PEARSON Edexcel

Mark Scheme (Results)

January 2019

Pearson Edexcel International GCSE

In Physics (4PH0) Paper 1P

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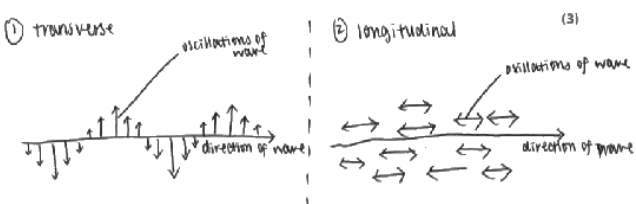
General Marking Guidance

- 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)	(i)	B (1.0 m);		1
			A is incorrect because it is only half the wavelength C is incorrect because it is 1.5 wavelengths D is incorrect because it is 2 wavelengths		
		(ii)	C (4 cm);		1
			A is incorrect because it is a quarter of the amplitude B is incorrect because it is half of the amplitude D is incorrect because it is double the amplitude		
	(b)		vibrations / oscillations / disturbance; (are) parallel or perpendicular to direction of energy transfer / wave (travel/movement); correct identification of <u>both</u> types; e.g. gets 3 marks	allow suitably labelled diagrams	3
	(c)		any two from: MP1. speed (in vacuo); MP2. idea that they don't need a medium to propagate; MP3. can all be reflected / refracted / diffracted; MP4. all carry energy / information;	allow quoted speed 3.0×10^8 m/s allow can travel through vacuum apply positive marking, not list marking	2

(d)	(i)	A (gamma rays); B is incorrect because infrared is not ionising enough C is incorrect because microwave is not ionising enough D is incorrect because radio is not ionising enough		1
	(ii)	D (visible light); A is incorrect because microwave is not visible to humans B is incorrect because radio is not visible to humans C is incorrect because ultraviolet is not visible to humans		1

	(iii)	any two from:
		  MP1. idea that x-rays are ionising / cause cell damage;
		
		  MP2. idea that risk increases with greater exposure;
		
		  MP3. idea that exposure reduced by increasing distance away;
			allow x-rays dangerous to health cause cancer
			
			unqualified "dangerous"/"harmful" is insufficient
			allow "to avoid excessive exposure"
			allow exposure reduced by shielding of walls
				2

Total for question 1 = 11 marks

Question number			Answer	Notes	Marks
2	(a)	(i)	C; A is incorrect because it is a thermistor B is incorrect because it is a fixed resistor D is incorrect because it is a variable resistor		1
		(ii)	B; A is incorrect because it is a thermistor C is incorrect because it is a LDR D is incorrect because it is a variable resistor		1
	(b)	(i)	power = current × voltage;	allow rearrangements and standard symbols e.g. P = I × V	1
		(ii)	substitution OR rearrangement; evaluation to 2 or more s.f.; e.g. 2200 = current × 230 OR current = power/voltage (current =) 9.6 (A)	9.565... OR 9.57 condone rounding to 9.5 or 9.56	2
		(iii)	D (13 A); A is incorrect because this fuse would blow in normal operation B is incorrect because this fuse would blow in normal operation C is incorrect because this fuse would blow in normal operation		1
		(iv)	any two from: fuse (wire) melts / eq.; circuit is broken; preventing heater from overheating;	condone 'fuse blows' allow current is cut off / eq.	2

Total for question 2 = 8 marks

Question number	Answer	Notes	Marks
3 (a)	both poles the same; both poles labelled as north / N;;	ignore additional poles labelled near dashed lines	2
(b)	any suitable method, e.g. place plotting compass {near magnet(s) / in magnetic field}/ use of iron filings; move compass to different position (and repeat) / tap paper gently (to reveal shape); compass gives direction of field;	allow suitably clear diagrams allow steel dust, iron powder for iron filings filings must be suitably qualified allow using multiple compasses must be clear	3

Total for question 3 = 5 marks

Question number			Answer	Notes	Marks
4	(a)	(i)	pressure = force ÷ area;	allow rearrangements and standard symbols e.g. p = F ÷ A	1
		(ii)	calculation of total weight; substitution and rearrangement; evaluation; e.g. 0.432 (= 0.072 x 6) (area =) 0.432 / 820 (area =) 0.000 53 (m^2)	 (0.072 x 6) / 820 0.000 52683 (m^2) 5.2683×10^{-4} (m^2) allow 0.0005 (m^2) 0.000 0878 (m^2) gains 2 marks POT error loses a mark	3
	(b)	(i)	pressure decreases; (because) area (in contact with table) increases / weight (over the same area) decreases;	accept quantitative method	2
		(ii)	density remains constant; (because) mass of squares AND volume of squares is the same;	density not affected allow because the material is the same	2

Total for question 4 = 8 marks

Question number			Answer	Notes	Marks
5	(a)	(i)	substitution into E = V × I × t; rearrangement; correct evaluation to 2 s.f.; e.g. 25 = 4.5 x 0.65 x time (time =) 25 / (4.5 x 0.65) (time =) 8.5 (s)	no mark for formula alone as given in paper correct answers not given to 2 s.f. gain 2 marks only e.g. 9 (s), 8.55 (s), 8.547... (s) etc.	3
		(ii)	GPE = mass × g × height;	allow rearrangements and standard symbols e.g. GPE = m × g × h	1
		(iii)	substitution; rearrangement; evaluation; e.g. 5.0 = 0.780 x 10 x height (height =) 5.0 / (0.780 x 10) (height =) 0.64 (m)	answer of 0.000 64 (m) gains 2 marks only allow 0.641... (m) allow use of g = 9.81 giving 0.65 (m)	3
		(iv)	any two from: MP1. energy transferred (to surroundings) as heat / sound; MP2. mass also has KE; MP3. mass of string has been ignored / eq.; MP4. motor not 100% efficient;	condone energy wasted as heat/sound energy lost to wires/winding in motor	2
	(b)		any four from: MP1. current in <u>coil</u>; MP2. (creates) magnetic field around wires / coil; MP3. interaction between this field and field of magnets; MP4. (produces) a force on the wires / coil; MP5. forces on opposite sides of the coil are in opposite directions;	check diagram for force arrows allow coil becoming electromagnet can be shown on the diagram	4

		MP6. idea that direction of current reverses (every half turn);	allow commutator switches current around	

Total for question 5 = 13 marks

Question number		Answer	Notes	Marks
6	(a)	use of stopwatch / stop clock; start timing when released and stop timing when parachute hits the floor;	allow use of datalogger condone timer	2
	(b)	independent = mass (of parachute); dependent = time (taken for fall);		2
	(c)	any one from: (constant) height; still air / no wind; release from rest; same area of parachute / same parachute;	however expressed	1
	(d) (i)	correct average; given to 2 decimal places; e.g. 0.87666… 0.88	mark independently	2
	(ii)	suitable linear scale chosen (>50% of grid used); axes labelled with quantities and unit; plotting correct to nearest half square (minus one for each plotting error) ;; 	ignore orientation **ignore final point** i.e. two plotting errors = no marks for plotting | mass in g	average time taken in s
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20	1.68
40	1.26
60	1.11
80	0.99
100	0.93
120	0.88		4

	(iii)	acceptable curve of best fit drawn;		i.e. smooth curve with even distribution of points either side allow ecf from plotting errors ignore parts of curve outside plotted points if extrapolated	1
(e)	(i)	down arrow labelled weight; up arrow labelled air resistance / drag;		allow gravitational force ignore 'gravity' allow friction ignore lift, upthrust	2
	(ii)	any three from: MP1. idea of unbalanced force at the start (which causes acceleration); MP2. air resistance increases with speed; MP3. idea of forces become balanced; MP4. (therefore) no resultant force (near the bottom);		e.g. only weight is acting e.g. weight is equal to air resistance	3

Total for question 6 = 17 marks

Question number	Answer	Notes	Marks
7	any five from: MP1. determine / measure distance; MP2. determine / measure time; MP3. appropriate measuring instrument for distance OR time; MP4. use a suitable distance / count laps (of known length); MP5. repeat experiment and calculate average; MP6. use of speed = distance ÷ time; MP7. suitable experimental precaution e.g. reaction time considered, time from and to predetermined points;	allow idea of measuring diameter/radius and calculating distance ignore 'human error' allow mark a start/finish point	5

Total for question 7 = 5 marks

Question number			Answer	Notes	Marks
8	(a)	(i)	(unbalanced) force = mass × acceleration;	allow rearrangements and standard symbols e.g. F = m × a	1
		(ii)	substitution OR rearrangement; evaluation; e.g. 49 = 45 × a OR a = F / m (a =) 1.1 (m/s^2)	 allow 1.088… (m/s^2) reject 1.08 (m/s^2)	2
		(iii)	any suitable suggestion; e.g. friction between snow / ground and sledge ground is not level towing rope / direction at an angle to the ground / direction of movement	 allow air resistance, drag	1
	(b)	(i)	acceleration = <u>change</u> in velocity ÷ time (taken);	allow rearrangements and standard symbols e.g. a = Δv ÷ t a = v-u ÷ t	1
		(ii)	substitution AND rearrangement; evaluation to at least 2s.f.; e.g. v = 1.3 × 2.4 (+ 0) (v =) 3.1 (m/s)	v = a × t allow 3.12 (m/s)	2
	(c)	(i)	<u>area</u> under the line / graph;		1

		(ii)	any three from:
			  MP1. (constant) acceleration between 0 and A;
			  MP2. constant velocity between A and B;
			  MP3. constant deceleration / negative acceleration between B and C;
			  MP4. deceleration is less than acceleration;
				
				allow no acceleration
					3

Total for question 8 = 11 marks

Question number			Answer	Notes	Marks
9	(a)		Geiger-muller tube;	allow GM tube spark counter geiger counter	1
	(b)	(i)	any two from: MP1. rocks / buildings / radon gas; MP2. cosmic rays / (radiation from) the Sun; MP3. medical sources; MP4. nuclear waste / accidents; MP5. some foods e.g. coffee, bananas etc.;		2
		(ii)	any three from: MP1. remove the radioactive source; MP2. measure background count; MP3. repeat the measurement and calculate average; MP4. idea of scaling background count to same time as count measurement; MP5. subtract background count from the non-corrected measurement;	allow background count taken for 20 minute period	3
	(c)		number of neutrons decreases by one; number of protons increases by one;	condone atomic number for protons 'neutron becomes a proton' gains both marks 'atomic number increases by 1, mass number stays the same' gains both marks allow for one mark if no other scored for the idea that the nucleus becomes a different element	2
	(d)		any two from: MP1. reduce exposure time; MP2. handle with tongs / at a distance;	allow keeping in lead container when not in use	2

| | | MP3. use shielding; | allow use of gloves, mask etc. | |
| | | MP4. wear a film badge / monitor; MP5. not pointing source at anyone; | | |

Total for question 9 = 10 marks
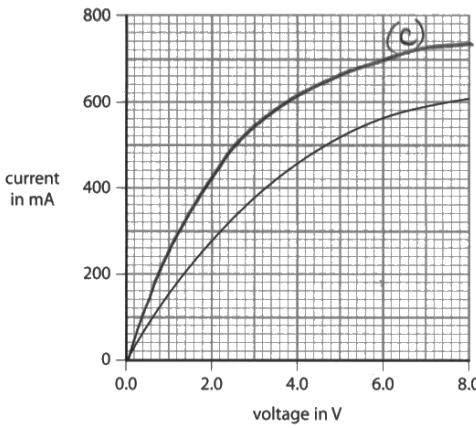
Question number	Answer	Notes	Marks
10 (a)	particles collide with **walls** (of can); idea that force is produced (by bombarding particles); pressure is force on an area;	allow bombard, hit, impact upon allow Newton's Laws / momentum argument allow p = F / A ignore ideas of particles closer to each other	3
(b)	MP1 pressure increases; any two from MP2 to MP4 MP2. increase in {(average) speed / <u>kinetic energy</u>} of particles (due to higher temp); MP3. particles collide with wall **more often**; MP4. particles collide with wall with **more force**;	allow alternatives for particles e.g. molecules allow 'hit harder' allow greater change of momentum	3
(c)	substitution into $p_1V_1 = p_2V_2$; rearrangement; evaluation; e.g. $p_1 \times 8500 = 100 \times 43000$ $(p_1 =) (100 \times 43000) / 8500$ $(p_1 =) 510$ (kPa)	no mark for equation as given in paper -1 for POT error allow 505.88...	3

Total for question 10 = 9 marks

Question number			Answer	Notes	Marks
11	(a)	(i)	any two from: MP1. optical fibres for communication; MP2. endoscopes; MP3. optical fibres in decorative lamps etc.; MP4. safety reflector; MP5. prism in {binoculars / camera / periscope / rangefinder};	allow 1 mark for unqualified "optical fibres" in the absence of any other marks e.g. bicycle/car reflector, cat's eye	2
		(ii)	idea that light travels from more (optically) dense medium to less (optically) dense medium; incident angle greater than critical angle;	allow if expressed in terms of refractive index allow "has to go from glass to air" / eq.	2
	(b)	(i)	normal line drawn correctly by eye where light ray meets flat surface at A;		1
		(ii)	angle measured in the range 24-30°;	allow ecf from incorrect normal	1
		(iii)	ray emerges from block at position A; refracting correctly away from normal;		2
		(iv)	sin(c) = 1 ÷ n;	allow rearrangements and word equations	1
		(v)	substitution AND rearrangement; evaluation; e.g. n = 1 ÷ sin(40°) (n =) 1.6	allow 1.557...	2

Total for question 11 = 11 marks

Question number	Answer	Notes	Marks
12 (a)	series circuit containing lamp and some form of power supply; ammeter in series with lamp; voltmeter in parallel with lamp; some method of varying the voltage across the lamp;	allow any recognisable symbol allow any recognisable symbol e.g. variable power supply, variable resistor in series, potentiometer circuit etc.	4
(b) (i)	one correctly read pair of values from the graph; one correct value for resistance calculated; second correct value for resistance calculated; resistance increases (as voltage increases);	penalise failure to convert mA to A once only	4
(ii)	increasing voltage increases the current; (causing) greater (rate of) electron collisions; (causing) increase in temperature;		3
(c)	similar shape curve drawn so that all parts are above the existing line;		1

Total for question 12 = 12 marks