½ x 1200 x 16(.0)^2 x 10^{-3} accept any value that rounds to 150 e.g. 153.6 award full marks for correct answer without working. award 1 mark for 153.6 or 150 to any other power of ten	(**2**) AO2

Question number	Answer	Additional guidance	Mark
8 (a) (ii)	selection and substitution (1) $17.5 (\times 10^3) = \frac{126 (\times 10^6)}{t}$ re-arrangement and evaluation (1) (t=) 2(.0) (h)	alternative method selection and rearrangement (1) $(t =) \frac{E(nergy)}{P(ower)}$ or $(t=) \frac{126 (\times 10^6)}{17.5 (\times 10^3)}$ (substitution and) evaluation (1) (t=) 2(.0) (h) award full marks for correct answer without working. allow 1 mark for 7(.2) to any power of ten (incorrect time conversion) allow 1 mark for 2(.0) to any power of 10 (POT error)	(**2**) AO2

Question number	Answer	Additional guidance	Mark
8 (a) (iii)	an explanation linking (energy transfers when the car is decelerating) (from) kinetic energy (store) (1) (to) chemical energy (store) (1)	 idea of energy that would be otherwise wasted uses an electrical pathway {electric current / electricity / emf} produced allow mechanical for kinetic in this context recharges battery increases available energy store of battery more useful energy available	(**2**) AO2

Question number	Answer	Additional guidance	Mark
8 (b) (i)	**either** calculation of time: substitution (1) (t =) $\frac{126\ (\times 10^6)}{15 \times 400\ (\times 3600)}$ evaluation (1) (t=) 5.8(3) (h) conclusion (1) claim is justified as the time is less (than 6 hours) **or** calculation of energy: substitution (1) 6 (x 3600) = $\frac{E}{15 \times 400}$ rearrangement and evaluation (1) E = 130 MJ conclusion (1) claim is justified as energy (in 6 hours) is more than (126 MJ) required.	accept correct time conversion e.g. 5h 50 min 350 min 21 000 s award 2 marks for correct answer without working. award 1 mark for answer of either 2.1 or 5.8(3) to any other power of ten allow relevant comment based on incorrectly calculated time (independent mark) accept 129.6 MJ accept 129 600 000 J allow relevant comment based on incorrectly calculated energy (independent mark)	(**3**) AO3

Question number	Answer	Additional guidance	Mark
8 (b) (ii)	substitution (1) 126 (x 10^6) = Q x 400 re-arrangement and evaluation (1) (Q =) 315 000 (coulombs)	alternative method re-arrangement (1) (Q =) $\frac{E}{V}$ **or** (Q =) $\frac{126 (x 10^6)}{400}$ (substitution and) evaluation (1) (Q =) 315 000 (coulombs) accept answers rounding to 320 000 (coulombs) allow one mark for answers rounding to 3.2 to any other power of ten award two marks for correct answer without working.	(**2**) AO2

Total 11 marks

Question number	Answer	Additional guidance	Mark
9 (a) (i)	substitution into work done = force x distance (1) 1800 = force x 1.2 rearrangement and evaluation (1) (force =) 1500 (N)	alternative method rearrangement (1) $(\text{force} =) \frac{\text{work (done)}}{\text{d(istance moved)}}$ **or** (force =) $\frac{1800}{1.2}$ (substitution and) evaluation (1) (force =) 1500 (N) if no other marks scored allow one mark for answer of 500 (N) or 4500 (N) award full marks for correct answer without working.	(**2**) AO2

Question number	Answer	Additional guidance	Mark
9 (a) (ii)	substitution (1) 64 = $\frac{1800 \times 100}{\text{total work done}}$ **or** 0.64 = $\frac{1800}{\text{total work done}}$ rearrangement and evaluation (1) (work done =) 2800 (J)	alternative method re-arrangement (1) (total work done =) $\frac{\text{work done on barrel} \times 100}{\text{efficiency}}$ **or** (work done=) $\frac{1800 \times 100}{64}$ **or** (work done=) $\frac{1800}{0.64}$ (substitution and) evaluation (1) (work done =) 2800 (J) allow values that round to 2800; e.g. 2812.5 award full marks for correct answer without working.	(**2**) AO2

Question number	Answer	Additional guidance	Mark
9 (a) (iii)	any **one** of additional mass in the system (1) rope stretches (1)	 (bottom) pulley / rope has {mass / weight} ignore references to the mass / weight of barrel tension in rope ignore references to consequences of friction such as air resistance, heat or sound. ignore pulling at an angle ignore references to person	(**1**) AO1

Question number	Indicative content	Mark
***9(b)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. Use of equipment • Provide a measurable load; for example hang a cube on one end of the system / on spring (balance) • Provide a measurable effort; for example hang spring balance on other end of system • Method to measure distances moved; for example use metre rule Obtaining relevant data • Measure weight of cube with spring balance • Take reading of spring balance when being pulled • Measure height by which the cube is raised • Measure distance moved by (end of) spring balance. Processing results • calculate work done on cube = obtained weight x obtained distance • calculate work done by student = obtained force x obtained distance • calculate efficiency as (calculable) work done on cube / (calculable) work done by student • inspect results to look for relationship between weight of cube and efficiency • plot graph of efficiency against weight	**(6)** AO3

Level	Mark	Descriptor
	0	• No awardable content
Level 1	1–2	• Analyses the scientific information but understanding and connections are flawed. (AO3) • An incomplete plan that provides limited synthesis of understanding. (AO3)
Level 2	3–4	• Analyses the scientific information and provides some logical connections between scientific enquiry, techniques and procedures. (AO3) • A partially completed plan that synthesises mostly relevant understanding, but not entirely coherently. (AO3)
Level 3	5–6	• Analyses the scientific information and provide logical connections between scientific enquiry, techniques and procedures. (AO3) • A well-developed plan that synthesises relevant understanding coherently. (AO3)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance At least two uses of equipment	Possible candidate responses Hang cubes on hook Spring balance on ring
Level 2	3–4	Additional guidance At least two methods of obtaining relevant data from use of equipment.	Possible candidate responses Measure weight of cube with spring balance. Hang cube on hook. Pull on other end. Measure how far cube has gone up. OR Put cube on hook. Put spring balance on ring. Pull and read force. Measure how far spring balance moves.
Level 3zz	5–6	Additional guidance At least two methods of obtaining relevant data from correct use of equipment and at least two descriptions of processing that data.	Possible candidate responses Use spring balance to measure weight of cube and force needed by student. Measure height that cube was raised by. Calculate work done by multiplying force and distance moved in each case.

Total 11 marks

Question number	Answer	Additional guidance	Mark
10 (a) (i)	C (a) slower than (b) and (a) opposite to (b) B and D are incorrect because the direction of the readings are opposite and so the rotations must be opposite A is incorrect because the value in (a) is less than the value in (b) and so the rotation cannot be faster		(**1**) AO1

Question number	Answer	Additional guidance	Mark
10 (a) (ii)	**either** an answer in terms of magnetic fields and forces: current in the (dynamo) coil generates a magnetic field (1) (interaction of) fields cause force (that opposes motion) (1) **OR** an answer in terms of output energy and input work: energy is being transferred to the lamp (1) additional work is being done (by teacher) / additional energy is necessary (1)	accept lamp uses (thermal / heat / light) energy (to light up) ignore reference to greater (electrical) resistance	(**2**) AO1

Question number	Answer	Additional guidance	Mark
10 (b)	substitution into $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ (1) $\frac{230}{V_s} = \frac{800}{18}$ rearrangment (1) $(V_s =) \frac{18 \times 230}{800}$ evaluation (1) (Vs =) 5.2 (V)	alternative method re-arrangement (1) $(V_s =) \frac{V_p \times N_s}{N_p}$ substitution (1) $(V_s =) \frac{18 \times 230}{800}$ evaluation (1) (Vs =) 5.2 (V) allow values that round to 5.2 (e.g. 5.175) award 1 mark for answers that round to 10 000 (e.g. 10 222) award full marks for correct answer without working.	(**3**) AO2

Question number	Indicative content	Mark
***10(c)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. Basic facts • Sound is vibrations (of air) • Loudspeaker emits / gives out sound • Loudspeaker is an output device • Microphone accepts / takes in sound • Microphone is an input device Principles of operation • Alternating current or (electrical) signal sent into a loudspeaker • Loudspeaker cone / coil vibrates (air) • Motor effect in loudspeaker • Microphone cone / coil is vibrated by air/sound • Alternating current / (electrical) signal is produced by microphone • Electromagnetic induction in microphone Details of operation of loudspeaker • Alternating current or (electrical) signal in coil produces changing magnetic field • (changing) Force between magnetic field of coil and magnet. • Frequency / amplitude of sound depends on frequency / amplitude of alternating current Details of operation of microphone • Coil oscillates in a magnetic field • Generates an alternating p.d. (across the wires) / alternating current /signal • Frequency / amplitude of alternating p.d. / current depends on amplitude / frequency of the sound	**(6)** AO2

Level	Mark	Descriptor
	0	• No awardable content
Level 1	1-2	• The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. • Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3-4	• The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. • Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5-6	• The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. • Lines of reasoning are supported by sustained application of relevant evidence. (AO2)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance Basic facts	Possible candidate responses A loudspeaker vibrates to make sound.
Level 2	3–4	Additional guidance Principles of operation supported by basic facts. Facts may be implied by principles.	Possible candidate responses Sound vibrates the coil in the microphone. This makes a signal. OR A loudspeaker uses the motor effect to vibrate the cone and make a sound.
Level 3	5–6	Additional guidance Principles and details of operation. Principles may be implied by details. One device may be more developed than the other but both devices must be referenced.	Possible candidate responses Alternating current in the loudspeaker coil makes the coil move inside the magnet. This forces the cone to vibrate and produce sound. The microphone makes an alternating current.

Total 12 marks