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Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCSE in Physics (5PH1H) Paper 01
Unit P1: Universal Physics

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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)	Any one from portable (1) not weather dependent (1) takes up less space (1)	Reverse argument (RA) in each case can be {moved/used} anywhere ignore convenient/costs does not need wind condone (source) {(more) reliable/ always available/used any time} condone smaller 'It' refers to generator/petrol	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	Any one from uses {fossil fuel/petrol} (1) {non-renewable/finite/limited} resource (1) (exhaust) {fumes/gases} are {polluting /damage environment}(1)	RA in each case fuel costs ignore unqualified references to cost {petrol/fuel} may run out/not sustainable needs refilling constantly produces pollutants /condone pollutes emits named gases e.g.$C0_2$,CO, SO_2 contributes to acid rain/greenhouse effect/global warming not eco-friendly ignore references to noisy/ harmful 'It' refers to generator/petrol	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b) (i)	8000 (J)	(if answer wrong, give mark) for 5200 + 2800 (J) 8 **k**J (note k must be added)	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b) (ii)	Substitution (1) $\frac{2800}{8000}$ (× 100 %) Evaluation (1) 35 %	ecf from 1(b)(i) 0.35 if 0.35 seen in working but rounded to 0.4 - award mark award full marks for correct answer even with no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)	explanation linking any **three** of: • (idea of relative) movement(1) • (between) magnet/field/flux (1) • (and) coil/conductor/wire (1) • {emf/voltage } (produced) (1) • without { battery / contact }(1)	cut/cutting/change (of field/flux) the induced voltage makes current flow in a circuit =1 mark	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(a)	B the Universe but not the Solar System		**1**

Question Number	Answer	Acceptable answers	Mark
2bi	nebula red giant	must be in this order on page for nebula accept (some/cloud of) {dust/gas/hydrogen} condone protostar instead of nebula ignore 'stellar/planetary' do **NOT** accept red **super**giant	**2**

Question Number	Answer	Acceptable answers	Mark
2bii	A 7.5 billions of years		**1**

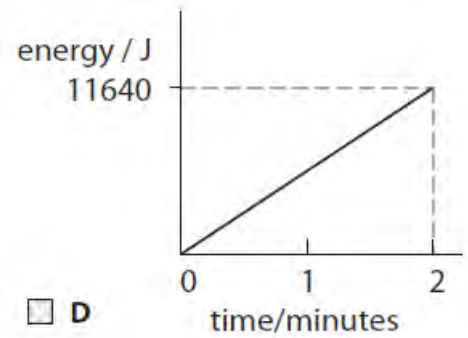
Question Number	Answer	Acceptable answers	Mark
2c	(to) red **super**giant (1) (and then) supernova (1)	condone super red giant ignore {bigger/massive} red giant must be in this order for 2 marks if reversed award 1 mark mention of supernova without red supergiant scores 1 beware of lists (e.g. -1 for each addition between red supergiant and supernova to min 0)	**2**

Question Number	Answer	Acceptable answers	Mark
2d	An explanation linking (force of) gravity (1) and **any one** from (gives) inwards (force on particles) (1) OR (which) balances outward force (on particles) (1)	gravitational {force/pull} ignore GPE and pressure {inward/downwards/backwards} (pull) (force) is in (idea of) opposite direction to outwards push balances outward push upwards for outwards gravitational attraction (of particles) scores 2 marks inward force balances outward force = 1 mark	**2**

Question Number	Answer	Acceptable answers	Mark
3(a)	conversion (1) 3.2 W = 0.0032 kW substitution (1) 0.0032 × 24 × 14 evaluation (1) 1.1 (p)	allow conversion and substitution in either order correct substitution of any power x time x cost (per unit) answers rounding up from 1.0752 to 1.1 =3 marks condone rounding to 1 (p) for 3 marks if some correct working shown any other answer using 10752 (to any {power of 10 / sig.fig.}) = 2 marks award full marks for the correct answer with no working	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(b)	substitution (1) 97 = 230 × I transposition (1) power OR 97 voltage 230 evaluation (1) 0.42 (A)	allow substitution and transposition in either order ignore power of 10 errors until evaluation mark allow numbers which round down to 0.42 (A) e.g. 0.42/0.42174 (A) for 3 marks award full marks for correct answer with no working unsupported 4.2 (A) OR 0.042 (A) score 2 condone rounding to 0.4 (A) condone use of 240 instead of 230 to give 0.402 so accept for 3	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	substitution (1) $\frac{230}{9.2} = \frac{4700}{N_s}$ transposition (1) $\frac{4700 \times 9.2}{230}$ (or in words/symbols) evaluation (1) 190	allow substitution and transposition in either order accept {? /their final answer or blank space} for N_s any arrangement of the equation $\frac{4700 \times 9.2}{230}$ or 4700/25 scores 2 marks award full marks for correct answer with no working allow 188/187.7 for 3 marks allow POT error for 2 marks	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	**D**  ☐ **D**		**1**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	**C** 310 nm		**1**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	infrared (radiation)	infra red/ infra-red/ir/IR (condone) heat (radiation)	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(iii)	suggestion including: (radiation) is absorbed (1) second mark can only be scored if first mark is scored by atmosphere (1)	blocked/stopped/reflected/filtered/scattered ignore 'can't pass through' condone any named EM radiation by named gases e.g. 'carbon dioxide absorbs' scores 2	**2**

Question Number	Answer	Acceptable answers	Mark
4b	transposition (1) (f =) v/λ OR c/□ substitution (1) $3 \times 10^{8} / 800 \times 10^{-9}$ evaluation (1) 3.75×10^{14} hertz / Hz (1)	allow substitution and transposition in either order 3×10^{8} / 800 shows transposition $3 \times 10^{8} / 800 \times 10^{-9}$ scores for transposition and substitution $3 \times 10^{8} = f \times 800 \times 10^{-9}$ just scores substitution mark ignore power of 10 errors until evaluation mark award full marks for correct answer with no working POT error gives 2 calculation marks, but check for unit e.g. kHz/GHz etc condone Hertz OR s^{-1} ignore hz or c.p.s accept correct SI prefix eg kHz, MHz, GHz, THz etc	**4**

Question Number	Answer	Acceptable answers	Mark
4c	An explanation linking star moving (relative to Earth) (1) and **any one** from wavelength is {smaller/decreased / shorter} (1) OR towards Earth (1)	 {blue shift / opposite of red shift} frequency is {larger / bigger / higher /increased} towards {'us' / (our) Sun} Max 1 mark if mark 2 and 3 contradict	**2**

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	**B** position **X**		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	Description to include: • magnify (1) second mark can only be scored if first mark is scored • image {of the Moon/formed by the objective lens} (1)	enlarge/make bigger etc ignore zoom/zoom in real/intermediate image image at X unqualified 'image' is insufficient ignore ideas of focusing	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	A description including any **three** of • make wave (on water surface) (1) • {look at / observe} movement of cork (1) • (if cork and wave move) in same directions, wave is longitudinal (1) • (if cork and wave move) at right angles then wave is transverse (1)	(cork moves) {horizontally /left and right} wave is longitudinal definition of longitudinal (cork moves) vertically /up and down wave is transverse definition of transverse full marks can be scored from a suitably labelled diagram	**(3)**

Question Number		Indicative Content	Mark
QWC	***5(b)(ii)**	An explanation including some of the following points (Changes are in bold type: reasons follow a bullet point) **changes** **detail** **reason** wavelength changes decreases (because) speed decreases direction changes towards because speed decreases the normal left hand end meets surface first **Relevant technical terms are refract and normal.** **One at least should be mentioned at levels 2 and 3 for full marks.** **Marks can be scored for the use of *v = f λ* in any relevant way such as linking 'slower *v'* to '*smaller λ'* by saying *v is proportional to λ (at constant f)*** **Notes**: • A correct unlabelled diagram can score up to 3 marks. • If conflict, between words and diagram go with words. • Ignore density arguments • If candidate contradicts the question and states that wave speed increases causing direction to change to (further) away from the normal or refract away from the normal, the maximum mark is level 1, 2 marks.	**(6)**

Level	**0**	No rewardable content
1	**1 - 2**	• a limited explanation including two simple changes OR one detailed change OR one simple change with a reason e.g. the wavelength changes and the direction changes OR the wavelength decreases OR the waves change direction because the speed is less • 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 explanation including one simple change, one detailed change AND a linked reason to either change e.g. the direction changes, the wavelength decreases because the waves slow down OR two detailed changes with reason not given/unclear for 3 marks e.g. the wavelength decreases and the wave bends towards the normal OR as shown on a diagram • 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 explanation including two detailed changes AND a reason for each. e.g. the wavelength decreases because the waves slow down and the wave bends towards the normal because the left hand side slows down first • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Question Number	Answer	Acceptable answers	Mark
6(a)	**D** outer core mantle crust		**1**

Question Number	Answer	Acceptable answers	Mark
6(b)	An explanation linking (tsunamis are) caused by {earthquakes/volcanoes} (1) and **any one** from (idea that earthquakes/volcanoes etc.) are unpredictable (1) OR (earthquakes occur/jolt/slip) under the {sea/ocean/water} (1)	{movement/slipping} of (tectonic) plates landslides tsunamis occur after earthquake/ meteorites (sudden) jolt/slip/random/occur at any time ignore tsunamis are unpredictable 'they' refers to tsunamis	**2**

Question Number	Answer	Acceptable answers	Mark
6(c)	one mark per box correctly filled distance from earthquake / km: 100, 300, **60** amplitude / mm: 1, 0.1, 2 magnitude: 3, **3**, **3**	accept for middle row 3: 2.8-3.2 inc. accept distance value for another earthquake with amplitude 2 (mm) (by eye) accept a distance value within approx. 10% (in range 55 to 65 inc. for 60)	**3**

Question Number		Indicative Content	Mark
QWC	***6(d)**	An explanation linking some of the following points (properties are in bold type: contributions to understanding follow a bullet point) **Properties** • Contribution to understanding **mention of P- being longitudinal** **mention of S- being transverse** **speed (unchanging) and reflection** • idea of echolocation / thickness of Earth's crust / detecting boundary layers e.g. mantle and (outer) core **speed (changing) and refraction** • understanding of change in density of rocks (in the Earth's interior) /detecting boundary layers eg mantle and (outer) core **{longitudinal /P-} can travel through solids AND liquids** • idea of internal volumes of liquid/liquid (outer) core / solid inner core • shadow zone /absence of P-waves on side of the Earth **{transverse /S-} can {only travel through solids/not travel through liquids}** • shadow zone /absence of S-waves on opposite side of the Earth (to source of the S-waves) • idea of internal volumes of liquid/idea of liquid (outer) core Note: • Some marks can be awarded based on labelled diagrams. Unless detailed annotation is present, marks for the diagram are limited to level 2. • If conflict, between words and diagram go with words.	**(6)**

Level	0	No rewardable content
1	1 - 2	• a limited explanation including at least two properties OR one property AND a possibly unconnected idea about the Earth's interior OR two vague and possibly unconnected ideas from contributions to understanding about the Earth's interior e.g. P-waves travel through solids and liquids, S-waves only travel in solids OR S-waves only travel through solids, the speed of waves change with density OR parts of the Earth are liquid and speed changes at different places inside the Earth. • 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 explanation including at least two properties and the contribution to understanding of one of them e.g. P-waves travel through solids and liquids. S-waves only travel in solids, showing that the (outer) core is liquid. OR {P/S/Seismic} waves will bounce back from a boundary. S-waves only travel in solids, showing that the (outer) core is liquid. • 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 explanation correctly linking at least two properties and their associated contributions to understanding. The examples chosen should include reference to both P-waves and S-waves. e.g. P-waves travel through solids and liquids and can be detected on the opposite side of the Earth. S-waves only travel in solids, showing that there is a liquid (outer) core. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

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