Mark Scheme (Results)

January 2016

Pearson Edexcel International GCSE in
Physics (4PH0) Paper 1P
Science Double Award (4SC0) Paper 1P

Pearson Edexcel Certificate in
Physics (KPH0) Paper 1P
Science (Double Award) (KSC0) 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)	any two from MP1. (same) speed(in a vacuum); MP2. transverse waves; MP3. travel through vacuum/do not require a medium; MP4. em wave/spectrum; MP5. carry information ; MP6. transfer energy;	ignore refraction reflection diffraction interference heat produced by Sun effects on body do not accept unqualified energy	(2)

(b)	infrared:
	  skin burns;
	
	ultraviolet:
	  damage to surface cells; OR
	  blindness;
		ignore for IR
		skin cancer/ cell mutation /sunburn
		
		accept
		causes (skin) cancer for UV
		sunburn for UV
		damage to eye for UV
			(2)

(c)	red;		(1)

Total for Question 1 = 5 marks

Question number	Answer	Notes	Marks
2 (a)	A carbon;		(1)
(b)	A negatively charged electrons;		(1)
(c)	D steel;		(1)
(d)	C 2 N poles facing;		(1)

Total for Question 2 = 4 marks

Question number	Answer	Notes	Marks
3 (a)	C the Solar System;		(1)
(b)	small circle centred on Q;		(1)
(c)	correct shape; correct orbit, star is clearly not at the centre of the orbit;	accept • 'open' ellipse /eq • oval • hyperbola it is not necessary that perihelion < orbital radius of S	(2)
(d) (i)	Any one comparison from: MP1. smaller {orbital path/ distance travelled} for close planets; MP2. larger speed for close planets;	Allow reverse arguments accept smaller orbital radius ignore lack of gravity all refs to time	(1)
(ii)	C planet S makes more orbits than P;		(1)
(e) (i)	250 (million km);		(1)
(ii)	150 (million km);		(1)

Total for Question 3 = 8 marks

Question number	Answer	Notes	Marks
4 (a) (i)	upward force label = lift/eq; downward arrow drawn same size as up arrow; downward force arrow labelled as weight/eq;	allow upthrust (normal) reaction judge by eye do not accept unqualified 'gravity' ignore horizontal forces/arrows	(3)
(ii)	any two from: MP1. speed remains (almost) constant /does not reduce (as much); MP2. (because) friction reduced/eq; MP3. (because of cushion of) air lifts the car;	allow KE for speed RA allow for MP3 (because) the car does not touch the track Ignore idea that air pushes glider idea that speed increases unqualified 'travels further'	(2)
(b) (i)	(average) speed = $\dfrac{\text{distance}}{\text{time}}$;	accept standard abbreviations rearrangements	(1)
(ii)	substitution; evaluation; e.g. 8.3/0.314 26 (cm/s)	ignore the POT until evaluation 26.4 (cm/s)	(2)
(iii)	314 (ms) ;	Allow 0.314 s Accept answer in standard form, number and unit required Allow this mark if the working shows that time has been calculated by 8.3/26 (=0.319 or 0.32)	(1)

Total for Question 4 = 9 marks

Question number	Answer	Notes	Marks
5 (a) (i)	MP1. series circuit containing lamp and some form of power supply; MP2. ammeter in series (with lamp/battery); MP3. voltmeter in parallel across lamp;	correct symbols only condone cell for battery	(3)
(ii)	V=I.R;	accept in words rearrangements NOT the 'triangle'	(1)
(iii)	current reading from graph; calculation; unit; e.g. 1.5 (A) 4 Ω /ohms	 do not accept V/A for Ω	(3)
(iv)	correct shape; correct end position/size;		(2)
(b)	 D ;		(1)
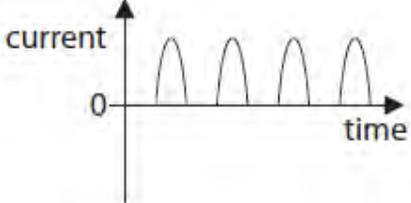
Total for Question 5 = 10 marks

Question number	Answer	Notes	Marks
6 (a)			(1)
(b) (i)	normal drawn correctly;	judge by eye	(1)
(ii)	correct angle marked to their normal;	judge by eye	(1)
(iii)	correct angle chosen within ± 3°;	27°, no ECF from bi or bii	(1)
(vi)	$\dfrac{\sin i}{\sin r} = n$;	accept rearrangements	(1)
(v)	substitution; evaluation; e.g. $\dfrac{\sin 43}{\sin 27} = n$ 1.5	allow ECF from biii	(2)
(c) (i)	Total Internal Reflection;	accept TIR	(1)
(ii)	MP1. light reflects (inside (surface) of fibre); MP2. with angle i> critical angle; MP3. (because) light travels slower in glass;	condone light hits/bounces off the fibre wall	(3)
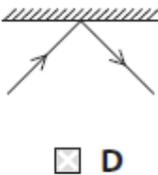
Total for Question 6 = 11 marks

Question number	Answer	Notes	Marks
7 (a)	positive charge to alpha; negative charge to beta; electromagnetic waves to gamma;	One mark for each correct line Minus one mark for two lines from any one box on the left	(3)
(b) (i)	in this order only: gamma, beta, alpha;		(1)
(ii)	any two from: can damage cells; can cause mutation; can cause cancer;	allow kill cells/tissues radiation burns radiation poisoning change genes	(2)
(c)	<table below>		(3)
(d)	any suitable device e.g. (thin window) GM tube; cloud chamber; spark chamber; semiconductor detector;	accept spelling mistakes Geiger counter NB do not accept repeat of stem (film badge or photographic film)	(1)

	0.1 cm paper	0.5 cm aluminium	0.5 cm lead
alpha radiation	stopped	stopped	stopped
beta radiation	goes through	stopped	stopped
gamma radiation	goes through	goes through	goes through

Each row correct for 1 mark;;;

Total for Question 7 = 10 marks

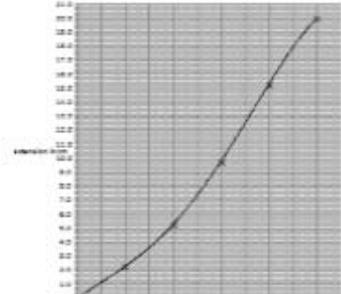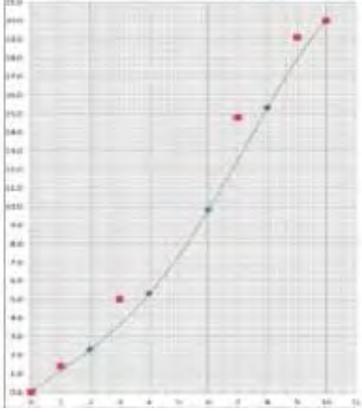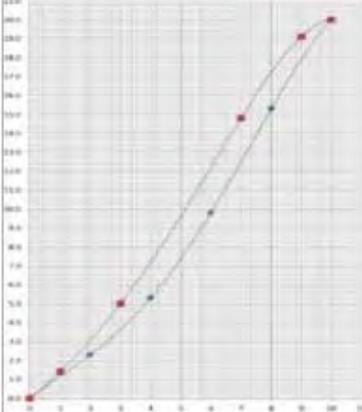| Question number	Answer	Notes	Marks
8 (a)	any two from: MP1. reverse the magnet (N into coil); MP2. reverse the connections at the ammeter; MP3. move the magnet out of coil;	ignore all references to • speed of movement • numbers of turns on the coil CARE that candidate does not conflate MP2 and 3 to negate their answer allow for MP2 invert the coil	(2)
(b) (i)	Y= magnet; Z = coil (of wire);		(2)
(ii)	$(\pm)1.6$ (V);		(1)
(iii)	reading of time for 1 cycle ; evaluation; e.g. 0.04s 25 (Hz)	no mark for eqn as it is given time can be assumed if f= 1/0.04 seen allow for 1 mark 50, 12.5 (Hz)	(2)
(vi)	C higher higher ;		(1)
(v)	any one from stronger magnet; more turns on the coil;	ignore bigger magnet condone more coils	(1)
(c) (i)	rearrangement of eqn; substitution; evaluation; e.g. work done (energy output) = power x time (=) 3.1 x 290 900 (W)	Accept 899 (W)	(3)
(ii)	$$efficiency = \frac{useful\ energy\ output}{total\ energy\ input}$$	accept standard abbreviations rearrangements with factor of X 100	(1)
(iii)	substitution; rearrangement of eqn; evaluation; e.g. input energy = $\frac{output\ energy}{efficiency}$ = $\frac{899\ (W)}{0.72}$ = 1200 (J)	ECF from ci allow 900 for 899 1245, 1250, 1300 (J)	(3)

Total for Question 8 = 16 marks

Question number	Answer	Notes	Marks
9 (a) (i)	work done = force × distance moved;	accept standard abbreviations rearrangements	(1)
(ii)	Substitution into correct equation; evaluation; e.g. = 23 X 0.34 7.8 (J)	allow a POT error for -1 7.82	(2)
(b)	determination of time for 1 movement/eq; substitution; evaluation; e.g. 15 times in 60 s = 4 s = 7.8 4 2.0 (W)	ecf from (aii) allow: calculation of total work done /60 allow 1 mark for correct use of 15 1.955, 2 (W) allow 1 mark only for 7.82/60 or 782/60	(3)

Total for Question 9 = 6 marks

Question number	Answer	Notes	Marks
10 (a) (i)	Any three of MP1. idea of (continuous) random movement; MP2. collisions / impact/eq with (inside) fabric/walls; MP3. idea that force is produced (by bombarding molecules); MP4. idea of pressure as force on an area;	ignore moves freely allow momentum or NIII argument	(3)
(ii)	any four from: MP1. pressure inside stays constant; MP2. pressure difference across the balloon fabric; MP3. (resultant) force acting down on the fabric; MP4. balloon fabric becomes concave / moves downwards; MP5. (free end of) pointer moves up;	allow for MP1, pressure increases slightly, for MP2 volume of air in can decreases, for MP5 end of pointer on the fabric moves down	(4)
(iii)	accept any two sensible suggestions e.g. longer stick/lever; narrower (diameter of) can; more stretchy material; less taut material;		(2)
(b) (i)	either it/the reading would decrease; OR (right end of) pointer goes down; OR left end of pointer goes up;		(1)
(ii)	more pressure inside the can ; plus any one from: particles inside can now move faster / have more KE; (hence) particles hit the balloon fabric more frequently; (hence) particles hit the fabric harder;	allow if seen in (i) look for idea of time implied more often allow momentum idea	(2)

Total for Question 10 = 12 marks

Question number	Answer	Notes	Marks
11 (a) (i)	MP1. means of securing one end of elastic band; MP2. ruler; MP3. weights;		(3)
(ii)	extension linked to dependent force linked to independent temperature linked to control all three correct;; any one correct;		(2)
(iii)	any two from: determine length without weights; determine length with 12 N; subtraction to get extension;	allow find difference in lengths	(2)
11 (b)(i)	any two suggestions from:- MP1. unloading and loading at same intervals; MP2. filling in the (large) gap in the unloading data; MP3. more readings (where curve is most pronounced); MP4. increase the range of loads;	ignore repeat and average allow 'go up in ones'	(2)
(ii)	best fit curve; 		(1)

11 (b)(iii)	4 points plotted correctly; ; -1 for each incorrect point 		(2)
(vi)	best fit curve; 		(1)
(v)	a discussion to include any three points: MP1. does not obey Hooke's law; MP2. because graph is not linear throughout; MP3. Hooke's law requires extension directly proportional to force; MP4. it does show elastic behavior; MP5. because it returns to its original length; MP6. data points quoted to support other MP;	MP1 should only be awarded if there is an attempt at an explanation	(3)

Total for Question 11 = 16 marks

Question number	Answer	Notes	Marks
12 (a) (i)	any three from: MP1. air becomes hot; MP2. air expands; MP3. air becomes less dense; MP4. air rises;	NOTE cannot award MP4 unless MP2 or MP3 has been given reject for 1 mark(ie MAX mark = 2) air particles expand OR air particles become less dense	(3)
(ii)	clear inward arrow above the heat absorbing materials; clear up arrow inside the tower;		(2)
(iii)	convection (current);		(1)
(b) (i)	thermal (energy); kinetic (energy);	allow heat or solar or light	(2)
(ii)	(hot) air turns turbines; turbines turn the generator/magnets inside a coil;		(2)
(c) (i)	during the day there is direct heating from the sun/eq;	allow RA	(1)
(ii)	any sensible suggestion e.g. so that convection continues beyond daylight hours; to act as heat source for night time;		(1)
(iii)	any sensible suggestion e.g. water tanks (to provide hot water at night); crops;	Allow photovoltaic cells solar panel (dull) black objects / blocks painted black	(1)

Total for Question 12 = 13 marks