Pearson Edexcel

Mark Scheme (FINAL)

Summer 2018

Pearson Edexcel International GCSE

In Physics (4PH0) 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

Summer 2018
Publications Code 4PH0_2P_1806_MS

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	**A** – acceleration; B is incorrect because energy has magnitude only C is incorrect because power has magnitude only D is incorrect because speed has magnitude only		1
b	**A** – kg m/s; B is incorrect because of the squaring of metres C is incorrect because this is the units for mass × acceleration D is incorrect because this is the units for mass × velocity^2		1
c (i)	**C** – no resultant force acts on the train; A is incorrect because if this were true the train would accelerate downwards B is incorrect because if this were true the train would accelerate upwards D is incorrect because there are 2 forces acting, weight and reaction		1
(ii)	weight = mass × gravitational field strength;	accept rearrangements and standard symbols e.g. W = m × g reject 'gravity' for g	1
(iii)	conversion of grams to kilograms; substitution; evaluation; e.g. (mass =) 0.15 (kg) (weight =) 0.15 × 10 (weight =) 1.5 (N)	allow 0.15 seen anywhere in working -1 for POT error allow g = 9.8 (N/kg) or 9.81 (N/kg) allow 1.47, 1.4715 POT error e.g. 1500 (N) scores 2 marks	3

Total for question 1 = 7 marks

Question number	Answer	Notes	Marks
2 a (i)	wavelength correctly measured from diagram; measurement multiplied by 200 to get 1400 (cm);	allow range of 6.9-7.2 (cm) allow ECF from incorrect wavelength allow range of 1380-1440 (cm)	2
(ii)	(wave) speed = frequency × wavelength;	allow standard symbols and rearrangements e.g. $v = f \times \lambda$ condone s, c for speed	1
(iii)	substitution; evaluation; e.g. (speed =) 0.4 × 14 (speed = 5.6 =) 6 (m/s)	allow ECF from (a)(i) -1 for POT error (not changing cm to m) allow 5.5-5.8 (m/s) if given to more than 1 s.f.	2
(iv)	any suitable example; e.g. • a named electromagnetic wave • electromagnetic wave • wave on a string/rope • 'S' wave • gravitational wave	 allow em wave, EM wave ignore wave on a slinky unless qualified ignore seismic wave unless qualified as secondary / S wave	1

Question number	Answer	Notes	Marks
b (i)	diffraction;		1
(ii)	any three from:	ignore comments relating to changing wavelength / wavefronts ignore refraction, reflection etc.	3
	MP1. idea of greater diffraction when opening becomes narrower;	e.g. • waves will spread out more	
	MP2. effect on boat **when opening becomes narrower**;	e.g. • waves likely to reach boat • water will not be calm • boat will move (up and down)	
	MP3. idea of less diffraction when opening becomes wider;	e.g. • waves will not spread out as much • no diffraction	
	MP4. effect on boat **when opening becomes wider**;	e.g. • boat (still) does not move • waves (still) don't reach boat • if wall removed there is no longer a barrier so boat will move	

Total for question 2 = 10 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>3 a</td><td>one mark for each correct row;;;;

<table><tr><th></th><th>Independent variable</th><th>Dependent variable</th><th>Control variable</th></tr><tr><td>Type of toy car</td><td></td><td></td><td>✓</td></tr><tr><td>Time to travel from A to B</td><td></td><td>✓</td><td></td></tr><tr><td>Angle of ramp</td><td>✓</td><td></td><td></td></tr><tr><td>Distance travelled down ramp</td><td></td><td></td><td>✓</td></tr></table></td><td>do not award each mark if two or more ticks in same row</td><td>4</td></tr>
<tr><td>b</td><td>only two columns/rows with headings of ‘angle’ and ‘time’;

correct units included in both headings;

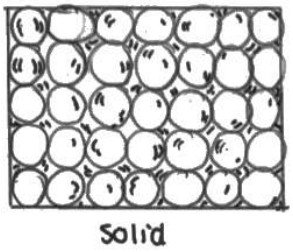
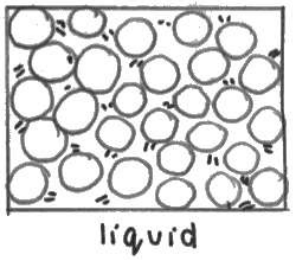
data for angles given in ascending/descending order and all data given to same precision as in the paper;</td><td>ignore third column/row for numbering tests
columns/rows can be in either order
reject if any units given with data values
ignore abbreviations for units e.g. ‘deg’, ‘secs’
units can be given in words or symbols and written in brackets, separated using / or written as e.g. ‘time in s’</td><td>3</td></tr>
</table>

Question number	Answer	Notes	Marks
c (i)	point circled at (30,0.50);		1
(ii)	any one from: MP1. ignore it (in calculations / drawing curve); MP2. repeat it;	allow exclude it, discard it ignore 'repeat the (whole) experiment'	1
(iii)	smooth curve passing within 1 square of all points except for (30,0.50);		1
(iv)	any one from: MP1. makes better use of the grid; MP2. time would never be zero; MP3. ramp would be flat / car would not move; MP4. no results taken below 10°/ 0.50 s;	allow 'no results at zero'	1

Total for question 3 = 11 marks

Question number	Answer	Notes	Marks
4 a	coil of (insulated) wire; (soft) iron core; current in the wire;	allow all points if clearly labelled in diagram allow solenoid, wire wrapped round core allow nickel allow magnetically soft core reject if magnet used as core allow if coil connected in a circuit with a power source e.g. a cell	3
b	steel is a hard **magnetic** material OR iron is a soft **magnetic** material; idea that steel remains magnetised; there is **attraction** between steel and electromagnet (core);	allow RA for iron e.g. 'iron loses its magnetism' allow idea that steel keeps its magnetism allow higher level answers in terms of domain alignment allow RA for iron e.g. 'iron no longer attracted to electromagnet' reject if linked to charge, rather than magnetism	3

Total for question 4 = 6 marks

Question number	Answer	Notes	Marks
5 a (i)	bar chart / bar graph;	condone histogram	1
(ii)	data is categoric / ordered / not continuous / discontinuous;	ignore data is discrete	1
b (i)	particles in a solid: regular arrangement with particles closely packed;	allow if clear from diagram  	4
	vibrate (in fixed position);		
	particles in a liquid: irregular/random arrangement with particles closely packed;	allow if clear from diagram e.g. no spaces big enough to add another particle  	
	move {around / over each other / **more** freely};	ignore unqualified 'move freely'	
(ii)	any two from: MP1. particles gain (potential / kinetic) energy; MP2. particles break (intermolecular) bonds; MP3. particles spread out / move further apart;	allow particles move faster allow particles break forces of attraction, particles escape from the liquid reject 'particles expand'	2

Total for question 5 = 8 marks

Question number	Answer	Notes	Marks
6 a	there is space between the nuclei / most of the atom is empty space;		1
b	alpha particles have a positive charge; (gold) nucleus / nuclei has a positive charge; same (like) charges repel;	allow 'alpha is positive', 'alpha is +2' must see the word 'nucleus' or 'nuclei' ignore references to poles	3

Total for question 6 = 4 marks

Question number	Answer	Notes	Marks
7	any 6 from: **any renewable resource** advantages MP1. resource will not run out; MP2. no polluting gases produced; **solar panels** advantages MP3. can be put on existing buildings; disadvantages MP4. only generates electricity when it is sunny / eq; MP5. would require a large area of panels; MP6. idea of visual pollution; **wind turbines** advantages MP7. only a small number of turbines would be required; MP8. (coastal location means) likely to be windy most of the time; MP9. could be located off shore; disadvantages: MP10. possible harm to birds; MP11. idea of visual / noise pollution; MP12. will not operate in heavy winds; **geothermal** advantages MP13. consistent/reliable power output; MP14. does not take up a lot of land space; disadvantages MP15. can only be built in geologically active areas/owtte;	ignore comments relating to cost allow does not contribute to global warming allow not generating electricity at night allow large space allow not windy all the time allow not weather dependent allow named area e.g. Iceland, Hawaii etc.	6

Total for question 7 = 6 marks

Question number	Answer	Notes	Marks
8 a (i)	(sum of) clockwise moment(s) = (sum of) anticlockwise moment(s) (in equilibrium);	allow no resultant moment allow if written mathematically e.g. $F_1d_1 = F_2d_2$	1
(ii)	moment = force × (perpendicular) distance; substitution showing one correct moment; substitution into principle of moments; final rearrangement and evaluation; e.g. moment = force × distance 620 × 1.4 OR F × 2.0 620 × 1.4 = F × 2.0 (F = 620 × 1.4 / 2.0 =) 430 (N)	 can be inferred from a force multiplied by a distance seen in working accept 868 seen in working allow correct rearrangements of this allow 434 (N) 1400, 1450, 1446, 1447 scores 2 marks	4
b	(force X) decreases; with any two from: • (because) distance from (left hand) pivot decreases; • (therefore) clockwise moment (of man's weight) decreases; • anticlockwise moment (of force X) decreases; • to maintain equilibrium;	 allow distance increases if clearly referring to RH pivot allow moments balanced	3

Total for question 8 = 8 marks