Mark Scheme (Results)

Summer 2021

Pearson Edexcel International GCSE

In Physics (4PH1) Paper 2P

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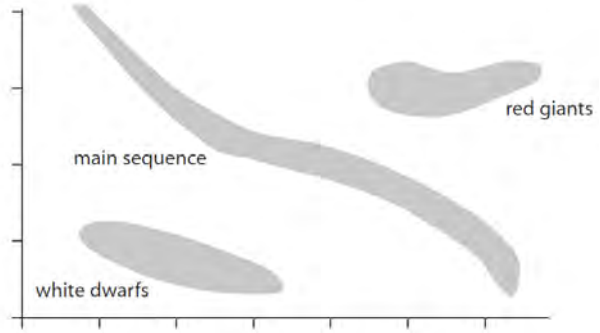
General Marking Guidance

- 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 – main sequence stars; A is not correct as black holes do not appear on the HR diagram C is not correct as neutron stars are not part of the main sequence. D is not correct as protostars are not part of the main sequence		1
(ii)	bottom left area of the HR diagram;	unlabelled scores 0	1
(iii)	top right hand area of HR diagram;  	unlabelled scores 0	1
(iv)	a measure of brightness/luminosity; idea that a star would be at a standard distance (10 parsecs/32(.6) light years);	accept power ignore lack of or incorrect value for distance	2
(b) (i)	C – ultraviolet; A is not correct as microwaves cause internal heating B is not correct as radio waves do not give skin burns D is not correct as visible light cannot harm skin cells.		1
(ii)	A – sunbathing; B, C and D are not correct as all reduce the absorption of UV by skin.		1

Total for Question 1: 7 marks

Question number	Answer	Notes	Marks
2 (a)	300 (metres);		1
(b)	0.554; any answer given to 2 sf; correct answer = 0.55 (s) e.g. (0.50+0.62+0.52+0.58+0.55)/5 = 0.554 (s) = 0.55 (s) to 2 s.f.	mark independently	2
(c)	difference in distance is 180 m; recall of equation: speed = distance / time taken; substitution; correct evaluation; correct answer = 330 (m/s) e.g. speed = (300 – 120)/0.55 speed = 180/0.55 speed = 327.2727… (m/s)	 allow use of standard symbols e.g. v = d/t condone s for v, s for d ECF incorrect distance and ECF incorrect time from (b) answer is 327.2727… (m/s) answer is 324.90… (m/s) if 0.554(s) is used	4
(d)	human reaction time;	 accept alternative valid variables e.g. wind speed, temperature, humidity, air pressure	1

Total for Question 2: 8 marks

Question number	Answer	Notes	Marks
3 (a)	insulator;	Allow 'non/not conductive'	1
(b)	any reference to electron transfer; loss (of electrons);	 idea of 'loss of electrons (from tube)' scores 2. reject any reference to movement of positive charges	2
(c)	electrons move through wire; as they are attracted by or to the metal mast; idea that this makes metal mast neutral (again);	 allow idea of 'opposite charges attracting' allow idea of 'to earth/earthing the mast' if no other mark scored	3
(d)	recall of equation energy = charge × voltage; substitution or re-arrangement; evaluation; correct answer = 860 (V) e.g. energy = charge × voltage voltage = energy/charge = 3.7/0.0043 voltage = 860.465… (V) voltage = 860 (V)	allow use of standard symbols e.g. E = Q × V reject C,c for charge -1 for PoT error	3
(e)	spark/discharge; damage/harm/injury/electrocution (of engineer);		2

Total for Question 3: 11 marks

Question number	Answer	Notes	Marks
4 (a) (i)	recall of equation: speed = frequency × wavelength; substitution or re-arrangement; correct evaluation; correct answer = 0.013 (m) e.g. speed = frequency × wavelength wavelength = speed ÷ frequency wavelength = 330 ÷ 25000 wavelength = 0.0132… (m)	allow use of standard symbols e.g. $v = f \times \lambda$ condone s for speed reject w for wavelength answer to 3sf is 0.0132 (m)	3
(ii)	amplitude corresponds to 2 squares; 2 squares gives 10 V for amplitude;	ecf incorrect number of squares for amplitude e.g. 4 squares giving 20V scores 1 mark	2
(b) (i)	field lines outside of coil appear to loop from end to end; arrow directions self-consistent; no overlapping field lines;	allow field lines approximately uniform through solenoid condone incorrect poles	3
(ii)	any THREE from: MP1. idea of force on coil from magnet; MP2. idea of alternating force on card; MP3. card vibrates; MP4. idea that card forces air to vibrate; MP5. longitudinal wave formed;	 allow idea of interaction between fields of bar magnet and coil allow idea of series of compressions and rarefactions	3
(iii)	idea that 25 kHz is outside the range of human hearing; upper limit of human hearing is 20 kHz;	 ignore reference to 20Hz or lower limit	2
(iv)	increase current (amplitude)/ increase strength of (bar) magnet/ increase number of turns on coil;	allow increase density of turns on coil condone change card for a different material allow change size or shape of card allow moving magnet closer to the coil allow higher order answers in terms of resonance	1

Total for Question 4: 14 marks

Question number	Answer	Notes	Marks
5 (a)	Any FIVE from: MP1. measure current and voltage to work out power; MP2. use ammeter and voltmeter; MP3. measure temperature increase AND time taken; MP4. find total energy (E = Pt or E = VIt); MP5. measure mass of substance; MP6. use a balance; MP7. rearrange to give c = E / m Δθ; MP8. plot a temperature-time graph; MP9. use gradient (so c = P/(m × gradient));	accept 'known power' accept 'power meter' or 'joulemeter' accept idea of 'known voltage' accept measure initial and final temperature for temp increase accept idea of waiting for highest temperature after power switched off accept 'use a stopwatch' for time taken	5
(b) (i)	34 (°C);		1
(ii)	any TWO from: MP1. bonds between particles are weakened or broken; MP2. particles go from regular to irregularly packed/EQ; MP3. particles go from vibrating (about a fixed position) to sliding past each other / EQ;	allow particles get (slightly) further apart /EQ ignore references to KE	2
(iii)	reference to different temperature changes in the same time; different specific heat capacities/EQ;	accept recognition that the states are different condone incorrect SHC comparisons between phases	2

Total for Question 5: 10 marks

Question number	Answer	Notes	Marks
6 (a)	creation of a (large) nucleus from small **nuclei**; resulting in a loss of mass; and the release of energy;	condone "fusing of two nuclei" accept reference to $E=mc^2$ condone "converted to energy"	3
(b) (i)	electrical working;	condone 'electrically'	1
(ii)	substitution in $V_{in}I_{in} = V_{out}I_{out}$; re-arrangement; evaluation; correct answer = 1.8 (kA) e.g. input power = output power $V_{in}I_{in} = V_{out}I_{out}$ $28 \times 21 = 330 \times I_{out}$ $I_{out} = (28 \times 21) \div 330$ I_{out} =1.7818...	-1 POT error	3

Total for Question 6: 7 marks

Question number	Answer	Notes	Marks
7 (a)	correct substitution KE = ½ (mass) × (speed)^2; re-arrangement to give v; evaluation to show 5.8(4…) (m/s); e.g. KE = ½ m v^2 0.29 = 0.5 × 0.017 × v^2 v^2 = 0.29 ÷ (0.5 × 0.017) = 34.1176471.. v = √34.1176471 = 5.8(4…) (m/s)	allow use of standard symbols e.g. KE = ½ m v^2 allow mass = 17 at this point	3
(b)	idea of conservation of momentum; idea that momentum before release was zero; evidence of re-arrangement; evaluation of large block speed giving 1.3 m/s; e.g. momentum of small block = 17 × 6 = 102 g m/s therefore momentum of large block = 102 g m/s momentum = mass × velocity = 75 v so v = 102/75 = 1.36 m/s	however expressed allow idea that momenta of two blocks is equal in magnitude allow 1.4 if v_{small} = 6 m/s ignore mass unit provided both masses consistent v=1.31 if v_{small} = 5.8 m/s v=1.32 if v_{small} = 5.84 m/s	4
(c)	substitution into given equation; idea of initial momentum = 0; evaluation; correct answer = 0.93 (N) e.g. force = change in momentum ÷ time taken force = ((0.017 × 6) – 0) ÷ 0.11 force = 0.102 ÷ 0.11 force = 0.9272… (N)	 allow use of init velocity = 0	3
(d)	substitution and re-arrangement of given equation; conversion of 17.6 cm to 0.176 m; evaluation; correct answer = 0.18(41…) (s) e.g. orbital speed=(2π × orbital radius)÷time period 6 = (2π × 0.176)÷T T = (2π × 0.176) ÷ 6 T = 0.1843… (s)	 accept 0.2 (s) accept use of v=5.84…(m/s) -1 POT error 0.092.. (s) for using 17.6 cm as a diameter scores 2 marks	3

Total for Question 7: 13 marks