

Mark Scheme (Results)

Summer 2022

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	За	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	

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Question number	Answer	Additional guidance	Mark
1 (a)	circuit symbol description	1 mark for each correct line.	(3) AO1
	LED LED switch resistor	more than one line to or from any box loses the mark for that symbol.	A01

Question number	Answer	Additional guidance	Mark
1 (b)(i)	B electrons		(1)
	A C and D are incorrect because they do not move through a conductor to create an electric current.		A01

Question number	Answer	Additional guidance	Mark
1 (b)(ii)	substitution (1)		(3)
	(charge =) 0.21 x 300		AO2
	evaluation (1)	award full marks for the correct answer	
	(charge =) 63	without working	
	unit (1)	independent mark	A01
	coulombs	C(oulombs)	
		c As	Fotol 7 more

Total 7 marks

Question number	Answer	Mark
2 (a)	B plotting compass	(1)
	A is incorrect because a force causes a linear movement.	
	C is incorrect because the liquid column expands or contracts linearly. D is incorrect because the slider is moved linearly	

Question number	Answer	Additional guidance	Mark
2 (b)	substitution (1)		(2)
	(moment =) 4(.0) x 5(.0) (/100)		AO2
	evaluation (1)		
	(moment =) 0.2(0) (Nm)	2 to any incorrect power of ten scores 1 mark e.g. 20 or 2000 etc award full marks for the correct answer without working	

Question number	Answer	Additional guidance	Mark
2 (c)	identification of clockwise and anticlockwise moment (1) 3(.0) x 5(.0) (/100) 6.0 x 2.5 (/100)	15 and 15 seen or	(2) AO2
	0.0 x 2.5 (/100)	0.15 and 0.15 seen	
		Accept Y is half the force (as Z) but twice the distance (from the pivot as Z) for this mark	
	values (of both moments) are equal (1)	may be implied by = sign	
		(turning effect) of the two forces are equal	

Question number	Answer	Additional guidance	Mark
2 (d)	(speed of R is) same (as speed of) P (1)		(2) AO1
	(sense/direction of R is) same (as sense/direction of P) (1)	clockwise / to the right mark may be awarded by arrow on diagram (provided it is not contradicted by a statement)	

Total 7 marks

Question number	Answer	Additional guidance	Mark
3 (a)(i)	arrow normal to surface at point x	Judge by eye	(1)
Clip with fig 6		may be inside or outside the container	A01

Question number	Answer	Additional guidance	Mark
3 (a)(ii)	particles are in (random) motion (1)		(2) AO1
	collide with sides (of container) (1)	particles bounce off sides of container	
		award 2 marks for change in momentum of particles.	

Question number	Answer	Additional guidance	Mark
3 (b)	particles have greater (kinetic) energy (1)	greater (average) velocity move faster/ more quickly more (frequent) collisions exert greater force on sides ignore changes pressure of the gas	(1) AO1

Question number	Answer	Additional guidance	Mark
3 (c)(i)	substitution (1)		(2)
	$P_1 = \frac{105 \times 2.3}{0.2}$		AO2
	evaluation (1)		
	P ₁ = 1200 (kPa)	allow values that round to 1200 e.g. 1207.5	
		award full marks for the correct answer without working	

Question number	Answer	Additional guidance	Mark
3 (c)(ii)	Use relevant information from table (1)	2.3 used in a calculation or comparison	(3) AO3
	relevant calculation (1) either		
	(volume of 30 balloons =) 0.07 x 30	2.1 (m ³) scores MP2 only	
	or		
	(number of balloons =) $\frac{2.3}{0.07}$	32(.8) scores MP1 and MP2	
	or		
	(volume per balloon=) <u>2.3</u> 30	0.077 (m ³) scores MP1 and MP2	
	comparison / supported conclusion (1)		
	2.1 is less than 2.3		
	Or 32 is more than 30	32 therefore claim is correct	
	Or 0.077 is more than 0.07		

Total 9 marks

Question number	Answer	Additional guidance	Mark
4 (a)(i)	(soft) iron (1)	allow (in this context) nickel (alloys)	
		cobalt steel	A01

Question number	Answer	Additional guidance	Mark
4 (a)(ii)	would be magnetised (when switch is closed) (1)	(is) magnetic (is) electromagnetic induced magnetism	(2) A01
	would be demagnetised when switch is open (1)	magnetism can be switched off	
		accept for either mark not permanent magnet or temporary magnet	

Question number	Answer	Additional guidance	Mark
4 (b)(i)	the <u>Earth/world/planet</u> has a magnetic field / core(1)	Earth/world/planet has a north (and south) pole	(1) AO3

Question number	Answer	Additional guidance	Mark
4 (b)(ii)	direction (of the field) has changed / rotated (1)	(from 0 to) 36° from N to NE	(2) AO3
	(strength of the) field has increased (1)) field has field is stronger	
		(changed by) 16.52 (µT)	
		numbers have increased (from 46.67 to 63.19)	

Question number	Answer	Additional guidance	Mark
4 (b)(iii)	a description including three from		(3)
	use of equipment to measure distance (1) ruler / tape measure		A03
	obtain a measurement (1) measure / record strength of the field (at a certain point)	measure the distance between phone and magnet	
	change the conditions (1) move the phone / magnet (to a different location)	rotate the phone/magnet	
	 process the results (1) e.g. draw a diagram make a table compare results/values see when (field) stays constant 		

Total 9 marks

Question number	Answer	Additional guidance	Mark
5 (a) (i)	B live and neutral		(1)
	A , C and D are incorrect because the terms positive and negative are not used in the context of wires in a mains cable.		A01

Question number	Answer	Additional guidance	Mark
5 (a)(ii)	a description that includes any two from		(2)
			A01
	melts (1)	blows / breaks	
	if there is a fault (1)	if current too large	
	breaks the circuit (1)		
	stops current (1)		
	safety (1)	prevents overheating / fire	
		if no other marks scored allow 1 mark for identifying the fuse.	

Question number	Answer	Additional guidance	Mark
5 (b)	conversion of time (1)		(3)
	1 x 60 (s)		AO2
	substitution (1)		AUZ
	(I =) <u>9000</u> 230 (x 60)		
	evaluation (1)		
	(I =) 0.65 (A)	any value that rounds to 0.65; e.g. 0.65217	
		0.7 0.6	
		award full marks for the correct answer without working	
		allow 2 marks for answer of 39(.130)	

Question number	Answer	Additional guidance	Mark
5 (c) (i)	An explanation linking		(2)
	energy has been dissipated /wasted / lost (1)	energy has been transferred mechanically	AO3
		useful energy is less than total energy supplied	
		identifies difference of 600(J)	
	as thermal energy (1)	heat / to the surroundings	
		ignore sound	
		accept (some) energy has been transferred to thermal store for 2 marks	

Question number	Answer	Additional guidance	Mark
5 (c)(ii)	substitution (1)		(2)
	(efficiency =) <u>8400</u> 9000		A02
	evaluation (1)		
	(efficiency =) 0.93	0.9 93(%) allow values that round to 0.93 or 93(%) award full marks for the correct answer without working	

Total 10 marks

Question number	Answer	Additional guidance	Mark
6 (a)	В		(1)
	A, C and D are incorrect because these do not measure the vertical change in height above the earth's surface.		A01

Question number	Answer	Additional guidance	Mark
6 (b)(i)	joule(s)	J j Nm newton metre(s) kg m ² s ⁻² kg m ² /s ² Ignore SI prefixes	(1) AO1
		do not accept nm	

Question number	Answer	Additional guidance	Mark
6 (b)(ii)	selection of and substitution into	accept	(2)
	E = F x d (1)	P x t = F x d	AO2
	1960 = weight x 4.0	436 x 4.5 = weight x 4.0	
	rearrangement and evaluation (1)		
	(weight =) 490 (N)	490.5 or 491	
		award full marks for the correct answer without working	
		530 scores 1 mark (used data to calculate median value)	

Question number	Answer	Additional guidance	Mark
6 (b)(iii)	selection of and substitution into $P = E \div t (1)$		(2)
	$425 = 2040 \div t$		AO2
	rearrangement and evaluation (1)		
	(time =) 4.8 (s)	0.208 scores 1 mark 867000 scores 1 mark	
		award full marks for the correct answer without working	

Question number	Answer	Additional guidance	Mark
6 (b)(iv)	values for power selected and added (1)		(2)
	<u>440 + 436 + 425</u>	<u>1301</u>	AO2
	(3)	(3)	
	evaluation (1)		
	434 (W)	accept values that round to 434 e.g. 433.667	
		accept 436 (median average) for 2 marks	
		1301 scores 1 mark 1017(.666) scores 1 mark	
		award full marks for the correct answer without working	

Question number	Answer	Additional guidance	Mark
6 (c)	estimate of weight (1)	ignore reaction time	(2)
	measure (actual) weight (1)	use scales ignore repeating measurements	A03

Total 10 marks

Question number	Answer	Additional guidance	Mark
7 (a)			(1)
	+		A01
	A		
	B C and D are incorrect because they do not show the electric field around a point charge.		

Question number	Answer	Additional guidance	Mark
7 (b)	rub the rod with (a cloth) (1)	friction	(1)
			A01

Question number	Answer	Additional guidance	Mark
7 (c)(i)	A adds electrons to the droplets B and D are incorrect because protons cannot be added or removed from droplets. C is incorrect because this would give an overall positive charge		(1) A01

Question number	Answer	Additional guidance	Mark
7 (c)(ii)	an explanation linking	accept reverse argument	(2)
	cloud from sprayer 1 is more dispersed (than from sprayer 2) (1)	spread out more (covers) larger area bigger / wider	AO3
	the droplets / charges repel each other (1)		

Question number	Answer	Additional guidance	Mark
7 (c)(iii)	an explanation linking		(2)
	(droplets) attracted (to seat) (1)	induced charge (on seat)	AO2
	including parts not in direct line of spray (1)	spreads out (over all the seat)	

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. Description of danger build-up of charge could create a spark flammable fuel can easily catch fire spark could ignite fuel igniting fuel could cause a fire / explosion of the plane Description of how risk is reduced The metal wire is connected to ground/earth Pipe and airplane at same potential Metal is a conductor Electrons can move through metal wire No charge build-up No danger of spark Reduce charge separation by plausible method such as reduce flow rate/ wider pipe / less friction	(6) AO1

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	<u>Additional guidance</u> Two statements	Possible candidate responses There could be a fire that could lead to an explosion.
Level 2	3-4	Additional guidance limited explanation linking facts about dangers arising from charge OR linking facts about how danger is reduced	Possible candidate responses A spark could cause a fire and explosion. OR Build-up of charge prevented by a wire connected to ground
Level 3	5-6	Additional guidance Detailed explanation about danger AND how danger is reduced. (one may be more detailed than the other but both should be present)	Possible candidate responses There could be a spark that could cause a fire in the fuel and explode. AND Wires between the airplane, pipe and ground prevent the build-up of charge.

Total 13 marks

Question number	Answer	Additional guidance	Mark
8 (a)(i)	Substitution and evaluation (1)		(1)
	15 (Ω)		A02

Question number	Answer	Additional guidance	Mark
8 (a)(ii)	select / recall (1)		(2)
	(power =) V x I	(power =) 4.5 x 0.3	A02
	or		
	(power =) $I^2 \times R$	0.3 ² x 15	
	or		
	(power =) $\frac{V^2}{R}$	<u>4.5²</u> 15	
	substitution and evaluation (1)		
	(power =) 1.4 (W)	allow 1.3(5) (W)	
		award full marks for the correct answer without working	

Question number	Answer	Additional guidance	Mark
8 (b)	an explanation linking any three from:	accept reverse arguments throughout	(3) A01
	lamp in second circuit is dimmer (than lamp in first circuit) (1)		
	current in second circuit is less (than in first circuit) (1)		
	potential difference / voltage across each lamp (in second circuit is) less / shared (1)		
	idea that power of each lamp (in second circuit) is less / shared (1)		
	the (total) resistance of the second circuit is more (than in first circuit) (1)		

Question number	Answer	Additional guidance	Mark
8 (c)	a diagram of a circuit including all of the following:	accept symbols	(3)
	power supply / cell(s) / battery, identifiable resistance wire an ammeter a voltmeter (1)	accept ohmmeter with resistance wire only	A02
		ignore lamp(s) / additional resistors	
	plus any two from		
	ammeter in series (1)		
	voltmeter in parallel (1)		
		allow ohmmeter (across wire) instead of ammeter and voltmeter for 1 mark	
	indication of tapping off / using 50cm of resistance wire (1)	e.g. (crocodile) clips	

Question number	Answer	Additional guidance	Mark
8 (d)			(2)
	d.c (current) in one direction only (1)	one way	A01
	a.c (current) changes direction (1)	both ways	

Total 11 marks

Question number	Answer			Mark
9 (a)	[x] B	bigger than in water	less than water	(1)
	A is incorrect because the density of steam is less than water. C is incorrect because the space between the particles increases. D is incorrect because the space between the particles increases and density of steam is less than water.			

Question number	Answer	Additional guidance	Mark
9 (b)	calculation of change in volume (1) (530 cm ³ – 490 cm ³) = 40 (cm ³)	measurement mark – using scale	(4) A02
	substitution (1) $7.9 = \frac{mass}{40}$	allow use of incorrect volume	
	rearrangement and evaluation (1)	answers without working	
	(mass = 7.9 x 40) (mass =) 316 (g)	316 scores 3 marks	
		0.316 kg scores 3 marks	
		316 to any other power of 10 scores 2 marks	
		4187 or 3871 scores 2 marks (incorrect volume)	
	evaluation to 2 sig fig (1) 320 (g)	any answer written to 2sf independent mark	
		answers without working	
		320 scores 4 marks	
		320 to any other power of ten scores 3 marks	
		4200 scores 3 marks 3900 scores 3 marks	

Question number	Answer	Additional guidance	Mark
9 (c)	an explanation linking		(2)
	density of wood less (than that of water) (1)	allow wood floats / should be submerged	A02
		allow wood absorbing water	
	less (volume of) water displaced (than volume of wood) (1)	allow (idea of) incorrect volume reading	
		allow (idea that) the volume cannot be measured this way	

Question number	Indicative content	Mark
-	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. Equipment • Thermometer • Measuring cylinder / balance • Power supply • Stirrer • Joule meter / ammeter / voltmeter • Stopwatch / clock Measurements • Mass / volume of water • Initial / final / change of temperature of water • Voltage / current / energy / power • Time (heated for) Detail • Lid/insulation to reduce energy loss • Ensure heater fully immersed / keep stirring the water • Use of equation $\Delta Q = m \times c \times \Delta \theta$ / calculation of input energy • Repeat and find average • Plot graph of temp change and time / energy	(6) AO1
	Credit can be given for correctly labelled diagrams	

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)

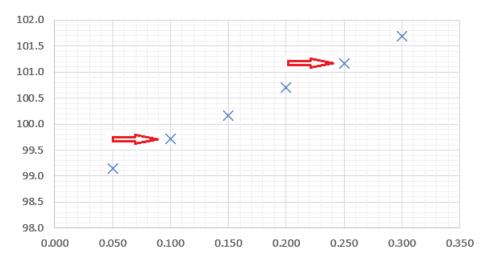
Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1-2	Additional guidance one measurement or two items of equipment or one piece of detail	Possible candidate responses measure the temperature of the water to start with or the student needs a power supply and a thermometer or insulated material around the beaker
Level 2	3-4	Additional guidance two items of equipment and at least one measurement or one piece of equipment and two measurements or two items of equipment and one piece of detail or one measurement and one piece of detail	Possible candidate responses The student needs a measuring cylinder to measure the volume of water. They also need a thermometer Or Measure the temperature rise of the water and use a balance to measure the mass or They need a power supply for the heater and a voltmeter. Keep the heater in the water. or Measure temperature rise of the water. Keep stirring the water all the time.
Level 3	5-6	Additional guidance two items of equipment and two measurements and one piece of detail.	Possible candidate responses The student needs a balance to find the mass of water. They also need a thermometer to measure the rise in temperature of the water. Then use the equation $\Delta Q = m \times c \times \Delta \theta$

Total 13 marks

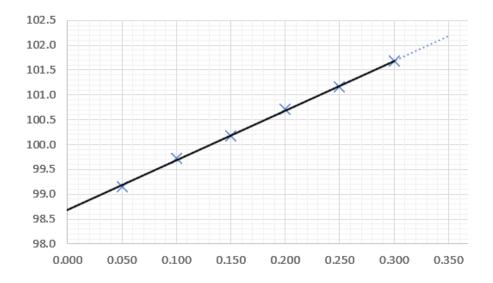
Question number	Answer	Additional guidance	Mark
10 (a) (i)	substitution (1)		(2)
	(pressure =) $\frac{2500}{4 \times 0.022}$		AO2
	evaluation (1)		
	28 000 (Pa)	any number rounding to 28 000 e.g. 28 400, 28 410, 28 409	
		award full marks for the correct answer without working	
		award one mark for numbers that round to 110 000 (Pa) (missing 4 in denominator)	
		award 1 mark for 454 545 (times by 4)	

Question number	Answer	Additional guidance	Mark
10 (a) (ii)	An explanation linking any two from	ORA for donkey	(2)
	camel less likely to sink into the soft ground (1)		AO3
	(same) force / weight is distributed / spread out (1)	ignore pressure is spread out	
	camel's hoof has greater (surface) area (than donkey) (1)	wider	
	camel's hoof exerts less pressure (than it would if hoof were smaller) (1)		
		if no other marks scored then allow 1 mark for split in camel hoof enables better grip (as it walks)	

Question number	Answer	Additional guidance	Mark
10 (b)(i)	Points plotted to within ± 1 small square		(2) AO2
	(0.100, 99.7) (1)		A02
	(0.250, 101.2) (1)		



Question number	Answer	Additional guidance	Mark
10 (b)(ii)	best fit straight line passing through at least four of the points (1)	do not accept tramlining (multiple lines / curves)	(1) AO2
		ignore slight shakiness in drawing	



Question number	Answer	Mark
10 (b)(iii)	D $y = mx + c$ A is incorrect because the graph is a straight line and this equation describes a parabola. B is incorrect because the line intercepts the Y axis at a positive value and this equation describes a line passing through the origin. C is incorrect because this equation describes a line which intercepts the Y axis at a negative value.	(1) AO2
	A is incorrect because the graph is a straight line and this equation describes a parabola. B is incorrect because the line intercepts the Y axis at a positive value and this equation describes a line passing through the origin. C is incorrect because this equation describes a line which intercepts the Y axis at a	

Question number	Answer	Additional guidance	Mark
10 (b)(iv)	answer between 98.6 and 98.8 (kPa)	allow ecf from their line of best fit in b(ii)	(1) AO3

Question number	Answer	Additional guidance	Mark
10 (c)	any two from	credit mark points seen on	(2)
		graph	AO3
	pressure(s) would be greater (values) (1)		
	steeper gradient of graph (1)	bigger gradient / steeper line (of best fit)	
	both straight lines (1)	both linear	
	intercept (on pressure axis) the same (1)	pressure at surface is the same	

Total 11 marks

Total for paper = 100 marks