Mark Scheme (Results)

Summer 2024

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

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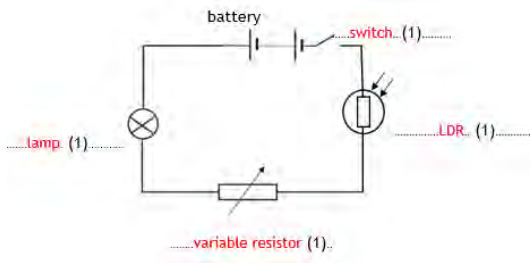
General Marking Guidance

- 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.

Question	Answer	Additional guidance	Mark
1(a)		**accept** lines drawn from the words in the box to the spaces **accept** bulb for lamp	**(4)** **AO1.1**

Question	Answer	Additional guidance	Mark
1(b)	substitution (1) (current =) $\dfrac{1.2}{4(.0)}$ evaluation (1) (current =) 0.3(0) (A)	award full marks for the correct answer without working	**(2)** **AO2.2**

(Total for question 1 = 6 marks)

Question	Answer	Mark
2(a)(i)	**D** 2 times **A,B,C** *are not correct as they all would involve* **P** *rotating more than once*	**(1)** **AO2.1**

Question	Answer	Additional guidance	Mark
2(a)(ii)	1. X near **Q** (1)	 **X** must be either on OR to the right of the line through the axle of Q **ignore** the number of teeth drawn on Figure 2	**(2)** **AO2.1**
	2. 10 (teeth) (1)		

Question	Answer	Additional guidance	Mark
2(b)	substitution (1) (moment =) 9(.0) x 0.4(0) evaluation (1) 3.6 (Nm)	award full marks for the correct answer without working ignore final answer of 4 (1sf)	**(2)** **AO2.1**

		allow 360 for one mark (unit error ie N cm)	

Question	Answer	Additional guidance	Mark
2(c)(i)	2.4 (Nm) (1)		**(1)** **AO2.1**

Question	Answer	Additional guidance	Mark
2(c)(ii)	substitution (1) 2.4 = 8.0 x distance rearrangement and evaluation (1) (distance =) $\frac{2.4}{8.0}$ = 0.3 (m)	award full marks for the correct answer without working if no other mark scored, accept for 1 mark distance = $\frac{moment}{force}$ OR accept for 1 mark 3.3 OR	**(2)** **AO2.1**

PMT

| | | accept for 1 mark

19.2 | |

(Total for question 2 = 8 marks)

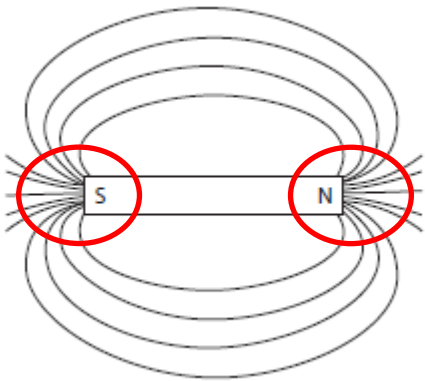| Question	Answer	Additional guidance	Mark
3(a)	The balloons have the same charge. This means that these balloons ___repel___ (1) each other. The charged particles transferred from the balloons to the cloth are called ___electrons___ (1) The cloth is left with a ___negative___ (1) charge. The unit of charge is the ___coulomb___ (1)	more than one word in a space loses the mark for that space	**(4)** **AO1.1**

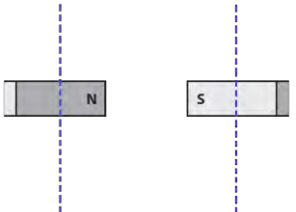| Question	Answer	Additional guidance	Mark
3(b)	an explanation linking any **two** from: balloon attracted (1) (by) negative charges/electrons (at surface) on wall (1) idea of charge separation in wall (1)	ignore 'sticks/attaches to the wall' as in stem may be drawn on Figure 6 eg minus signs induced charges (in wall) may be drawn on Figure 6	**(2)** **AO1.1**

Question	Answer	Additional guidance	Mark
3(c)	an explanation linking **two** from:	explanations using moving positive charges OR moving positive electrons can score a maximum of ONE mark for this item	**(2) AO1.1**
	metal/wire is a conductor (1) charge (electrons) moves in the wire (1)	if no other marks scored allow protons or positive charge(s) (in this context) moves <u>to the ground</u> for this mark only	
	electrons/negative charges (move) from ground to the sphere (1)		
	(the sphere is) earth(ed) (1)	(the sphere is) ground(ed) OR electrons neutralise (the positive charge on) the sphere	

(Total for question 3 = 8 marks)

Question	Answer	Additional guidance	Mark
4(a)(i)	arrow(s) going from N to S on any field line (1)	any contradictory arrow loses the mark	**(1)** **AO1.1**

Question	Answer	Additional guidance	Mark
4(a)(ii)	**X** drawn close to N or S (1)	 any X drawn outside either ellipse loses the mark - judge by eye	**(1)** **AO1.1**

Question	Answer	Additional guidance	Mark
4(a)(iii)	**one** reason from: where the (field) lines are close(st) (to each other) (1) close to the pole(s) (1)	accept where there are most lines ignore close to the magnet	**(1)** **AO1.1**

Question	Answer	Additional guidance	Mark
4(b)(i)	at least 1 straight line between the N and S (1) at least 1 curved line between N and S (1)	 ignore lines that start or end outside the region identified do not accept any contradictory lines within the region ignore any arrows	**(2)** **AO2.2**

Question	Answer	Additional guidance	Mark
4(b)(ii)	(it would) move towards the other magnet (1)	idea of attraction/joining together	**(1)** **AO3.3**

Question	Answer	Mark
4(c)(i)	**B** iron ***A,C and D*** *are not magnetic materials*	**(1)** **AO1.1**

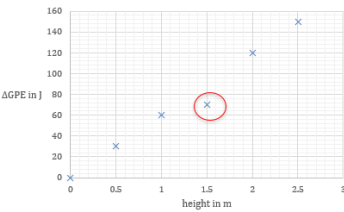| Question	Answer	Additional guidance	Mark
4(c)(ii)	A description to include: method (1) put magnet near paper clips outcome (1) (picks up/attracts) more paper clips OR (has the) longest chain OR (picks up/attracts from a) greater distance	method can be included with the outcome in one sentence for two marks e.g. see which magnet attracts the most paper clips	**(2)** **AO1.2**

(Total for question 4 = 9 marks)

Question	Answer	Additional guidance	Mark
5(a)(i)	substitution (1) (work done =) 1200 × 8(.0) evaluation (1) (work done =) 9600 unit (1) J	 award two marks for the correct answer without working independent mark accept j OR joule(s) OR N m ignore n m (lower case n) accept 9.6 kJ (kilojoules) for three marks	**(3)** **AO2.1**

Question	Answer	Additional guidance	Mark
5(a)(ii)	A description to include **two** from: kinetic (energy store) (1) (kinetic energy store is) transferred to thermal (energy store) (1) energy of the surroundings increases	ignore references to GPE KE accept heat for thermal thermal (energy store) increases accept arrow for 'transferred to'	**(2)** **AO2.1**

	(1) OR energy is dissipated (to surroundings) (1)	energy is transferred to the air/ground/surroundings	

Question	Answer	Mark
5(b)	**C** 900 N **A, B and D** *do not give the weight of the box.*	**(1)** **AO1.1**

Question	Answer	Additional guidance	Mark
5(c)(i)	circle around (1.5, 70) (1)		**(1)** **AO3.1**

Question	Answer	Additional guidance	Mark
5(c)(ii)	correct value of ΔGPE from the graph (1) 120 substitution (1) $\dfrac{(120)}{5}$ evaluation (1) 24 (W)	 (power =) <u>their value of energy</u> 5 their energy value must be a number between 0 and 160	**(3)** **AO3.2**

		evaluation of <u>their value of energy</u> 5 award full marks for the correct answer without working	

(Total for question 5 = 10 marks)

Question	Answer	Additional guidance	Mark
6(a)(i)	30 (°C) (1)		**(1)** **AO3.1**

Question	Answer	Additional guidance	Mark
6(a)(ii)	substitution (1) (c =) $\dfrac{96\,000}{0.82 \times 30}$ evaluation (1) (c =) 3900 (J/kg °C)	allow ECF from (a)(i) throughout allow values that round to 3900 e.g. 3902.4 (J/kg °C) award full marks for the correct answer without working	**(2)** **AO3.1**

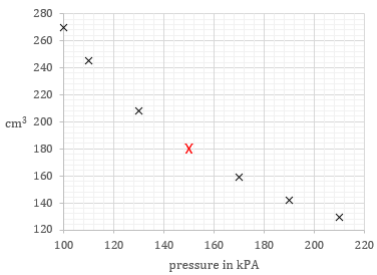| Question	Answer	Additional guidance	Mark
6(b)(i)	substitution (1) (P =) $\dfrac{130\,000}{87}$ evaluation (1) (P =) 1494 (W) value to 2sf (1) 1500 (W)	 award two marks for the correct answer without working independent mark for **any** number to 2sf	**(3)** **AO2.1**

Question	Answer	Additional guidance	Mark
6(b)(ii)	substitution (1) (efficiency =) $\dfrac{96\,000}{130\,000}$ evaluation (1) (efficiency =) 0.74	 accept values that round to 0.74 e.g. 0.7385 accept 74 % for 2 marks allow 74 without % sign for 1 mark only allow 0.73 or 73% for 1 mark award full marks for the correct answer without working	**(2)** **AO2.1**

Question	Answer	Mark
6(c)(i)	**A** earth ***B, C and D*** *would not help to protect from shock*	**(1)** **AO1.1**

Question	Answer	Additional guidance	Mark
6(c)(ii)	 an explanation linking **two** from:	ignore references to p.d./voltage current is greater than fuse	**(2)** **AO1.1**

PMT

| | if the current is too large (1)

(fuse) melts/breaks (1)

switches off (current/circuit) (1) | value/size/rating

blows

stops current OR stops flow of charge | |

(Total for question 6 = 11 marks)

Question	Answer	Additional guidance	Mark
7(a)(i)	point plotted at 150,180 (1)	± half a square	**(1)** **AO3.1**

Question	Answer	Additional guidance	Mark
7(a)(ii)	smooth curve through the points (1)	smooth curve through/touching at least 5 crosses ignore slight shakiness in drawing do not accept tramlining (multiple curves)	**(1)** **AO3.1**

Question	Answer	Additional guidance	Mark
7(a)(iii)	224 ± 4 (cm^3) (1)	any number between 220 and 228 inclusive	**(1)** **AO3.1**

Question	Answer	Mark
7(a)(iv)	**C** 20 °C **A** *is incorrect as it is 253 K* **B** *is incorrect as it is 273 K* **D** *is incorrect as it is 546 K*	**(1)** **AO1.1**

Question	Answer	Additional guidance	Mark
7(b)(i)	kinetic (1)	movement / internal reject mechanical / potential / elastic	**(1)** **AO1.1**

Question	Answer	Additional guidance	Mark
7(b)(ii)	substitution (1) $(P_2 =) \dfrac{300 \times 600}{400}$ evaluation (1) $(P_2 =)$ 450 (kPa)	allow values to 1sf e.g. 400 or 500 allow one mark for 400 OR 450 OR 500 to any other power of ten award full marks for the correct answer without working	**(2)** **AO2.1**

Questio n	Indicative content	Mark
7(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. AO1 particles exerting pressure: • particles in (rapid) (random) motion/have high speed • particles move freely • particles collide • particles collide with the (walls of) the container • there is a change in momentum of the particles • producing a force on the walls • pressure = force/area OR P=F/A effect of decreasing volume: • when volume decreases collisions increase • when volume decreases rate/frequency of collisions increases • force on walls increases so pressure increases • area of walls decreases • (P = F/A) (so) as area decreases pressure increases	(6) AO1.1

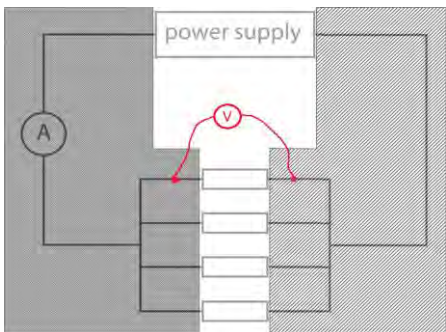| Level	Mark	Descriptor
	0	• No rewardable material.

Level	Mark		
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)	

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 facts, statements from either section	Possible candidate responses particles are moving
Level 2	3–4	Additional guidance limited explanation of both sections OR detailed explanation of one section	Possible candidate responses particles are moving and collide more particles in a gas are moving freely colliding with the walls of the container

Level 3	5–6	Additional guidance	Possible candidate responses
		detailed explanation from both sections	particles in a gas are moving freely, colliding with the walls of the container
			as the volume decreases (rate of) collisions increases

(Total for question 7 = 13 marks)

Question	Answer	Mark
8(a)	**The only correct answer is B** *A, C* and *D* are not correct because they do not add up to the current entering the junction AND they do not equal the current coming from the battery	**(1)** **AO1.1**

Question	Answer	Additional guidance	Mark
8(b)(i)	voltmeter in parallel with resistors (1)	 one voltmeter connection in each shaded region	**(1)** **AO1.2**

Question	Answer	Additional guidance	Mark
8(b)(ii)	36(.4) (mA) (1)	allow 36 to 37 inclusive may be seen in table in Figure 22	**(1)** **AO3.2**

Question	Answer	Additional guidance	Mark
8(b)(iii)	substitution into $V = IR$ (1) 6(.00) = 9.1 (× 10^{-3}) × R rearrangement (1) (R =) $\dfrac{6(.00)}{9.1\,(× 10^{-3})}$ evaluation (1) 660 (Ω)	allow substitution and rearrangement in either order accept 18.2/2 or 27.3/3 or (36 to 37)/4 in place of 9.1 allow substitution of correct values into a visible, incorrectly rearranged algebraic equation for this mark only (R =) $\dfrac{V}{I}$ allow values that round to 660 e.g. 659.3 award full marks for the correct answer without working. value rounding to 660 to any other power of 10 scores 2 marks	**(3)** **AO2.1**

Question	Answer	Additional guidance	Mark
8(b)(iv)	an explanation linking: (total) resistance increases (1)		**(3)** **AO3.2**

| | (because) current decreases (1) | fewer paths for the current | |
| | (and) voltage stays the same (1) | resistance calculations supporting increasing resistance | |

Question	Answer	Additional guidance	Mark
8(c)	substitution (1) $P = 9.0 \times 230$ evaluation (1) 2100 (W)	 allow values that round to 2100 (W) e.g. 2070 (W) award full marks for the correct answer without working	**(2)** **AO2.1**

(Total for question 8 = 11 marks)

Question	Answer	Additional guidance	Mark
9(a)		allow substitution and rearrangement in either order	**(3)** **AO2.1**
	substitution (1) $8.96 = \dfrac{14.1}{V}$	allow substitution of correct values into a visible, incorrectly rearranged algebraic equation for this mark only	
	rearrangement (1) $(V =) \dfrac{14.1}{8.96}$	$(V =) \dfrac{m}{\rho}$	
	evaluation (1) $(V =) 1.57\ (cm^3)$	accept numbers that round to 1.57 allow 1.6 award full marks for the correct answer without working allow 1.6 or answers rounding to 1.57 to any other power of 10 scores 2 marks	

Question	Answer	Additional guidance	Mark
9(b)	an explanation linking: density of solid is greater (than density of liquid) (1) (because) distance between particles in solid is less (than distance between particles in liquid) (1)	 solids are dens**er** accept in solids, particles are clos**er** accept in solids, there are **more** particles per unit volume / particles are **more** (tightly) packed	**(2)** **AO1.1**

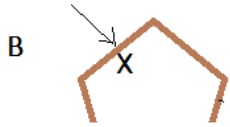| Question	Answer	Additional guidance	Mark
9(c)	substitution into $Q = m \times L$ (1) (Q =) 60 ($\times 10^{-3}$)$\times$ 2.26 ($\times 10^6$) evaluation (1) 1.36×10^5 (J)	 136 000 (J) 135 600 (J) accept numbers that round to 1.4×10^5 (J) award full marks for the correct answer without working any answer rounding to 1.4 to any other power of 10 scores 1 mark	**(2)** **AO2.1**

Question	Indicative content	Mark
9(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. AO1 - ice melts at 0 °C - water boils at 100 °C 0 to 1 minute temperature of ice rising 1 to 7 minutes ice melting 1 to 7 minutes energy supplied is used to increase (potential) energy of ice particles 1 to 7 minutes energy supplied is used to break bonds (between ice particles) 7 to about 15 minutes temperature of water rising 7 to about 15 minutes energy supplied is used to increase (kinetic) energy of water particles - about 15 to 20 minutes water boiling - about 15 to 20 minutes energy supplied is used to break bonds (between water particles)	**(6)** **AO1.2**

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1) • Presents a description which is not logically ordered and with significant gaps. (AO1)
Level 2	3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. (AO1) • Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing. (AO1)

| Level 3 | 5-6 | • Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. (AO1) |
| | | • Presents a description that has a well-developed structure which is clear, coherent and logical. (AO1) |

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 limited description including isolated facts for any section	Possible candidate responses temperature of ice/solid increases OR ice melts OR water boils
Level 2	3–4	Additional guidance limited description relating knowledge and understanding to interpretation of graph in **one** section plus an isolated fact	Possible candidate responses temperature of ice/solid increases for 1 minute AND temperature of the water increases
Level 3	5–6	Additional guidance detailed description relating knowledge and understanding to interpretation of graph in **two** sections plus an isolated fact	Possible candidate responses temperature of ice/solid increases for 1 minute AND ice melting while 0 °C for 6 minutes AND water boils

(Total for question 9 = 13 marks)

Question	Answer	Mark
10(a)	This shows the **only** direction normal to surface, acting towards surface	**(1)** **AO3.1**

Question	Answer	Additional guidance	Mark
10(b)	substitution (1) (force =) 4.8 (x 10^7) x 1.2 (x 10^{-5}) evaluation (1) 576 (N) their evaluation rounded to 2sf (1) 580 (N)	award full marks for the correct answer (580) without working award 1 mark for 5.76 to any other power of ten award 2 marks for 5.8 to any other power of ten	**(3)** **AO2.1**

Question	Answer	Additional guidance	Mark
10(c)(i)	a description including: pressure increases as height decreases (1) OR as height increases pressure decreases (1) non-linear (1)	negative correlation implication of non-linear e.g. curved OR not proportional OR gradient increases as height increases OR gradient decreases as pressure increases	**(2)** **AO3.2**

Question	Answer	Additional guidance	Mark
10(c)(ii)	accept any answer from 30 to 34 (kPa) (1)		**(1)** **A03.2**

Question	Answer	Additional guidance	Mark
10(c)(iii)	substitute into % calculation (1) $\frac{74 - 104}{104}$ (x 100) evaluation (1) (-) 29 (%)	$\frac{104 - 74}{104}$ (x 100) any number rounding to (-)29(%) e.g. (-)28.8(%) award full marks for the correct answer without working award 1 mark for (-)0.29 OR (-)0.288	**(2)** **AO2.1**

		award 1 mark for (-)40(.54) (%) or (-)41 (%) award 1 mark for 71 (%)	

Question	Answer	Additional guidance	Mark
10(d)	an explanation linking: density decreases as height increases (1) with (because) particles are further apart (higher up) (1)	ignore gravity accept reverse arguments density decreases as you go higher accept fewer particles per unit volume accept particles more spaced out	**(2) AO3.2**

(Total for question 10 = 11 marks)