Pearson Edexcel

Mark Scheme (Results)

January 2023

Pearson Edexcel International GCSE
In Physics (4PH1)
Paper 2P

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

January 2023
Question Paper Log Number P71898A
Publications Code 4PH1_2P_MS_2301

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	electrons; negative; positive; electrons; attract;	accept recognisable spellings	5

Total for Question 1 = 5 marks

Question number	Answer	Notes	Marks
2 (a)	particles in a solid have a regular arrangement; particles in a liquid have an irregular arrangement; particles in both are closely packed;	ignore references to motion all marks can be given from clear, titled diagrams	3
(b)	particles **vibrate** (about fixed positions) in a solid; idea that particles move around in a liquid/eq;	e.g. "particles slide over each other"/"particles flow"	2
(c)	evaluation of temperature change; substitution into $\Delta Q = m \times c \times \Delta T$; evaluation; e.g. $\Delta T = (21 - 3) = 18$ (°C) $\Delta Q = 0.016 \times 4200 \times 18$ (ΔQ =) 1200 (J)	allow ecf from incorrect ΔT or use of 3, 21 or 24 -1 for POT error allow 1210, 1209.6 condone 1209 200, 201.6 scores 2 1400, 1411 scores 2 1600, 1613 scores 2	3

Total for question 2 = 8 marks

Question number	Answer	Notes	Marks
3 (a)	daughter nuclei / named nuclei e.g. krypton or barium/ neutron(s);	reject daughter cells condone nucleus ignore atom reject uranium allow gamma (radiation)	1
(b)	any two from: MP1. radioactive waste; MP2. uranium is radioactive; MP3. non-renewable; MP4. risk of nuclear accident/eq; MP5. higher {setup / decommissioning} cost;	 allow radiation can cause cancer/mutate {cells/DNA} accept long term storage argument allow named event e.g. Chernobyl, Fukushima ignore unqualified "high cost" argument	2
(c) (i)	rate of {energy transfer/doing work};	allow energy transferred per {unit time / second} reject energy transferred **in** a unit time reject P=current × voltage	1
(ii)	substitution into P = W / t; rearrangement; evaluation; e.g. $7.49 \times 10^9 = 6.47 \times 10^{14} / t$ $t = 6.47 \times 10^{14} / 7.49 \times 10^9$ (t =) 86 400 (s)	 -1 for POT error allow 86000, 86382, 86381.8…	3

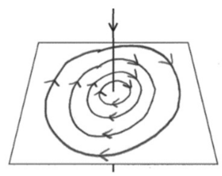
Total for question 3 = 7 marks

Question number	Answer	Notes	Marks
4 (a)	IV = temperature (of ball); DV = height (of bounce);	condone 'T' allow vertical distance condone 'h'	2
(b)	measurement from floor to <u>bottom</u> of ball; correct use of scale; e.g. distance = 6.2 (cm) distance = (6.2 × 4 =) 24.8 (cm)	accept range 6.1-6.3 (cm) accept range 24.4-25.2 (cm) ECF candidate's value for measurement. 25.6-30.0 (cm) scores 1 mark	2
(c)	six marks as distributed: **apparatus (2 marks max.)** MP1. ruler / tape measure; MP2. idea of water bath (and thermometer); **measurements (2 marks max.)** MP3. range of temperatures; MP4. height of the ball's (first) bounce; MP5. height measured at eye level; MP6. repeats taken **at each temperature** and mean found; **control variables (2 marks max.)** MP7. height ball is dropped from; MP8. surface the ball bounces on; MP9. condition of drop; MP10. idea of using multiple copies of the same ball;	marks can be awarded if clear from diagram allow use of heated beaker and water with thermometer reject idea of heating ball directly with a Bunsen burner allow other methods of direct heating must be clear that different temperatures are tested allow reduce parallax error allow use of phone/video camera AND idea of freeze frame or ruler in shot i.e. non-human dropping mechanism or checking that ball is dropped from rest	6

Total for Question 4 = 10 marks

Question number			Answer	Notes	Marks
5	(a)	(i)	moment = force × (perpendicular) distance;	allow standard symbols and rearrangements allow d or s for distance condone m, M for moment	1
		(ii)	correct calculation of or substitution for moment of block's weight; use of principle of moments; evaluation of force F; e.g. (moment of weight = 260 × 0.25 =) 65 (Nm) 65 = force F × 0.80 force F = 81 (N)	 stated or implied POT -1 allow 6500 (Ncm) allow 81.25 (N) 118(.2) (N) scores 2	3
		(iii)	force F increases; with any two from: • distance from support A increases / distance from support B decreases; • clockwise moment / moment of weight increases; • anti-clockwise moment / moment of force F increases (to keep balance);	 ignore 'moves closer to B'	3
	(b)	(i)	**one** vertical downwards arrow drawn; arrow starts at centre of gravity;	ignore label DOP	2
		(ii)	any two from: MP1. tension force is upwards; MP2. tension force is same magnitude as weight / eq; MP3. idea of no resultant force / acceleration;	 allow forces balance allow forces cancel out	2
		(iii)	any two from: MP1. forces are acting on the same body; MP2. idea that forces are not the same type / origin; MP3. correct example of Newton's third law pair;	 e.g. weight of block is balanced by gravitational force of block on Earth	2
1					

Total for Question 5 = 13 marks

Question number			Answer	Notes	Marks
6	(a)	(i)	single circle centred on the wire and parallel to the plane of the card; at least two concentric circles in the same plane; clockwise direction arrow marked on at least one line; e.g. 	allow gap where circle crosses wire circles do not have to stay within the card DOP by eye ignore spacing reject if contradicting arrows	3
		(ii)	EITHER: MP1. iron filings (used); MP2. tap card / eq.; OR MP1. (plotting) compass (used); MP2. multiple compasses **used** / compass moved to new position;	ignore references to magnets, other current-carrying wires being used allow iron powder, steel dust etc. allow use of a magnetometer condone correct use of right-hand grip rule for 1 mark if no other mark scored	2
	(b)		any three from: MP1. (both) wire(s) have magnetic fields around them; MP2. each wire has a current in a magnetic field; MP3. each wire experiences a force; MP4. forces are same size but in opposite directions; **OR** MP1. RH grip rule indicates relationship between current and field for one of the wires; MP2. LH rule indicates relationship between field from one wire, current in other wire and force on second wire; MP3. combination of these two will give force on second wire towards first wire;	ignore references to poles reject reference to opposite charge for MP2 allow 'fields interact' allow 'wires attract each other' allow reference to Newton III	3

Total for Question 6 = 8 marks

Question number	Answer	Notes	Marks
7 (a)	microphone;		1
(b) (i)	determination of number of squares for 1 period by finding average period from whole diagram; correct use of timebase of 0.5 ms seen; evaluation of time period; evaluation of frequency; e.g. 1 period = 8 squares ÷ 5 = 1.6 squares time period = $1.6 \times 0.5(\times 10^{-3})$ time period = 8.0×10^{-4} s frequency = $(1/8.0\times10^{-4})$ = 1250 (Hz)	ignore units ignore PoT ecf candidate's time period apply PoT here time period of between 1.5 and 1.59 squares giving frequency between 1260 and 1333Hz scores 3 marks max.	4
(ii)	use of speed = frequency × wavelength; dimensionally correct substitution; evaluation; e.g. speed = frequency × wavelength speed = 1250 × 0.27 (speed =) 340 (m/s)	seen or implied allow ecf from (b)(i) -1 for POT error allow 337.5 (m/s)	3
(iii)	idea of adjusting timebase; idea of **decreasing** timebase/eq;	however described DOP ignore reference to y-axis	2

Total for question 7 = 10 marks

Question number	Answer	Notes	Marks
8 (a) (i)	idea that stars are not the same size / mass / brightness / (absolute) magnitude/ luminosity /temperature /depends on which star is in front;	ignore 'same intensity'	1
(ii)	any answer that rounds to 31 (years);		1
(iii)	conversion from years to seconds; substitution; rearrangement; evaluation; e.g. 31 years = 9.78×10^8 seconds 19 = 2π × radius / 9.78×10^8 (radius =) 19×9.78 x 10^8 / 2π (radius =) 3.0×10^9 (km)	allow conversion from km/s to km/year allow ecf from (c)(ii) allow 2 956 255 958 (km) answer of 94 (km) gets 3 marks max. (no unit conversion)	4
(b)	any three from: MP1. light (from galaxy) has been red-shifted; MP2. {binary system / galaxy} is moving away (from Earth); MP3. universe is expanding; MP4. (therefore) universe must have been at a single point some time in the past;	ignore CMBR ignore references to any other galaxy allow idea of Hubble's Law i.e. speed and distance directly proportional	3

Total for Question 8 = 9 marks

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom