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Mark Scheme (Results)

June 2014

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

Pearson Edexcel Level 1/Level 2 Certificate
Physics (KPH0) Paper 1P
Science (Double Award) (KSC0) Paper 1P

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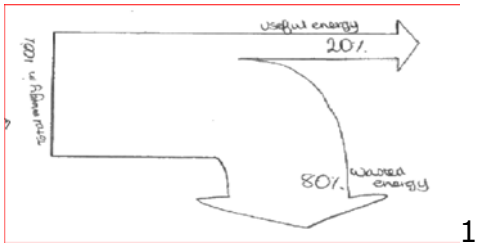
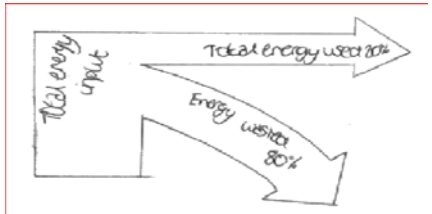
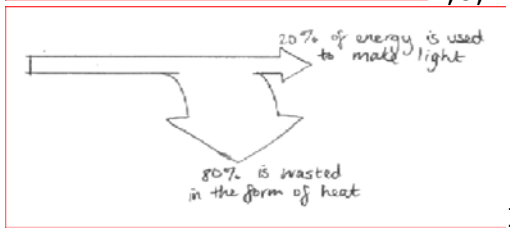
General Marking Guidance

- 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 i	Any two from – Radio; Microwaves; Infrared; Visible;		2
ii	Microwaves; Infrared;		2
b	D Increasing wavelength		1
c i	(wave) speed = frequency x wavelength	Accept equivalent Accept recognised symbols	1
ii	Substitution into correct equation; Evaluation; Unit; Eg. (wave) speed = 200 000 x 1500 300 000 000 m/s	mark unit and calc independently Power Of Ten error = -1 e.g. not converting kHz to Hz Accept • bald answer • answer in SF • alternative speed units with corresponding evaluation e.g. 300 000 km/s 1.08×10^{12} km/hour	3

(Total for Question 1 = 9 marks)

Question number	Answer	Notes	Marks
2 a i	B kettle		1
ii	A food mixer		1
b	any one from MP1 total energy always has the same value; MP2 energy cannot be created or destroyed; MP3 energy input = energy output ;	Allow student speak with two distinct ideas on energy e.g. none is lost or gained none is lost just transferred	1
c i	Both of: MP1 . is 20% of the energy input ; MP2 . (20%) is transferred usefully / as light; **OR both of:** MP3 . 80% of the energy input ; MP4 . (80%) is wasted / transferred as heat;	allow energy used for energy input 20% (or 80%) is not enough for the mark, 'energy input' or 'energy used' must be mentioned allow for 1 mark, a definition of efficiency condone power for energy independent marks	1 1
ii	Sankey diagram giving – MP1. One input and ONLY two outputs; MP2. Roughly correct proportions; MP3. Two correct labels; e.g.	allow • output arrows in either direction • both output arrows in same direction • 2 from ○ input/electrical/total, ○ useful/light, ○ wasted/heat/thermal ignore % on labels sound	1 1 1

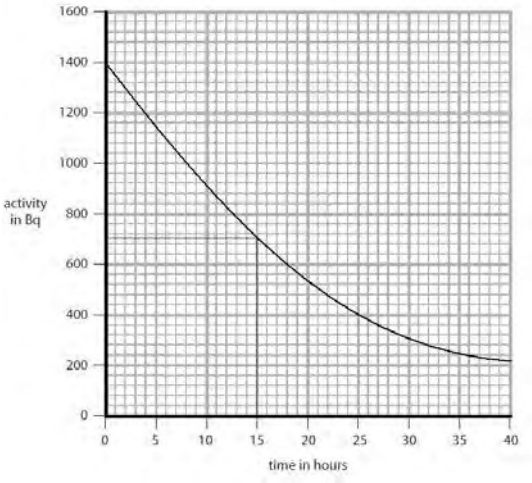
	 1,1,1	there must not be a size difference between input and outputs, even if the light is ~ 1/4 of heat i.e. 100 units in and 100 units out  1,0,1  1,0,1	

(Total for Question 2 = 8 marks)

Question number	Answer	Notes	Marks
3 a i	newtons / N;	Reject n, Ns Allow Newtons	1
ii	any one of scales weighing scale electronic/electric balance newtonmeter;	newtonmetre	1
b	MP1. Record outline of foot; MP2. Attempt at evaluation of area; MP3. Detail of method of measurement; e.g. Draw round foot / feet Count / estimate the squares On squared / graph paper	Allow suitable alternatives dip foot into paint/ink and make footprint find area of rectangle around foot area of rectangle minus area of spaces around the foot use of ruler is insufficient for MP3	3
c i	Pressure = force / area;		1
ii	Substitution into correct equation; Evaluation; e.g. Pressure = $\frac{650}{270}$ 2.4	ACCEPT • rearranged equation • equation in recognised symbols Ignore triangle or units equation allow 2.41 or 2.4074 etc	1 1

(Total for Question 3 = 8 marks)

Question number	Answer	Notes	Marks
4 a	(Atoms / nuclei with the) same number of protons; Different numbers of neutrons;	ALLOW relevant correct alternatives e.g. • atomic number, proton number • nucleon number, atomic mass ignore comments about electrons	1 1
b i	Electron;	ignore comments about properties of electrons e.g. speed ALLOW • e^- or e^+ • positron	1
ii	any suitable detector e.g. Geiger(-Muller) tube/detector/counter; photographic film; zinc sulfide; gold leaf electroscope;	ALLOW • phonetic/incorrect spelling	1
iii	beta penetrates paper; beta absorbed/stopped by lead +/or aluminium ;	IGNORE • all details of experimental setup • beta goes through aluminium/eq DO NOT ALLOW • bounced back for absorbed • contradictions in answers e.g. re aluminium	1 1 1

	MP1. line goes through 0,1400 and (first half-life plotted at) 15, 700; MP2. line goes through/second half-life plotted at 30, 350; MP3. a correctly **curved line** between 15 and 30 hours AND the line extends beyond 35 hours; i.e.  	ALLOW for MP2 an ecf from incorrect first half-life to 'correct' second half-life e.g. 800---400 IGNORE • a *slight* upcurve at 35 to 40 hours • Bar charts • **Since this is a sketch then allow tolerance of +/- 1 square on the points**	1 1 1

Question number	Answer	Notes	Marks
d i	any FOUR from: MP1. there is a known proportion / composition / activity when rocks formed; MP2. measure/determine the proportion of uranium or the activity now; MP3. compare activity now to original activity/eq; MP4. (hence) determine the time / number of half-lives elapsed; MP5. (hence) calculate age from reference to half-life;	allow as a numerical example ignore work out the proportion when rocks were formed ALLOW • Bq for activity • radioactivity for activity • amount for proportion IGNORE • measure half-life of uranium • they know its activity ALLOW colloquial expressions such as 'see how long it took to decay this much'	1 1 1 1 1

ii	MP1. idea that it/half-life is **too** short OR idea that decay occurs **too** quickly/rapidly; PLUS MP2. (hence) **U / isotope** would (all) have decayed (long ago) OR **U activity** would be too small (to distinguish from background / to measure);	comparative of some sort needed for MP1 allow not enough time care that you do not award both alternatives for MP2 IGNORE granite decays it decays	1 1

(Total for Question 4 = 15 marks)

Question number	Answer	Notes	Marks
5 a	any FIVE from: MP1. Object has weight or there is a downward force (due to gravity on the object); MP2. So it accelerates (downwards); MP3. there is (a force of) drag (upwards or to oppose movement); MP4. drag increases as speed increases; MP5. eventually drag = weight ; MP6. (hence) resultant force is zero; MP7. (hence) object travels at constant speed;	allow: gravity pulls it down the speed/velocity increases oil resistance / water resistance / air resistance for drag oil friction / water friction / air friction for drag 'drag increases as it accelerates' forces are equal / forces are balanced accept 'no acceleration' DO NOT ALLOW • (The drag) slows it down MP2 • upthrust for drag MP3 • resistance = acceleration for MP5 • terminal velocity for constant speed for MP7	5

b	<u>Measuring instruments</u> MP1. Timer / stop-clock/ light gate (and data logger); MP2. Ruler / scale; <u>Measurements made</u> MP3. Take time for ball to pass between two points; MP4. determine the distance apart; MP5. Repeat readings lower down; **OR** MP6. For a set time (e.g. for 1 s); MP7. measure distance travelled (in this time); MP8. Repeat readings lower down; **OR** MP9. measure velocity using light gate with data logger; MP10. at two different places; <u>Using measurements</u> MP11. Use speed = distance / time; MP12. How results indicate terminal velocity achieved;	Ignore ticker-timer measurement of mass condone tape measure if the measurements are from top to bottom then only give MP3 or MP4 not both allow velocity for speed	5

(Total for Question 5 = 10 marks)

Question number	Answer	Notes	Marks
6 a i	Power = current x voltage;	Accept • rearranged equation • equation in recognised symbols	1
ii	Substitution and rearrangement; Evaluation; eg I = 2000 / 230 8.7 (A)	Accept • 9 (A) • 8.695…..(A) ETC NOT • 8.6 incorrect truncation • 9.0 incorrect rounding	1 1
iii	D 13 A		1
b	Series – single switch to control both; Parallel – independent control;	Allow idea of one element failing (and the other continuing) ignore comments about voltages or currents there is no mark for getting the 2 answers reversed	1

c i	ANY FOUR FROM – MP1. earth connected to (metal) casing; MP2. If casing becomes live/ live wire touches case; MP3. Provides low resistance path (to earth); MP4. (So) large/surge current <u>in earth wire</u>; MP5. (hence) fuse breaks/melts/blows; MP6. (so) circuit switches off or current stops or supply cuts off;	Allow circuit breaker(RCCB) DO NOT CREDIT: the electricity goes to the ground/eq for MP3	4
ii	any two from MP1. It has a metal case; MP2. Metals/the case conducts (electricity); MP3. to prevent (user getting) a shock;		1 1

(Total for question 6 = 12 marks)

Question number	Answer	Notes	Marks
7 a	Any FOUR from: MP1. Current in <u>coil</u> ; MP2. (Creates) magnetic field (around the wires of the coil); MP3. Interaction of (this) field with that of (permanent) magnets; MP4. There is a force on the wire(of coil); MP5. Reference to left hand rule; MP6. force up on one side and down on other side;	current in circuit is not enough coil becomes an electromagnet allow field cutting as the interaction idea of catapult field reference to moment/turning effect on the coil	4
b i	one of • Reverse supply polarity (however described); • reverse current direction (however described); • swap magnets over(however described);		1
ii	any one from: • Reduce current (however described); • Reduce voltage (however described); • increase resistance of circuit (however described); • weaker magnetic field (however described);	Allow : less turns on coil Condone: fewer coils	1

(Total for Question 7= 6 marks)

Question number	Answer	Notes	Marks
8 a	(surface) area;		1
b i	Any one from: volume of water; timing period;	Ignore conditions of the room	1 1
ii	any TWO from: MP1. (this variable) would affect heat loss; MP2. so wouldn't know which factor/variable mattered ; MP3. otherwise not fair test /results would not be valid / results would not be reliable;	allow description of how the variable would affect heat loss	1 1
c	ANY SUITABLE e.g. • care with hot water • container not near edge of table/bench • do experiment while standing	allow • gloves • goggles	1
d i	31 40 28 25 ALL FOUR CORRECT = 2 -1 each mistake Minimum score = 0		2 1

ii	MP1. temperature (difference); MP2. (surface) area or time; MP3. relevant units on both;	X and Y unimportant	1 1
iii	Any TWO from: MP1. use water that is at the same starting temp; MP2. Pour in and wait until that temperature is reached before timing; MP3. method to ensure small time gap between pouring water and starting; MP4. put (same volumes into) containers in a water bath;	Accept sensible alternative workable method(s), allow two different methods e.g. do one at a time use other people to help	2

(Total for Question 8 = 12 marks)

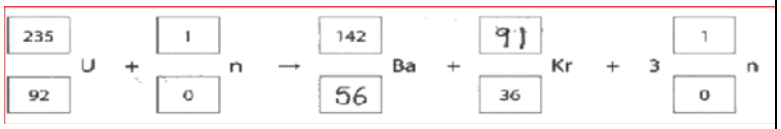
Question number	Answer	Notes	Marks
9 a	Any FIVE from: MP1. Energy (transferred) from the sun; MP2. Air over the land is heated ; MP3. Warmer air over land expands; MP4. Air becomes less dense; MP5. Therefore rises (**must** have connection); MP6. Cooler air over sea becomes denser; MP7. Cooler air over sea sinks; MP8. Air (from over the sea) moves inland to replace rising air;	no mark for bald convection current land heats up air reject for 1 mark • particles expand and /or become less dense can **only** be awarded if MP3 or MP4 is given ignore • heat rises	5
b	MP1. Example of a larger particle given: e.g. ➢ smoke particles ➢ pollen MP2. Idea that larger particles move with random motion; MP3. Idea of collisions with smaller (invisible) particles;	Ignore • air/water particles move with random motion	1 1 1

(Total for Question 9 = 8 marks)

Question number	Answer	Notes	Marks
10 a	a moon orbits a <u>planet</u>; a planet orbits a star (/the Sun) ;	Ignore • comments about eccentricity, oval, plane of orbit, time of orbit etc	1 1
b	Substitution; Evaluation; Unit (to **match** the value of v); e.g. $V = \frac{(2 \times \pi \times 385000)}{27} = \frac{2\ 417\ 800}{27}$ 90 000 km/day	Note value of π used may vary time values and corresponding approximate speeds are 27 days…….. 89 600 km/days 648 hours…….. 3 731 km/ hours 38 880 mins……. 62 km/min 2 332 800 s…… 1.04 km/s allow answers which round to 89 600 Accept suitable **matching** units	1 1 1 1 1
c i	E=1/2 mv^2;	Accept • rearranged equation • equation in words	
ii	substitution ; Mass converted to kg ; 47.(33…..) seen;	allow sub of mass as 50 g 1.496 or 1.5 seen gets 2 marks	3
d i	44(J) ;		1
ii	GPE = mgh;	Accept • rearranged equation • equation using (all the) words Allow for 'g' • gravitational field strength but NOT gravity	1

iii	Substitution and rearrangement; Calculation ; $\frac{12}{0.05 \times 1.6}$ 150 (m)	POT error loses 1 mark e.g. 0.15 (m) gets 1 mark	2
e	any Two from: • Value of g lower(on the Moon)/RA; • lack of air resistance (on the Moon)/RA; • Time of flight greater;	ignore • 'no gravity' allow • less gravity • drag for air resistance	2

(Total for Question 10 = 15 marks)

Question number	Answer	Notes	Marks
11 a	91; 56;  		1 1
b	Three FROM – MP1. Neutrons released; MP2. neutrons slowed by moderator; MP3. Can be absorbed by **other** (U) **nuclei**; MP4. Causing further fissions;	ignore comments about control rods collide or react for absorb if MP3 or 4 or both not given then award 1 mark for a description of a first absorption	3
c i	Correct labels for – Control rods; Shielding;	Accept • lines with or without arrow heads (in either direction) • any part of control rod (black in diagram) • any part of external box for shielding	1 1 2

ii	Two from: MP1. Reactor material / waste is **radioactive**; MP2. (radiation) ionises cells/ tissues / organs / body or causes cancer; MP3. radiation is very penetrating;	allow damages for ionises NOT ALLOW bald 'it is dangerous' do not award marks for 'shielding prevents escape of radiation'/eq	

(Total for Question 11 = 9 marks)

Question number	Answer	Notes	Marks
12 a	MP1. series circuit containing lamp and some form of power supply; MP2. ammeter in series with lamp; MP3. voltmeter in parallel across lamp; MP4. variable resistor in series OR use of variable power supply;	incorrect symbols or substantial gaps =- 1 ONCE allow either symbol for lamp ignore other components e.g. switch	4
b i	idea that gradient changes; e.g. voltage increases more rapidly than the current	look for a rate change expressed in student terms Accept • line is curved • not a straight line • V is not proportional to I	1
ii	MP1. Lamp heats up; MP2. Greater chance of electron collisions; MP3. (hence) resistance increases;	do not award marks for a description of the shape of the graph	3

(Total for question 12 = 8 marks)