

Mark Scheme (Results)

Summer 2018

Pearson Edexcel International GCSE

In Physics (4PH0) Paper 1P

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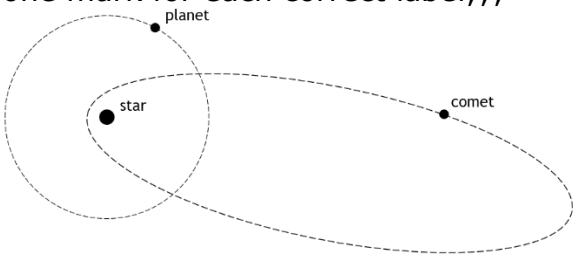
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General Marking Guidance

- 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.

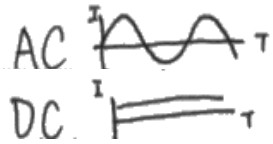
Question number	Answer	Notes	Marks
1 (a)	one mark for each correct label;;;  	allow 'Sun' for star named planet / 'Earth' for planet	3
(b)	arrow direction from moon towards Earth;	judge by eye ignore starting position of arrow	1
(c)	galaxy / universe;	accept known galaxies e.g. milky way, andromeda	1

Total for question 1 = 5 marks

Question number	Answer	Notes	Marks
2 a	1 mark for each word gravitational; kinetic; kinetic; elastic/thermal;	this order only	4
b (i)	any three from: MP1. measure an initial length; MP2. measure an extended length; MP3. extension is the difference between extended length and initial length; MP4. use of a ruler; MP5. detail to improve quality of measurements taken;	 e.g. • original length of spring • distance from bottom of spring to bench allow use of a caliper e.g. • take measurements from the same points on the spring each time • described use of a fiducial marker • placing ruler with 0 at bottom of spring	3
b (ii)	straight line of positive gradient throughout; line passes through origin;	reject curve at end of line unless straight section clearly identified as Hooke's Law region	2

Total for question 2 = 9 marks

Question number	Answer	Notes	Marks
3 (a) (i)	power = current × voltage;	allow standard symbols and rearrangements e.g. P = I x V reject C / A for current, W for power	1
(ii)	substitution OR rearrangement; evaluation to at least 2 s.f.; e.g. 1800 = I × 230 OR (I =) 1800 / 230 (I =) 7.826… (A)	must be seen bald answer with no supporting working only gets 1 mark	2
(iii)	**D** – 13 A; this is the only value above the quoted current A….. this is a common fuse value but lower than the current of 8A hence it will not work B….. this is a common fuse value but lower than the current of 8A hence it will not work C…. this is not a common fuse value and is lower than the current of 8A hence it will not work		1

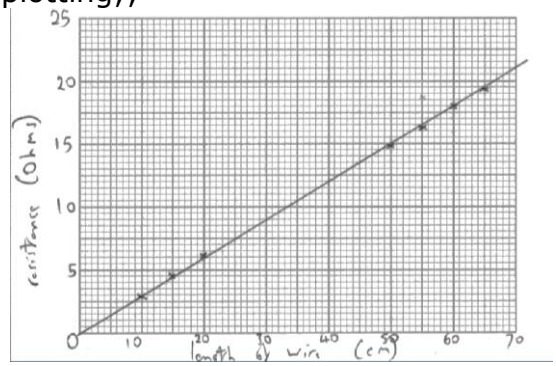
Question number	Answer	Notes	Marks
(b) (i)		allow marks if shown in labelled diagrams e.g. 	2
	idea that alternating current is (continuously) changing direction;	• allow 'current travels backwards and forwards' / 'current is positive and negative' • condone different directions	
	idea that direct current only in **one** direction / does not change direction;		
(ii)	battery / cell;	allow dynamo / suitable named cell e.g. solar panel, power bank	1

Total for question 3 = 7 marks

Question number	Answer	Notes	Marks
4	any four from: MP1. measure / find mass; MP2. using a balance; MP3. measure / find volume; MP4. using a displacement method (to find volume); MP5. a suitable experimental **precaution**; AND MP6. (formula to use density =) mass / volume;	allow marks if clear from labelled diagram allow <u>weighing</u> scale allow any correct formula for volume e.g. • object tied to thread • awareness of meniscus • measure at eye level • repeat readings • take average • zero balance • balance on horizontal surface • avoid splashing water • measure mass before volume must be this rearrangement allow symbols	5

Total for question 4 = 5 marks

Question number	Answer	Notes	Marks
5 (a) (i)	use the half cm scale / mm scale;	ignore 'more decimal places' etc. ignore all responses about quality	1
(ii)	any three from: MP1. **named** method of reducing parallax error; MP2. straighten wire; MP3. start measurement from integer on the ruler; MP4. make sure ruler is parallel to wire;	**ignore repeating /averaging** e.g. • move ruler closer to wire • place wire on ruler • use of set squares accept zero	3

Question number	Answer	Notes	Marks
(b) (i)	reference to temperature of the wire changing; (preventing) a change in resistance;	e.g. wire getting hot / melting ignore references to control variables reject incorrect physics	2
(ii)	any two from: MP1. extend the range of lengths; MP2. fill in gap in results; MP3. take repeats and average; MP4. take results at smaller intervals;	if no other MP seen, then award 1 mark for unqualified 'more lengths' allow repeat to check for anomalies	2
(iii)	scale on both axes; label on both axes with units; plotting;; 	linear scale using at least 50% of the squares ignore orientation tolerance is +/- 0.5 square -1 for each error	4
(iv)	suitable straight line of best fit passing no more than 1 square from any point;	line does not need to extend beyond plotted points	1
(v)	simple pattern statement; e.g. as length increases resistance increases additional detail; e.g. linear relationship	 ignore positive correlation (directly) proportional scores both marks	2

Length of wire in cm	Resistance in ohms
10	2.8
15	4.5
20	6.1
50	14.9
55	16.3
60	18.0
65	19.4

Total for question 5 = 15 marks

Question number	Answer	Notes	Marks
6 a	**C** – radio; this has the longest wavelength A—this has the shortest wavelength B—this has a shorter wavelength than radio D—this has a shorter wavelength than radio		1
b	any two from: MP1. (same) speed; MP2. (all) transverse (waves); MP3. (can all) travel through vacuum; MP4. (all) transfer energy;	allow 3×10^{8} m/s	2

	Answer	Notes	Marks
c	for **three** named parts of the spectrum 1 use and 1 harmful effect max. **gamma use;** • radiotherapy • sterilising medical equipment / food • (radioactive) tracers **gamma harmful effect;** • causes cancer / cell mutation **x-ray use;** • observing internal structure of the body/eq **x-ray harmful effect;** • causes cancer / cell mutation **ultraviolet use;** • fluorescent lamps • treating skin disorders • killing bacteria **ultraviolet harmful effect;** • damage to skin (cells) • blindness **visible use;** • optical fibres • photography **visible harmful effect;** • eye damage (at high intensity) **infrared use;** • short range communication e.g. remote controls • heaters • night vision equipment **infrared harmful effect;** • burns skin/tissue **microwave use;** • cooking • satellite communications **microwave harmful effect;** • internal heating of body tissue **radio use;** • communications;	 allow treating cancer damage is not sufficient kills cells damage is not sufficient allow tanning, security allow sunburn, skin cancer allow cataracts ignore sunburn ignore 'damage' allow internal burns	6

Total for question 6 = 9 marks

Question number	Answer	Notes	Marks
7 a (i)	acceleration = <u>change</u> in velocity / time (taken);	allow standard symbols and rearrangements e.g. a = (v-u)/t	1
(ii)	substitution; evaluation; unit; e.g. (acceleration =) 6.1 (-0) / 0.62 (acceleration =) 9.8 m/s^2	 allow 10, 9.8387…	3
(iii)	gradient;	allow slope	1
(iv)	height = area under the line; use of ½ x base x height; evaluation; e.g. height = area under the line; (height =) 0.5 x 6.1 x 0.62 (height =) 1.9 (m)	seen explicitly or implied by working allow alternative methods leading to correct answer for 3 marks allow range of 1.88-1.92	3
b	any five from: MP1. weight / downward force (acts on the ball); MP2. so it accelerates; MP3. there is drag (acting upwards); MP4. drag increases with velocity/speed; MP5. idea that eventually drag = weight; MP6. (hence) resultant force is zero; MP7. ball falls at a constant velocity/speed OR ball has zero acceleration;	 allow 'gravity pulls it down' the velocity/speed increases air resistance / air friction allow 'forces are equal/balanced' allow 'reaches terminal velocity'	5

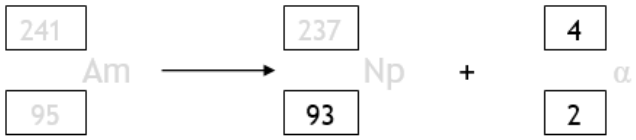
Total for question 7 = 13 marks

Question number	Answer	Notes	Marks
8 a (i)	correctly drawn thermistor symbol; e.g. 	line through the symbol must be diagonal and 'ice hockey stick' shaped but can be in any orientation	1
(ii)	correct symbol for a voltmeter connected in parallel with any component; component is the lamp;	DOP	2
b (i)	voltage = current × resistance;	allow rearrangements and standard symbols e.g. V = I × R	1
(ii)	dimensionally correct substitution; rearrangement; evaluation; e.g. 5.6 = 0.79 × R (R =) 5.6/0.79 (R =) 7.1 (Ω)	-1 for POT error (not converting mA to A) allow 7 (Ω), 7.09 (Ω), 7.089 (Ω), 7.0886…(Ω) 7.08 (Ω) gets 2 marks only	3
c	brightness increases; and any **two** from: • (because) thermistor resistance decreases; • (therefore) current increases; • (therefore) voltage of lamp increases;	ignore references to power	3
d	(current) decreases / eq;	condone idea of current halving	1

Total for question 8 = 11 marks

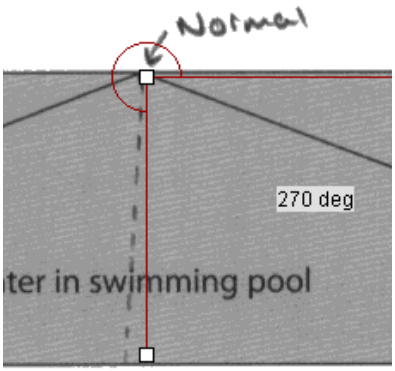
Question number	Answer	Notes	Marks
9 a	**D**; this is the only correct pattern, arrows in correct direction with repulsion shown A—this is the pattern for N to S B—this is the pattern for S to N C—this is the pattern for S to S		1
b (i)	straight AND parallel lines drawn; lines are evenly spaced; arrows are pointing downward;	ignore lines drawn outside region enclosed by magnets and existing field lines allow if communicated in writing if not clear from drawing arrows do not need to be on all lines but conflicting arrows negates the mark	3
(ii)	lines should be closer together / OWTTE;	ignore any described changes to the apparatus e.g. moving magnets closer together ignore unqualified 'draw more lines'	1

Total for question 9 = 5 marks

Question number	Answer	Notes	Marks
10 (a) (i)	**A** – 95; this is the number of protons B—this is the number of neutrons C—this is the atomic mass D—this is the sum of atomic mass and the no of neutrons		1
(ii)	**B** – 146; this is the number of neutrons A—this is the number of protons C—this is the atomic mass D—this is the sum of atomic mass and the no of neutrons		1
(iii)	**A** – 95; there are as many electrons as protons B—this is the number of neutrons C—this is the atomic mass D—this is the sum of atomic mass and the no of neutrons		1
(b)	1 mark for each correct;;; 		3
(c)	number of neutrons does not change / eq; number of protons does not change / eq;	award both marks for 'nothing changes' / 'it stays the same'	2
(d)	MP1. smoke **absorbs** alpha (particles); MP2. {less/no} alpha particles reach the detector;	allow alpha **cannot penetrate** smoke allow not as many alpha particles are detected ignore 'count rate falls' as this is in the stem	2

Question number	Answer	Notes	Marks
(e) (i)	time (taken); and EITHER of: • for (radio)activity to **halve**; • for **half** the (radioactive) nuclei / atoms / isotope to decay;	allow how long it takes reject 'half the time' allow count rate for activity ignore • element • substance reject: • particles • molecules • 'break down' • 'reactivity' • a nucleus / an atom • halve in mass • to completely/fully decay	2
(ii)	any three from: MP1. beta would penetrate casing; MP2. beta would not be absorbed by smoke; MP3. {source/smoke alarm} would need replacing frequently; MP4. idea that alarm would trigger due to naturally decreasing count rate;	allow idea that beta could be hazardous to health allow beta can penetrate smoke allow the source would not last long	3

Total for question 10 = 15 marks

Question number	Answer	Notes	Marks
11	PLEASE NOTE THE DIAGRAM IS THE SECOND MP		
(a) (i)	total internal reflection;	allow TIR	1
(ii)	line drawn perpendicular to surface where ray meets it;	judge by eye line can be either solid or dashed this diagram shows out of tolerance  	1
(iii)	70 (°);	allow range of 67-73 (°)	1
(iv)	same angle as given in (a)(iii);		1
(b) (i)	line drawn passing through the surface; line bends away from the normal above the surface;	arrow not required, normal not required	2
(ii)	refraction;		1

Question number	Answer	Notes	Marks
(c) (i)	sin(c) = 1 / n	allow rearrangements	1
(ii)	substitution into correct equation; rearrangement and evaluation; final correct answer given to 3 s.f.; e.g. (sin(c) =) $\frac{1}{1.33}$ c = 48.753… c = 48.8 (°)	 mark independently allow 0.75187… if correct equation seen anywhere	3
(iii)	MP1. relationship between angle of incidence and critical angle stated consistently with answer to (c)(ii); e.g. i > c MP2. conclusion consistent with value of c found in (c)(ii); e.g. (if (c)(ii) < 52° then) reflection	 (if (c)(ii) > 52° then) refraction	2

Total for question 11 = 13 marks

Question number	Answer	Notes	Marks
12 a	oil / (natural) gas / petrol / diesel / uranium / plutonium;	allow methane for natural gas ignore as insufficiently specific: fossil fuel(s) nuclear	1
b	any three from: MP1. increase in {(average) speed / <u>kinetic</u> energy} of particles (due to higher temp); MP2. particles collide with wall **more often**; MP3. particles collide with wall with **more force**; MP4. pressure is force on an area;	 allow alternatives for particles e.g. molecules allow 'hit harder' allow greater change of momentum award **only** if MP2 or MP3 seen allow symbol equation p = F / A	3
c (i)	pressure = force / area;	allow standard symbols and rearrangements e.g. p = F / A	1
(ii)	substitution; rearrangement; evaluation; e.g. 1.45 x 10^6 = force / 0.0243 (force =) 1.45 $\times$ 10^6 $\times$ 0.0243 (force =) 3.52 $\times$ 10^4 (N)	 -1 for POT error (e.g. incorrect conversion of MPa to Pa) allow 35 235 (N) 0.035235 scores 2 marks	3

Question number	Answer	Notes	Marks
d (i)	thermal / sound;	condone heat	1
(ii)	efficiency equation seen or implied; measurement of useful energy output; measurement of total energy input; evaluation; e.g. efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$ useful energy = 9 (mm) or 0.9 (cm) input energy = 62 (mm) or 6.2 (cm) efficiency = 0.15	allow if seen anywhere allow if seen on diagram allow if seen on diagram allow 8-10 (mm) allow 61-63 (mm) allow 0.14 – 0.15 allow if given as % e.g. 14% - 15%	4

Total for question 12 = 13 marks

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