Mark Scheme (Results)

Pearson Edexcel

Additional Sample Assessment Materials
GCSE 9-1
Paper 2: Physics 1PH0/2H

First examination 2018

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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.

1PH0_2PH – Physics Mark Scheme

Question number	Answer	Mark
1 (a)(i)	An explanation that combines identification –knowledge and reasoning / justification • (particles / atoms / molecules) {hit / collide with} piston (1) • causing a force (on the piston) (1)	**(2)**

Question number	Answer	Mark
1(a)(ii)	An explanation that combines identification – knowledge and reasoning / justification • volume decrease makes the density of particles increase / more crowded idea (1) • increasing the **rate** at which particles collide (with the piston) (1)	**(2)**

Question number	Answer	Additional guidance	Mark
1(a)(iii)	Rearrangement (1) $P_2 = \frac{P_1V_1}{V_2}$ substitution (1) $P_2 = \frac{103 \times 0.010}{0.0070}$ evaluation **to 2 sf** (1) = 150 (kPa)	 147 (kPa) 1.5×10^2 kPa or 1.5×10^5 Pa **rearrangement and substitution in either order** award full marks for correct answer without working	**(3)**

(Total for Question 1 = 7 marks)

Question number	Answer	Additional guidance	Mark
2 (a)	An answer that combines the following points of understanding to provide a logical description: named force (acting at a distance) (1) situation (1)	 e.g. magnetic force between two (magnetic) poles	**(2)**

Question number	Answer	Additional guidance	Mark
2 (b)(i)	rearrangement of work = force × distance to give distance = work ÷ force (1) substitution and evaluation (1) 18 (m)	 seeing 2700 ÷ 150 Award full marks for correct answer without working	**(2)**

Question number	Answer	Mark
2 (b)(ii)	2700 (J)	**(1)**

Question number	Answer	Additional guidance	Mark
2 (b)(iii)	rearrangement of KE = ½ mv^2 $v = \sqrt{(2 \times KE \div m)}$ (1) substitution and evaluation (1) 19 (m/s)	 $v = \sqrt{(2 \times 2700 \div 15)}$ $v^2 = (2 \times 2700 \div 15)$ allow answers that round to 19 award full marks for correct answer without working allow alternative route using $v^2 - u^2 = 2ax$ for full marks	**(2)**

Question number	Answer	Additional guidance	Mark
2 (c)	An answer that combines points of interpretation/evaluation to provide a logical description: efficiency increases (at first) (1) to maximum efficiency (for mass of about 25 kg) (1)	 e.g. decreases for larger masses	**(2)**

(Total for Question 2= 9 marks)

Question number	Answer	Additional guidance	Mark
3 (a)	substitution into P = V × I (1) 2600 = 230 × I rearrangement (1) I = P ÷ V evaluation (1) 11 (A)	Substitution and re-arrangement in either order I = 2600 ÷ 230 for 2 marks allow answers that round to 11 award full marks for correct answer without working allow I = 2.6 ÷ 230 for 1 mark allow 0.011 (A) for 2 marks max if no other marks scored, award 1 mark for 2.6 kW = 2600 W	**(3)**

Question number	Answer	Mark
3 (b)(i)	either power = (current)^2 × resistance OR $P = I^2 \times R$	**(1)**

Question number	Answer	Additional guidance	Mark
3 (b)(ii)	substitution into $P = I^2 \times R$ (1) $55 = 4.4^2 \times R$ rearrangement (1) $R = P \div I^2$ evaluation (1) 2.8 (Ω)	Substitution and re-arrangement in either order $R = 55 \div 4.4^2$ for 2 marks allow answers that round to 2.8 award full marks for correct answer without working allow alternative route $V = P \div I = 55 \div 4.4$ then $R = V \div I = 12.5 \div 4.4$	**(3)**

(Total for Question 3= 7 marks)

Question number	Answer	Mark
4 (a)	**B** negative | positive	**(1)**

Question number	Answer	Additional guidance	Mark
4 (b)(i)	An explanation that combines identification - understanding (1 mark) and reasoning - understanding (1 mark): charges move (1) because of **friction** (1)	(negative) electrons transfer glass loses electrons	**(2)**

Question number	Answer	Mark
4 (b)(ii)	An explanation that combines identification - understanding (1 mark) and reasoning - understanding (1 mark): (negative) electrons are rubbed off the glass (on to the silk) (1) giving the silk a <u>negative</u> charge (1)	**(2)**

Question number	Answer	Additional guidance	Mark
4 (c)(i)	An answer that combines the following points of understanding to provide a logical description: the situation which caused the charge separation (1) where the spark travelled {from/to} (1)	examples: when refuelling, spark between end of {fuel/pipe} and vehicle =2 spark {between/from /to} person comb/clothes/metal handle and, when combing hair/removing clothing/opening door = 2 lightning flash, between cloud and cloud/plane/ground, =2 ignore between plug and socket/jump leads	**(2)**

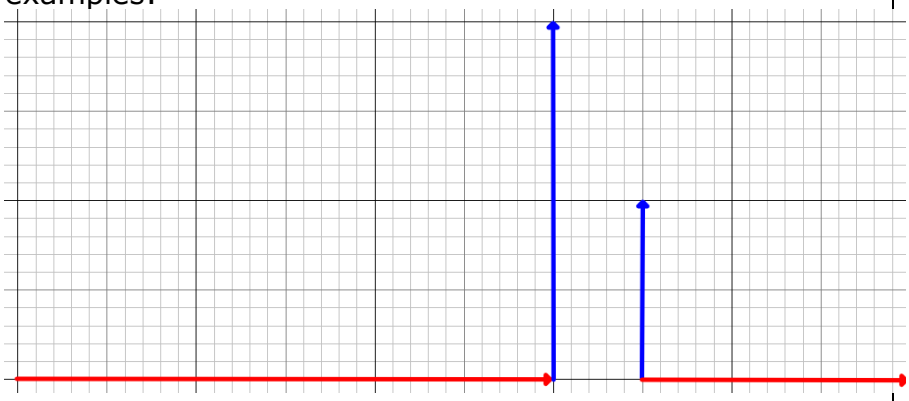
Question number	Answer	Additional guidance	Mark
4 (c)(ii)	unit conversion (1) $0.22\ \mu C = 0.22 \times 10^{-6}$ C and 2 ms $= 2 \times 10^{-3}$ s substitution (1) 0.22×10^{-6} = current x 2×10^{-3} s rearrangement (1) current = $0.22 \times 10^{-6} / 2 \times 10^{-3}$ evaluation (1) 1.1×10^{-4} (A)	substitution and re-arrangement in either order both needed award full marks for correct answer without working power of ten error only loses one mark, if the rest is correct	**(4)**

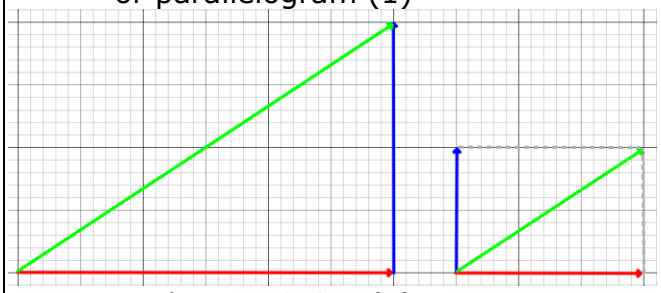
(Total for Question 4 = 11 marks)

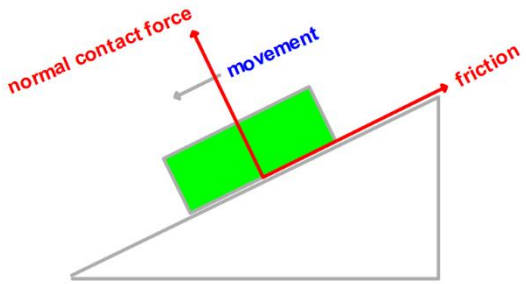
Question number	Answer	Mark
5(a)	An answer that combines points of interpretation/evaluation to provide a logical description: Use of lubrication / oil (1) To reduce friction (between parts) (1)	**(2)**

Question number	Answer	Mark
5(b)	C a javelin moves through the air after leaving an athlete's hand	**(1)**

Question number	Answer	Mark
5(c)	An explanation identifying the fact that the forces shown are acting on two different bodies / they are not acting on the same body (1)	**(1)**

Question number	Answer	Mark
5(d)(i)	• two vector arrows at rights angles representing the forces (1) • two vector arrows in proportion (1) examples: 	**(2)**

Question number	Answer	Additional guidance	Mark
5(d)(ii)	• drawing shows a completed triangle or parallelogram (1)  • Evaluation 3.6 N (1)	±0.2 N may be calculated using Pythagoras theorem	**(2)**

Question number	Answer	Additional guidance	Mark
5(e)	• An arrow showing the 'normal contact force' - from between the two surfaces, acting upwards (1) • An arrow showing the 'friction' force – from between the two surfaces (1) • Both forces in the correct directions, as shown (1) 	generally upwards / away from the surface can be to the left or to the right they do not need to start from the same point	**(3)**

(Total for Question 5 = 11 marks)

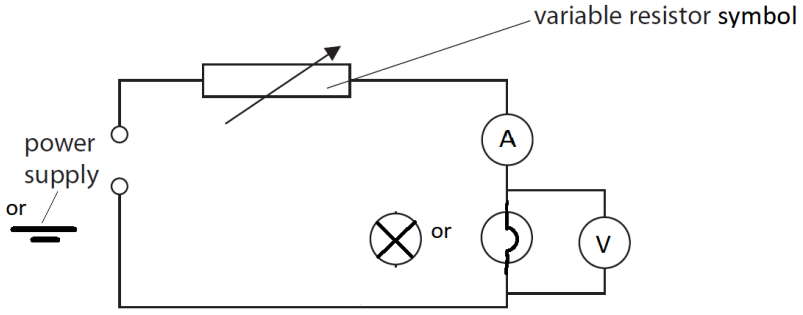
Question number	Answer	Additional guidance	Mark
6(a)(i)	Substitution: Density = mass/ volume (1) = 28 x10^{-3}/ 3.6 x 10^{-6} (1) Evaluation = 7777 kg / m^3 (1)	 (recalled / used) ignore any power of ten (pot) error here do not penalise any sf errors (7.77 etc. would get 2 marks: losing the pot mark in the evaluation)	**(3)**

Question number	Answer	Additional guidance	Mark
6(a) (ii)	(Use $\Delta Q = m \times c \times \Delta\theta$) substitution thermal energy gained = 0.028 x 510 x 80 (1) evaluation = 1100 (J) (1)	 ignore any pot error here 1142 (J)	**(2)**

Question number	Answer	Mark
6a(iii)	An explanation that combines identification – knowledge (2 marks) and reasoning / justification (1 mark) Solid state → particles vibrate (1) → about fixed positions (1) Liquid state → particles move randomly / freely (1)	**(3)**

Question number	Answer	Additional guidance	Mark
6b	An answer that combines **any four** of the following points of understanding to provide a logical description: • chooses either thermocouple or infra-red thermometer (1) • molten steel is poured into a crucible (1) • a stopwatch is started (1) • the crucible + contents are allowed to cool down (in the room) (1) • temperatures are taken at regular intervals (e.g. every minute) (1)	 any interval with steel – every 10 minutes etc.	**(4)**

(Total for Question 6 = 12 marks)

Question number	Answer	Mark
7(a)	 ammeter with correct symbol, in series with the lamp (1) voltmeter with correct symbol, in parallel with the lamp (1) valid method of changing the potential difference (1)	(3)

Question number	Answer	Mark
7(b)	P (ohmic) resistor/wire (1) Q (filament) lamp (1) R (semiconducting) diode (1)	(3)

Question number	Answer	Mark
7(c)	An answer that makes reference to: Identification – knowledge (1 mark) and reasoning / justification – knowledge (2 marks) • to begin with (there is) no current as V increases, then, after a certain voltage, the current rises • sharply / with an increasing gradient • associated with a decreasing resistance	(3)

(Total for Question 7 = 9 marks)

Question number	Answer	Mark
8(a)	**D** a microphone	(1)

Question number	Answer	Mark
8(b)	**B** keep the magnet still and move the coil to the left	(1)

Question number	Answer	Additional guidance	Mark
8(c)(i)	An explanation that combines identification via a judgment to reach a conclusion, via reasoning to include • the peaks get higher (1) • because (faster means) greater rate of change of magnetic field (1) • the width of the peaks gets less (1) • because (faster means) shorter times for magnet to travel through (coils) (1)	greater induced emf / voltage width of each wave gets less	(4)

Question number	Answer	Additional guidance	Mark
8(c)(ii)	An explanation that combines identification, via a judgment, to reach a conclusion, via reasoning, linking one from: • time involved is very short (1) • 500 ms (0.5 s) shown on graph (1) with one from • the meter could not respond quickly enough (1) • human/person could not take/record the readings quickly enough (1)	data loggers can take (lots of) readings quickly human reaction times insufficient	(2)

Question number	Answer	Additional guidance	Mark
8(d)	use of $\frac{V_P}{V_S} = \frac{N_P}{N_S}$ (1) transformation and evaluation (1) (N_s=) 25	award full marks for correct answer without working	**(2)**

(Total for Question 8 = 10 marks)

Question number	Answer	Additional guidance	Mark
9(a)(i)	Recall GPE = m x g x Δh (1) Substitution = 400 x 9.8 x 1.5 (1) Evaluation = 5900 (J) (1) (which is nearly 6000 J)	 accept 5880 (J)	**(3)**

Question number	Answer	Additional guidance	Mark
9(a)(ii)	An explanation that combines identification – knowledge (1 mark) and reasoning (1 mark) • energy is dissipated/scattered (1) • into the surroundings (1)	 energy from a loss of ball's PE / its gain in KE ends up as (kinetic) energy of molecules (of ball / wall / air)	**(2)**

Question number	Answer	Mark
9(a)(iii)	**B** velocity	**(1)**

Question number	Indicative content	Mark
9(b)	Answers will be credited according to the 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 of the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **A03 (6 marks)** • the varying height shows a varying gravitational potential energy(gpe) during the swings • when the height is a maximum the gpe is a maximum-at top of swing • when the height is a minimum the gpe is a minimum-at bottom of swing • kinetic energy varies during swing • kinetic energy maximum at bottom of swing • kinetic energy minimum at top of swing • (continuous) interchange of KE and gpe • total amount of energy is constant during one swing • over a number of swings max KE and max PE decreases • energy is dissipated/'lost' to surroundings • because of air resistance / friction • amplitude/size of swings decrease (as energy 'lost' to surroundings) ignore references to momentum	**(6)**

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Deconstructs scientific information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. • Judgements are supported by limited evidence. (AO3)
Level 2	3-4	• Deconstructs scientific information and provides some logical connections between scientific concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently. • Judgements are supported by evidence occasionally. (AO3)
Level 3	5-6	• Deconstructs scientific information and provide logical connections between scientific concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently. • Judgements are supported by evidence throughout. (AO3)

(Total for Question 9 = 12 marks)

Question number	Answer	Additional guidance	Mark
10(a)	recall and use of $P = \frac{F}{A}$ (1) evaluation (1) = 450 (Pa)	$P = \frac{0.15 \times 10}{3.3 (\times 10^{-3})}$ 454 (Pa)	**(2)**

Question number	Answer	Additional guidance	Mark
10(b) (i)	rearrange $p = \rho g h$ to give $\rho = p / (g h)$ (1) substitution using any point from graph (1) e.g. depth = 50km and pressure = 1.5 GPa $\rho = p / (g h)$ $= 1.5 \times 10^9 / (10 \times 50 \times 10^3)$ Evaluation (2) = 3000 (kg/m^3)	rearrangement and substitution in any order allow any combination from the graph and ignore 'pot' error here 'pot' error scores 2 marks maximum	**(4)**

Question number	Indicative content	Mark
10(bii)	Answers will be credited according to the 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 of the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO2 (3 marks) A03 (3 marks)** **A03 Interpretation and evaluation from the graph** Similarities: • both show increasing pressure with depth • both show a range of pressures over kilometre depths / heights Differences: • ocean water shows a linear relationship (straight line) but atmosphere gives a non-linear (curved) relationship • density of ocean water not changing with depth but density of atmosphere changes as you go higher • The pressures in the ocean recorded are much bigger (GPA compared with kPa) The depth of the ocean shown is up to 100km whereas the height of the atmosphere involved is only up to 10km **A02 Link between graph shapes and underlying physics** Similarities: • pressure is due to (increasing) weight of fluid (liquid / gas) above • more molecules above Differences: • atmosphere becomes thinner the higher you go molecules in the ocean stay (on average) the same distance apart but in the atmosphere they get further apart (on average) as you go higher up	**(6)**

Level	Mark	Descriptor
	0	• No awardable content
Level 1	1–2	• Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) • 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. (AO2)
Level 2	3–4	• Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) • 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. (AO2)
Level 3	5–6	• Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) • 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. (AO2)

(Total for Question 10 = 12 marks)

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