Pearson Edexcel

Mark Scheme (Results)

November 2023

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

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General Marking Guidance

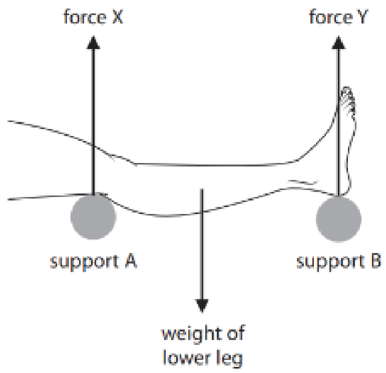
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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)	all five rows correct = 3 marks 3-4 rows correct = 2 marks 1-2 rows correct = 1 mark	row cannot score if both boxes ticked allow any reasonable indication other than a tick	3

Statement	Nuclear fusion	Nuclear fission
happens in the cores of stars	✓	
happens when a nucleus absorbs a neutron		✓
causes large nucleus to split		✓
produces radioactive daughter nuclei		✓
uses hydrogen to produce helium	✓	

Question number	Answer	Notes	Marks
(b)	high temperature; (so that) nuclei will have high(er) speed or high(er) {kinetic energy/KE}; high pressure; plus one from: • (so that nuclei will be) closer together / eq; • (so that nuclei are) more likely to collide/ eq;	ignore references to repulsion or attraction condone particles, atoms, molecules for nuclei e.g. closely packed e.g. collide more frequently	4

Total for Question 1 = 7 marks

Question number	Answer	Notes	Marks
2 (a) (i)	substitution OR rearrangement; evaluation; e.g. 19 = force × 0.55 OR force = moment/distance (force =) 35 (N)	allow 34.5, 34.54, etc. -1 POT error	2
(ii)	A (0.25 m); B is incorrect because this is not a perpendicular distance C is incorrect because this is the distance between weight and force F D is incorrect because this is the distance to force F		1
(b) (i)	**force** X has the shorter distance to the CoG; moments of two forces must be equal/eq; so force X must be larger; 	Note: no credit for repeating question I.e. CoG is closer to support A condone reference to **force** A accept 'weight' for CoG allow RA i.e. (total) clockwise moment = (total) anti-clockwise moment DOP on either	3
(ii)	any three from: force X decreases; force Y increases; change by the same amount; total force remains the same;	 allow idea of change with distance is linear	3

Total for Question 2 = 9 marks

Question number	Answer	Notes	Marks
3 (a)	any five from:		6
	MP1. idea of mass of water = [mass of water and cup] − [mass of cup];	accept zeroing balance with cup present	
	MP2. mass found on balance;	condone ‘weighing scales’ or ‘scales’ reject ‘scale’ allow ‘measure volume of water with a measuring cylinder and multiply volume by density to find mass’ for MP1 and MP2	
	MP3. time measured on timer/stopwatch/stopclock;	accept idea of a fixed amount of time	
	MP4. idea of finding temperature change;	e.g. temp change = final temp − initial temp accept idea of a defined temperature change I.e. stop heating after a temp change of 20 degrees	
	MP5. energy supplied = voltmeter reading × ammeter reading × time;	accept E = VIt accept use of joulemeter	
	MP6. **whole experiment** repeated and averaged;	i.e. get several values of c	
	MP7. water stirred (throughout);		
	MP8. keep taking temperature after heater switched off for max temp;		
	MP9. plot a graph of temperature against time;		
	MP10. find gradient of temperature-time graph;		
	and one from:		
	MP11. use of equation "gradient = power of heater / m × c” or re-arrangement;		
	MP12. rearrangement of formula sheet equation; i.e. c = energy supplied/(m × temp change)		

(b)	(i)	substitution into given formula; rearrangement; evaluation; e.g. $54\,000 = 0.56 \times c \times 22$ $c = 54\,000 / 0.56 \times 22$ (c =) 4400 (J/kg °C)	 -1 POT error allow 4383… allow any reasonable rounding ignore rounding error after 3sf	3
	(ii)	any two from: MP1. heating of beaker/heating of thermometer; MP2. heating of surroundings/heating of insulation; MP3. insulation not perfect; MP4. hole(s) in lid for thermometer/heater leave gaps;	ignore references to KE or sound allow idea of 'heat goes to beaker/thermometer' allow idea of 'heat going to surroundings or insulaton' e.g. insulation conducts or radiates allow idea of heat 'escaping' through lid or via evaporation	2

Total for Question 3 = 11 marks

Question number	Answer	Notes	Marks
4 (a)	substitution into given formula; rearrangement; evaluation; e.g. 16 = energy / 2.5 (× 3600) energy = 16 × 2.5 (× 3600) (energy =) 140 000 (J)	ignore units 2 marks max. if time not converted correctly to seconds e.g. 40 (J), 2400 (J) allow 144 000 (J) 2.5 × 60 × 60 or 9000 seen for 1 mark if no other mark awarded	3
(b)	any six from: MP1. it steps up or steps down the **voltage;** MP2. current in (primary) coil **produces** magnetic field; MP3. current is changing/alternating; MP4. causing a (changing) magnetic field **in the core**; MP5. the core strengthens the magnetic field; MP6. idea that iron is a soft magnetic material I.e. can gain and lose its magnetism easily MP7. field lines interact with (secondary) coil; MP8. which **induces** a voltage in the secondary coil; MP9. transformer won't work with (steady) d.c.;	allow "increases", "decreases" or "changes" e.g. making the core magnetised allow "concentrates" for "strengthens" idea of core linking the two coils with magnetic field condone "induces a current" ignore idea of "works with a.c." repetition of stem	6
(c)	less turns (on the primary coil) / eq;	ignore any reference to secondary ignore references to increasing current, power or voltage of the primary coil condone 'coils' for 'turns'	1

Total for Question 4 = 10 marks

Question number	Answer	Notes	Marks
5 (a)	423 (K);	allow 423.15 (K), 423.16(K)	1
(b) (i)	B and D only;	both required	1
(ii)	particles closer together in solid; particles have fixed or regular arrangement in solid but irregular in gas;	accept RA ignore motion references may be shown in a clear, titled diagram may be shown in a clear, titled diagram	2
(iii)	kinetic energy stays constant / eq; and any two from: • temperature stays constant (during state change); • (average) speed of particles does not change; • (kelvin) temperature is (directly) proportional to (average) kinetic energy of particles;		3

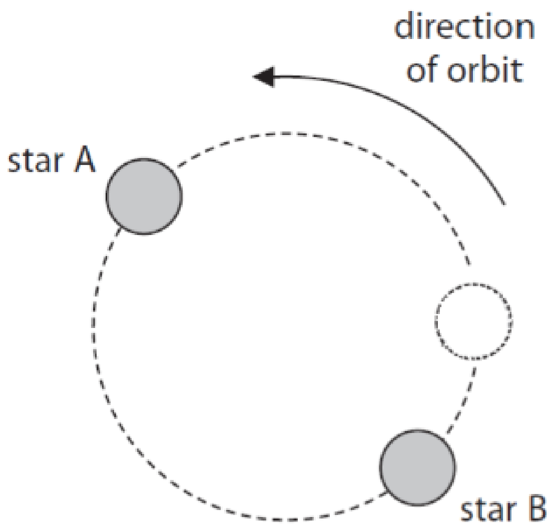
Total for Question 5 = 7 marks

Question number	Answer	Notes	Marks
6 (a)	idea that (total) momentum before = (total) momentum after (event);	ignore 'momentum is conserved'	1
(b) (i)	zero/0/nought/nothing;		1
(ii)	recall of momentum = mass × velocity; substitution; evaluation; e.g. p = mv $p = 2.6 \times 10^{-8} \times 26\,000$ $p = 6.8 \times 10^{-4}$ (kg m/s)	allow standard symbols e.g. p = m × v -1 POT error allow 6.76×10^{-4}	3
(iii)	6.8×10^{-4} (kg m/s); right;	allow ecf from (ii)	2
(iv)	substitution into 'F=ma'; rearrangement; evaluation; answer given to 2s.f.; e.g. 2.6 ($\times 10^{-3}$)= 1.2 × acceleration acceleration 2.6 ($\times 10^{-3}$) / 1.2 (acceleration =) $2.16\ldots \times 10^{-3}$ (m/s^2) (acceleration =) 2.2×10^{-3} (m/s^2)	ignore units −1 for POT error independent mark	4
(c)	any two from: MP1. idea of tiny amount of fuel 'consumed' per second; MP2. any attempt of calculation of time to run out of xenon **seen**; MP3. correct calculation of $7.575... \times 10^6$ s; MP4. idea that 'burn' is for a long time; MP5. idea that low acceleration for long time gives high speed change; MP6. mass of spacecraft will be larger so acceleration is even smaller;	ignore idea of simple yes/no accept 88 or 87.68.. days, 2104 hours, 1.26.. $\times 10^5$ minutes , 12.5.. weeks, 0.24... years	2

Total for Question 6 = 13 marks

Question number	Answer	Notes	Marks
7 (a)	microphone;		1
(b) (i)	determination of number of squares for one period; use of timebase to determine appropriate period in seconds; e.g. period = 8/1.5 = 5.3 squares period = (5.3 × 0.002 =) 0.011(s)	allow 5.2 – 5.5 squares '5 x 0.002' or '0.01' scores 1 '8 x 0.002' or '0.016' scores 1 accept 0.0104 – 0.0110 (s) for 2 marks	2
(ii)	use of f = 1 / T to evaluate frequency; e.g. frequency = (1 / 0.011 =) 91 (Hz)	allow ecf from (i) allow 90.9-96.2 (Hz)	1
(c) (i)	energy (transferred) = charge × voltage;	allow rearrangements and standard symbols e.g E = Q × V allow W for energy ignore C for charge	1
(ii)	amplitude of signal in volts determined; evaluation of effective voltage; evaluation of energy transferred; e.g. amplitude = 2 squares × 5 = 10 V effective voltage = 10 / √2 = 7.1 V energy transferred = (7.1 × 6.3×10^{-5} =) 4.5×10^{-4} (J)	ecf amplitude in volts reject 6.3×10^{-5} / √2 -1 POT error allow 4.4×10^{-4} – 4.5×10^{-4} (J) 8.9... $\times 10^{-4}$ scores 2	3

Total for Question 7 = 8 marks

Question number	Answer	Notes	Marks
8 (a)	X at 3 o'clock position on orbit by eye; 	any indicative mark within a star's radius of the correct position	1
(b)	difference in wavelength: 11 (nm); all substitutions correct in formula; rearrangement; evaluation; e.g. $\Delta\lambda = 561 - 550 = 11$ (nm) $11/550 = v / 3.0 \times 10^8$ $v = 11/550 \times 3.0 \times 10^8$ ($v =$) 6.0×10^6 (m/s)	allow ecf from clear incorrect change in wavelength -1 POT error 5.88×10^6 scores 3 marks (wrong lab wavelength) ignore references to direction	4

Total for Question 8 = 5 marks

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