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Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE in Physics (5PH3H) Paper 01

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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.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- 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.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

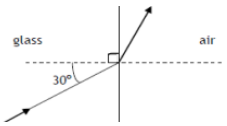
Question Number	Answer	Acceptable answers	Mark
1(a)(i)	D both real and virtual images		**(1)**

Question Number	Answer	Acceptable answers	Mark
1 (a)(ii)	A 8.3 dioptre		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	Diagram showing Convex lens, wider at the centre and more curved (1) shorter focal length identifiable (1)	Lens can be redrawn anywhere on the diagram	**(2)**

Question Number	Answer	Acceptable answers	Mark
1 (b)	substitution (1) 1/12= 1/8.5 + 1/v transposition (1) (1/v) = 1/12 - 1/8.5 evaluation (1) (1/v) = -0.034 Inversion (1) v = -29(cm)	substitution and transposition in any order 0.034,-7/204,7/204, 0.03,-0.03 (3) Ignore signs until final value of v is given. -29.1(cm) -29.14(cm) Allow answers that can be rounded down to -29(cm) full marks for the correct numerical answer with no working (-)204/7 or 29(cm) with no working gains 3 marks	**(4)**

(Total marks for question 1 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
2(a)	B 		**(1)**

Question Number	Answer	Acceptable answers	Mark
2 (b)(i)	substitution: (1) 3.2×10^{7} = power/6.3×10^{-6} transposition (1) (power) = $3.2 \times 10^{7} \times 6.3 \times 10^{-6}$ evaluation: (1) 200 (W)	substitution and transposition in any order ignore powers of 10 until evaluation 202(W) or 201.6(W) or 201(W) full marks for the correct numerical answer without working	**(3)**

Question Number	Answer	Acceptable answers	Mark
2 (b)(ii)	An explanation linking: EITHER • no light / energy is lost (1) OR • no <u>light</u> is refracted (out) (1) WITH • (because) idea of (total) internal reflection (1)	Ignore references to power No light / energy escapes All <u>light</u> stays in (the fibre) TIR Accept "<u>All light</u> is internally reflected" for 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
2 (c)	substitute and evaluate (sin c) = 1/1.7 (sin c) = 0.59 (1) from graph or calculation c = any value between 34° and 38° (1)	 0.588, 0.58, 0.6 full marks for the correct numerical answer without working	**(2)**

(Total marks for question 2 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
3 (a)(i)	A suggestion linking two of: • (X-rays/they) are harmful to health (1) • airport use non-essential/ hospital use essential (1) • idea that benefits outweigh risk in hospitals (1)	Dangerous to health/damage cells/ can cause cancer/mutate cells/ionising ORA Ignore references to risks of frequent flyers	**(2)**

Question Number	Answer	Acceptable answers	Mark
3 (a)(ii)	A suggestion linking: lead casing / shielding (1) <u>absorbs</u> X-rays (1)	metal casing/shielding (security workers) out of range Ignore references to lead suits/aprons etc.	**(2)**

Question Number	Answer	Acceptable answers	Mark
3 (b)(i)	Explanation linking two of the following:- • cathode is heated (1) • (electrons) given enough energy (1) • (electrons) escape (from the surface) (1)	filament/wire is heated boiled off / released / emitted Ignore emission	**(2)**

Question Number	Answer	Acceptable answers	Mark
3 (b)(ii)	C 4.4×10^{16} (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
3 (b)(iii)	substitution: (1) $1.4 \times 10^{-14} = 1.6 \times 10^{-19} \times V$ Transposition (1) $(V) = 1.4 \times 10^{-14} / 1.6 \times 10^{-19}$ evaluation: (1) 88 000 (V) /88 x 10^3 (V)/ 8.8 x 10^4 (V)	substitution and transposition in any order ignore powers of 10 until evaluation 87 500(V), 9 x 10^4 (V) 88 kV, 87.5 kV, 90kV full marks for the correct numerical answer without working	**(3)**

(Total marks for question 3 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
4 (a)(i)	C stationary		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	(Average KE/it is) halved	divided by 2,multiplied by 0.5	**(1)**

Question Number	Answer	Acceptable answers	Mark
4 (b)	Explanation in terms of particles linking the following:- • particles collide with / hit /strike / bombard (1) • the wall / sides of the balloon (1) • (causing a) force / (rate of) change in momentum (1)	Accept "molecules/atoms" for particles Must mention particles etc to gain this mark Ignore "push"	**(3)**

Question Number	Answer	Acceptable answers	Mark
4 (c)(i)	-46 + 273 (1)	273-46 / any use of 273	**(1)**

Question Number	Answer	Acceptable answers	Mark
4 (c)(ii)	substitution: (1) $\frac{101 \times 9.1}{273} = \frac{1.12 \times V_2}{227}$ Transposition (1) $V_2 = \frac{101 \times 9.1 \times 227}{273 \times 1.12}$ evaluation: (1) 682 (m^3)	Accept either Pa or kPa for substitution substitution and transposition in any order ignore power of ten error until evaluation 680 (m^3), 682.4 (m^3), 682.35 (m^3) full marks for the correct numerical answer without working	**(3)**

Question Number	Answer	Acceptable answers	Mark
4 (c)(iii)	bursts/explodes or words to that effect		**(1)**

(Total marks for question 4 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
5 (a)(i)	1. advantage (1) minimises patient's exposure to radioactivity 2. disadvantage (1) (has to be produced) close to the {place / time} of use	Does not stay in the (patient's) body for a long time / Decays quickly Any time constraint (in diagnosis/scanning/treatment) Ignore confusion between biological and physical half-life	**(2)**

Question Number	Answer	Acceptable answers	Mark
5 (a)(ii)	An explanation linking four from: • gamma (rays emitted) (1) • <u>two</u> (gamma rays) (1) • in opposite directions (1) • (because) momentum is conserved (1) • detectors / sensors placed around the patient (1) • simultaneous detection (1)	pair at 180°(to each other) gamma cameras/scintillation crystals idea of triangulation	**(4)**

Question Number		Indicative Content	Mark
QWC	***5(b)**	An explanation including some of the following points • protons and neutrons are made up of quarks • quarks can change (flavour) • proton made up of uud • neutron made up of udd • for β^+ a u changes to a d • for β^- a d changes to a u • for β^+ a p changes to a n • for β^- a n changes to a p	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description e.g. for β^+ a proton changes to a neutron OR protons and neutrons are made up of quarks which can change (flavour) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description including both processes but with significant error(s) e.g. 'a d changes to a u' [error], changing a proton to a neutron and emitting a β^+. A u changes to a d [error] changing a neutron to a proton and a β^- [errors in u and d] OR one of the processes with the correct detail e.g. A u goes to a d therefore a proton goes to a neutron and emits a β^+ • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed, accurate description of both processes e.g. A u goes to a d therefore a proton goes to a neutron and emits a β^+. A d goes to a u therefore a neutron goes to a proton and emits a β^-. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total marks for question 5 = 12 marks)

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	Circular/spiral/circle		**(1)**

Question Number	Answer	Acceptable answers	Mark
6 (a)(ii)	An explanation linking three of the following. • (fast moving) <u>protons</u> (1) • absorbed by (1) • nuclei (1) • (produces)unstable nuclei (1)	bombard / hit /strike / collide with stable atoms / stable element	**(3)**

Question Number	Answer	Acceptable answers	Mark
6 (b)(i)	B momentum		**(1)**

Question Number	Answer	Acceptable answers	Mark
6 (b)(ii)	(Momentum/it)equals mass x <u>velocity</u>	p = m x v kilograms / kg is the mass and metres per second / m/s is the <u>velocity</u> Accept "times" for x	**(1)**

Question Number		Indicative Content	Mark
QWC	***6(b)(iii)**	An explanation including some of the following points Diagram 1 • Moving in opposite directions before collision • inelastic collision • stationary after collision • momentum zero after collision • (therefore) total momentum must have been zero before collision • (therefore) cars were moving at the same speed in opposite directions (assuming cars have equal mass) • both cars had kinetic energy before the collision • KE zero after collision • KE converted into heat, sound, elastic potential energy etc. Diagram 2 • Elastic collision / almost elastic collision • Momentum conserved • Momentum transferred from first to last sphere • KE conserved / almost conserved • (because)last sphere reaches same height as first sphere • Three spheres always have zero momentum • Small amount of energy transferred to sound/heat	**(6)**

Level	0	No rewardable content
1	1 - 2	• A limited analysis of ONE collision which is given by a correct statement e.g. In collision 1, kinetic energy has been lost OR In collision 2 momentum is transferred from the first to the last sphere. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	• a simple analysis of BOTH collisions considering BOTH momentum AND kinetic energy correctly for each one e.g. In collision 1, momentum is conserved and the kinetic energy of the cars changes. In collision 2, momentum and the kinetic energy is conserved. • answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5 - 6	• a detailed analysis of BOTH collisions considering momentum AND kinetic energy for each collision correctly for each AND detailed reference to EITHER diagram. e.g. In collision 1, the momentum before and after the collision is zero because momentum is always conserved, but the KE is lost. In collision 2, all the momentum and KE is transferred to the last sphere because it gets to the same height as the first one. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(Total marks for question 6 = 12 marks)

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