

Pearson
Edexcel

Mark Scheme
(Results)

November 2020

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

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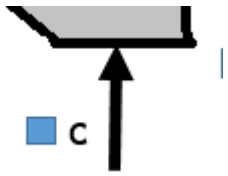
General Marking Guidance

- 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

*there will be situations where an AO1 question will include elements of recall of knowledge directly from the specification (up to a maximum of 15%). These will be identified by an asterisk in the mark scheme.

Question number	Answer	Additional guidance	Mark
1 ai	 A, B and D are incorrect because they are all closer to the surface		**(1)**

Question number	Answer	Additional guidance	Mark
1 aii	B. the same as the pressure on X A,C and D are incorrect because the pressure does not depend on surface area		**(1)**

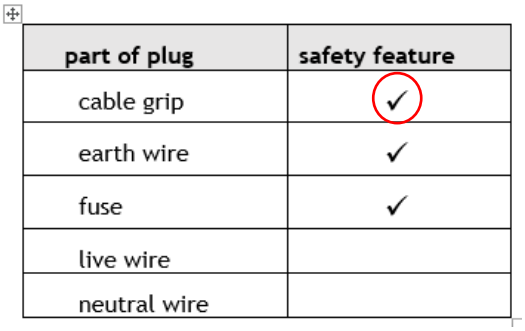
Question number	Answer	Additional guidance	Mark
1 bi	6.5 (1) m (1)	 metres / meters allow M independent marks	**(2)**

Question number	Answer	Additional guidance	Mark
1 bii	the pressure increases		**(1)**

Question number	Answer	Additional guidance	Mark
1 biii	there is additional pressure due to the atmosphere		**(1)**

Question number	Answer	Additional guidance	Mark
1 c	Any two from: height of atmosphere (above aeroplane) (1) density of atmosphere (1) the temperature (of the atmosphere) (1)	 less air above the aeroplane accept oxygen for air in this context the air gets thinner the air gets colder	**(2)**

Total for question 1 = 7 marks

Question number	Answer	Additional guidance	Mark
2 a		Note that the tick next to cable grip is already in the grid more than two additional ticks deduct one mark for each incorrect tick.	**(2)**

Question number	Answer	Additional guidance	Mark
2 bi	A an ammeter B, C and D are incorrect because they do not show current		**(1)**

Question number	Answer	Additional guidance	Mark
2bii	substitution (1) (Q) = 2.5 x 8 (x60) evaluation (1) 1200 (C)	 allow 20 (C) for 1 mark award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
2c	substitution (1) $\frac{15 \times 3.1}{230}$ evaluation (1) 0.20 (A)	 allow any value that rounds to 0.20; e.g. 0.2022 award full marks for the correct answer without working	**(2)**

Total for question 2 = 7 marks

Question number	Answer	Additional guidance	Mark
3ai	evaluation of gear ratio (1) 1:3 evaluation of number of revolutions (1) 6	 allow 1 mark if 60/20 or 20/60 or 20:60 or 60:20 seen award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
3aii	D 120mm down A and C are incorrect because gear T moves down B is incorrect because gear T moves 2mm per tooth		**(1)**

Question number	Answer	Additional guidance	Mark
3 bi	substitution (1) (moment=) 0.40 × 70 evaluation (1) 28 Nm (1)	 independent mark award full marks for the correct answer without working	**(3)**

Question number	Answer	Additional guidance	Mark
3 bii	an explanation linking the effort is at a bigger distance (1) from fulcrum (than the load) (1)	allow reverse argument for load (magnitudes of) moments are the same allow wheel/axle/pivot for fulcrum	**(2)**

Question number	Answer	Additional guidance	Mark
3 biii	(there will be more) friction (between the axle and wheel)	inside the bearing	**(1)**

Total for question 3 = 9 marks

Question number	Answer	Additional guidance	Mark
4ai	 D A and B are incorrect because they only show one force C is incorrect because the forces are in the wrong direction		**(1)**

Question number	Answer	Additional guidance	Mark
4 aii	substitution (1) (F =) 20 x (0.0)7 evaluation (1) 1.4 (N)	award full marks for the correct answer without working allow 1 mark max for POT error	**(2)**

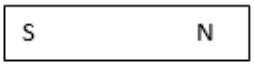
Question number	Answer	Additional guidance	Mark
4 bi	substitution (1) (E =) ½ X 20 x $0.09^{(2)}$ evaluation (1) 0.08(1) (J)	allow 1 mark for ½ x 20 x 9^2 or answer of 810 (J) or answer of 90 (J) award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
4 bii	a description including mention of one relevant energy store (1) correct transfer in context (1)	 potential/ PE/ kinetic/ KE/ thermal/ heat/ elastic potential energy stored in the spring transferred to kinetic energy of the ball/rod scores 2 marks kinetic energy of rod is transferred to kinetic energy of ball scores 2 marks idea of energy transferred to the surroundings/ thermal scores 2 marks	**(2)**

Question number	Answer	Additional guidance	Mark
4 biii	an explanation linking two from (controls the maximum) extension (1) idea of keeping below the elastic limit (1) (which would result in) spring being permanently stretched (1)	ignore <u>damaging</u> the spring (given in stem) stretch prevents spring being over-stretched / extended too far scores 2 marks allow distorted/ break	**(2)**

Total for question 4 = 9 marks

Question number	Answer	Additional guidance	Mark
5a	an explanation linking any **two** of steel is magnetic (material) (1) aluminium is non-magnetic (material) (1) steel falls into container A / aluminium falls into container B (1)	 steel attracted / sticks to / carried round by magnet/roller) is not attracted / does not stick (to magnet roller) steel cans are carried further round than aluminium and fall into A steel hangs on for longer / aluminium falls quicker	**(2)**

Question number	Answer	Additional guidance	Mark
5 (bi)		allow  or 	**(1)**

Question number	Answer	Additional guidance	Mark
5 (bii)	an explanation linking two from (strength of magnetic) field /force (1) (depends on) distance from the magnet (1)	 (magnets) attract / repel force / field is weaker when further away (from magnet) or reverse argument lines of force are further apart	**(2)**

Question number	Answer	Additional guidance	Mark
5 (biii)	a description to include four from move brick towards the car (1) until car (just) starts to move (1) measure distance of brick from car/magnet (1) repeat with 2 magnets (1) compare distances (for one magnet and for two magnets) (1) detail about procedure (1) conclusion or prediction (1)	 change distance between car and brick measure how close car gets to the brick how to attach second magnet(s) how to measure distance where to measure take several readings and find average if distance is bigger then it works	**(4)**

Total marks for Question 5 = 9 marks

Question number	Answer	Additional guidance	Mark
6 (a)	voltmeter should be moved (1) (to be) in parallel with the resistor X (1)	voltmeter is in wrong place / (re)connect the voltmeter allow 'voltage' for 'voltmeter' in this context allow across X or equivalent statement answers may be seen on the diagram	**(2)**

Question number	Answer	Additional guidance	Mark
6 (bi)	0.9 (v)	0.90 ignore units ignore calculations	**(1)**

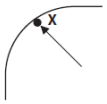
Question number	Answer	Additional guidance	Mark
6 (bii)	substitution (1) R = $\frac{2.1}{0.041}$ evaluation (1) R = 51(.2) (Ω) (which is approx. 50 (Ω))	allow (V) = 0.041 x 50 V = 2.05 (v) (which is approx. 2.1) allow R = 51(.2) (Ω) with no working for 2 marks	**(2)**

Question number	Answer	Additional guidance	Mark
6 (biii)	recall and substitution (1) (P) = 2.1 x 0.041 evaluation (1) (P =) 0.086 (W)	 allow any value that rounds to 0.086; e.g. 0.0861 (W) 0.09 (W) award full marks for the correct answer without working allow POT error for 1 mark	**(2)**

Question number	Answer	Additional guidance	Mark
6 (biv)	recall that effective resistance = sum of individual resistances (1) (resistance =) 50 + 22 evaluation (1) 72 (Ω)	 51 + 22 73 (Ω) award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
6 (bv)	substitution (1) (E =) 3.0 x 0.041 x 2 (x60) evaluation (1) 15 (J)	 accept values that round to 15; e.g. 14.76 award full marks for the correct answer without working award 1 mark for answer of 0.246 (J) or 0.25 (J) without working	**(2)**

Total marks for Question 6 = 11 marks

Question number	Answer	Additional guidance	Mark
7(a)	 ☐ C B and D are incorrect because they are not normal to the surface A is incorrect because the force should act outwards		**(1)**

Question number	Answer	Additional guidance	Mark
7(b)	substitution (1) (P_2=) $\frac{120 \times 2500}{1600}$ evaluation (1) 190 (kPa)	 award full marks for the correct answer without working accept values that round to 190; e.g.187.5, 188, 187	**(2)**

Question number	Answer	Additional guidance	Mark
7(c)	recall equation (1) pressure = $\frac{\text{force}}{\text{area}}$ substitution (1) (pressure =) $\frac{28}{2}$ evaluation (1) 14 (N/cm^2)	 accept $P = \frac{F}{A}$ ignore powers of ten errors for attempted unit conversions award full marks for the correct answer without working if no other marks scored then allow 1 mark for either $\frac{2}{28}$ or 0.07	**(3)**

Question number	Indicative content	Mark
***7(d)**	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. • Gas particles are in (random) motion • Particles hit sides of container / each other • This produces (net) force on (sides of) container • This causes a pressure (on the container) • As volume increases the particles have more space to move • This means that particles hit sides less frequently • Smaller (net) force on sides of container • Pressure decreases. • Change in pressure (with increase in volume) is not linear • Pressure never becomes zero	(6)

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Summary for guidance

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 simple description of how pressure is caused **or** how it changes	Possible candidate responses Particles hit sides of container **or** Pressure becomes less as volume increases
Level 2	3–4	Additional guidance description of how pressure is caused and how it changes	Possible candidate responses Particles hit sides of container. This causes a (net) force on sides of container. Pressure becomes less as volume increases
Level 3	5–6	Additional guidance Description of how pressure is caused, and why it changes in the way shown	Possible candidate responses Particles hit sides of container. This causes a (net) force on sides of the container. As volume increases the particles hit the sides less frequently so the pressure becomes less.

Question 7 = 12 marks

Question number	Answer	Additional guidance	Mark
8 (a)(i)	an explanation linking any three of the following : use a measuring cylinder /beaker or use a eureka can /displacement can/container with spout (1) (partly) fill measuring cylinder /beaker (with water) note the reading or fill (eureka) can to spout (1) immerse piece of copper (in water) (1) note difference in readings of water level (in measuring cylinder /beaker) or collect water from spout in a measuring cylinder /beaker (1)	give credit for other acceptable methods If no other marks scored then allow 1 mark for attempt to measure volume directly: e.g. fill copper tube with water, tip out and measure volume or measure dimension(s) of copper tube	**(3)**

Question number	Answer	Additional guidance	Mark
8(a)(ii)	recall and substitution (1) density= $\frac{m}{V}$ (density=) $\frac{0.058}{6.5 (\times 10^{-6})}$ evaluation (1) 8.9×10^{3} (kg/m^{3})	 accept values that round to 8900 e.g. 8923(kg/m^{3}) or 9000 8.9 to any other power of ten gains 1 mark award full marks for correct answer without working.	**(2)**

Question number	Answer	Additional guidance	Mark
8(b)(i)	rearrangement (and substitution) (1) (c) =$\frac{1050}{0.058 \times 78}$ evaluation (1) 230 (J/kg ˚C)	 c=$\frac{\Delta Q}{m \times \Delta\theta}$ award 1 mark if 78 seen accept 232(J/kg ˚C) award full marks for correct answer without working.	**(2)**

Question number	Answer	Additional guidance	Mark
8(b)(ii)	any two of the following reduce heat loss from water/insulate beaker/add cover (1) make the temperature rise larger/use a larger piece of copper/ use a smaller amount of water (1) (use)a stirrer (1) account for heat gained by glass beaker (1) transfer the hot copper faster (1) use a different heating method (1) measure the temperature of the boiling water (1)	ignore more accurate measurements e.g. thermometer, balance etc. ignore taking repeats start with colder water	**(2)**

Question number	Answer	Additional guidance	Mark
8 c	a description including two from: put the coil in the water (1) (electric) current in the wire/coil (1) thermal energy transferred (in the wire) (1)	 allow electricity for electric current heat(energy) in wire / temperature of wire increases/ produces heat/ gives energy/ to heat the water	**(2)**

Total marks for question 8 = 11 marks

Question number	Answer	Additional guidance	Mark
9 (a)	(upward) force increases with speed (1) relationship is non-linear (1)	allow reverse argument changing rate / increases exponentially/ initially no upward force (until 1000 turns per minute)	**(2)**

Question number	Answer	Additional guidance	Mark
9(bi)	recall and substitution into (1) gpe = m x g x h (gpe) = 4.5 x 10 x 20 evaluation (1) 900(J)	 allow 90(J) for 1 mark award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
9bii	900(J)	allow ecf from bi	**(1)**

Question number	Answer	Additional guidance	Mark
9biii	recall and substitution (1) power = work done / time taken (power =) 900 / 4 evaluation (1) 200 (W)	allow ecf from bi or bii 230(W) 225(W) award full marks for the correct answer without working	**(2)**

Question number	Indicative content	Mark
***9(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. • Chemical energy stored in battery • Transferred to KE in motors • Transferred to GPE as it rises • Thermal energy wasted (at each stage) • Energy transferred to surroundings (at each stage)	(6)

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Summary for guidance

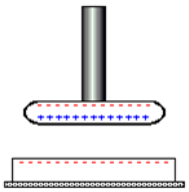
Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance Isolated fact e.g. a description of least one energy store **or** interpretation of diagram without mentioning energy stores or types	Possible candidate responses Chemical energy stored in the battery **or** energy transferred from the battery to the motors and then to the blades. Some energy is lost at each stage.
Level 2	3–4	Additional guidance Description of at least one energy transfer	Possible candidate responses KE (of blades) is transferred to GPE (as the drone rises) **or** (thermal) energy is transferred to the surroundings
Level 3	5–6	Additional guidance Description of two or more energy transfers	Possible candidate responses Chemical energy in the battery is transferred to KE of the blades **AND** Thermal energy is wasted in the motors when they turn.

Question 9 = 13 marks

Question number	Answer	Additional guidance	Mark
10 (a)(i)	rub (the balloon) (1) with a piece of cloth/hair/fur (1)	use friction allow on any insulated object	**(2)**

Question number	Answer	Additional guidance	Mark
10 (a)(ii)	B Negative charge has been added to the balloon A is incorrect removing negative charge would make the balloon positively charged. C and D are incorrect because positive charge cannot be moved		**(1)**

Question number	Answer	Additional guidance	Mark
10(a)(iii)	an explanation linking: method of handling balloons without discharging them (1) bring balloons near to each other (1) observation of repulsion (1)	 hang balloons up by their strings they/balloons will push away (from each other)	**(3)**

Question number	Answer	Additional guidance	Mark
10 (b)(i)	B  A and D are incorrect because a negative charge cannot induce a negative charge C is incorrect because the disc is insulated so negative charge cannot be removed		**(1)**

Question number	Answer	Additional guidance	Mark
10 (b)(ii)	an explanation linking: electrons / negative charges have flowed (1) from the metal disc / to the student / to earth/ground (1)	 reject positive charge moving for first mark	**(2)**

Question number	Answer	Additional guidance	Mark
10(b)(iii)	at least three straight lines joining disc and plastic (1) arrow(s) from disc towards plastic (1)	judge by eye ignore curved lines at edge do not award mark if there are arrows in both directions	**(2)**

Question 10 = 11 marks