

Mark Scheme (Results)

Summer 2015

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.
- 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)	A transverse and electromagnetic		(1)

Question Number	Answer	Acceptable answers	Mark
1(b)	<p>Evaluation 171.5 (1)</p> <p>Substitution (34.3/171.5) x 100 (1)</p> <p>Evaluation 20 (%) (1)</p>	<p>award full marks for correct answer with no working</p> <p>34.3 x 5</p> <p>[34.3 / (34.3 x 5)] x 100</p> <p>[34.3 / (34.3 x 5)]</p> <p>[34.3 / 171.5]</p> <p>Allow 0.2 or 1/5 for 3 marks</p>	(3)

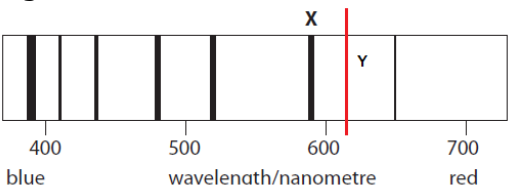
Question Number	Answer	Acceptable answers	Mark
1(c)	<p>rate of {energy/heat} (from the Sun){absorbed/taken in} (1)</p> <p>equals rate of {energy/heat} {radiated/emitted/given out}(1)</p>	<p>Allow 'energy in = energy out' for 1 mark</p> <p>'power in = power out' for 2 marks</p>	(2)

Question Number	Answer	Acceptable answers	Mark
1(d)	<p>Any two suggestions from:</p> <p>reflection (from external connections/plastic cover)(1)</p> <p>absorption by {external connection/ plastic cover/back plate} (1)</p> <p>transmission (through back plate) (1)</p>	<p>Not all energy absorbed by silicon layer/absorbed by wrong parts</p>	(2)

Total for Question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	Description including any two of: <ul style="list-style-type: none"> gravity (1) (causes the) nebula to collapse/contract (1) (causes the) temperature to increase (1) 	Pulls {particles/gas} together Forms protostar ke transferred to thermal energy KE/GPE -> thermal GPE -> KE until it was hot enough to start the reaction until fusion starts	(2)

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	D white dwarf		(1)

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	Y drawn anywhere to the right of X e.g. 	Accept any clear indication of where line should be line doesn't have to be labelled Reject lines both sides of X	(1)

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	explanation linking: <ul style="list-style-type: none"> (distant) galaxy <u>moving away</u> (1) (so) line shifted to longer λ (1) 	shifted to red/redshift/lower frequency λ (appears to be) increasing Do not allow: galaxy appears red λ and f contradictions	(2)

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	D ..is expanding ... did not have a beginning		(1)

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	Cosmic Microwave Background (Radiation)	[order of words unimportant] CMB(R) reject 'CMB and red shift'	(1)

Total for Question 2 = 8 marks

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	C The Earth is radiating heat to space		(1)

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	An explanation linking any 2 of: <ul style="list-style-type: none"> Hot material rises/cold material falls (1) (causes) material under the plate to move sideways (1) (because of) uneven heating (1) 	convection current in the {mantle/magma/under plates} heat from core warms mantle near core IGNORE temperature difference (in stem)	(2)

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	an explanation linking: <ul style="list-style-type: none"> change in wave speed (1) (with) change in {density/state of the rock/media/material} (1) 	Refraction S-waves reflected Accept change from solid to liquid or vice versa IGNORE reference to gas	(2)

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	suggestion to include: <ul style="list-style-type: none"> the time difference (1) of S and P waves {arriving/reaching /detected/recorded} (same place) (1) 	Allow P-waves travel faster ORA for 1 mark, if no other mark scored	(2)

Question Number	Answer	Acceptable answers	Mark
3(b)(iii)	<ul style="list-style-type: none"> • Identifies two points on the graph • Evidence of calculation or comparison to the equation • Draws a suitable conclusion 	<p>May be scored by points marked on graph</p> <p>Accept appropriate comment shape of graph e.g. Graph not straight at short distances or Graph nearly straight at long distances</p> <p>works better for long distances than short distances</p>	(3)

Total for Question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
4(a)	Any two suitable such as: <ul style="list-style-type: none"> • Measurements can be taken (1) • Permanent record/evidence (1) • Can be magnified (1) • Can detect waves outside visible part of spectrum (1) • Long exposure (to see faint objects/track objects) (1) 	<p>Analysis/compare</p> <p>'can record data' Taking photo is insufficient</p> <p>zoom in/show more detail</p> <p>can detect gamma rays, X-rays, ultraviolet, infrared</p> <p>Allow collect more light</p> <p>IGNORE better, brighter, clearer</p>	(2)

Question Number	Answer	Acceptable answers	Mark
4(b)	An explanation linking: <ul style="list-style-type: none"> • (Idea of) geocentric model believed initially (1) • Observation of moons orbiting Jupiter (rather than <u>Earth</u>) (1) • (Idea of) heliocentric model then preferred (1) 	<p>Initially everything {orbits/goes around} Earth</p> <p>Accept 'going around' for 'orbiting'</p> <p>Then everything {orbits/goes around} Sun</p> <p>Accept stopped believing geocentric Accept then not everything orbits the Earth</p>	(3)

Question Number	Answer	Acceptable answers	Mark
4(c)	B 20 cm		(1)

Question Number	Answer	Acceptable answers	Mark
4(d)(i)	Substitution $12/(14-12)$ (1) Evaluation 6.0 (1)	Award full marks for correct with no working Ignore any units	(2)

Question Number	Answer	Acceptable answers	Mark
4(d)(ii)	-12	Negative sign essential	(1)

Question Number	Answer	Acceptable answers	Mark
4(d)(iii)	Suggestion to include one of: <ul style="list-style-type: none"> Shows whether it is real or virtual (1) A positive sign for magnification indicates a {real image/inverted image/opposite side of lens to object} (1) 	Allow shows whether it is inverted or upright Allow shows which side of lens image is formed A negative sign for magnification indicates a {virtual image/upright image/same side of lens as object} IGNORE simple reference to magnification	(1)

Total for Question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)	D an ultraviolet wave		(1)

Question Number	Answer	Acceptable answers	Mark
5(b)	Ultraviolet (from lamp) <u>absorbed</u> (by fluorescent substance/bank note) (1) (which) emits {visible/light} (into eye) (1)	Allow UV for ultraviolet Allow 'taken in' for absorbed Allow 'given out'/releases/fluoresces for emits 'Fluoresces' on its own is insufficient Mention of both ultraviolet AND visible/light only, scores 1 mark only	(2)

Question Number	Answer	Acceptable answers	Mark
5(c)	Substitution (1) (Speed =) $6.67 \times 10^{14} \times 4.5 \times 10^{-7}$ Transposition AND substitution (1) (time =) $\frac{4 \times 10^{16}}{(6.67 \times 10^{14} \times 4.5 \times 10^{-7})}$ Evaluation (1) 1.33×10^8 (s)	Award full marks for correct answer with no working 3×10^8 (m/s) seen anywhere $\frac{4 \times 10^{16}}{3 \times 10^8}$ ECF candidate's speed maximum 2 marks Allow answers which round to 130 000 000 IGNORE Power of Ten error until evaluation	(3)

Question Number	Indicative Content	Mark
QWC	<p data-bbox="199 315 295 349">*5(d)</p> <p data-bbox="311 315 1102 349">An explanation including some of the following points</p> <ul data-bbox="363 387 1294 1021" style="list-style-type: none"> • Longitudinal {vibrations/oscillations} are {along/parallel to/in the same direction as} the direction of {travel/energy transfer} • Transverse {vibrations/oscillations} are {across/perpendicular to/90° to/right angles to} the direction of {travel/energy transfer} • Ultraviolet waves are transverse • Ultrasound waves are longitudinal (ignore sound – not on list) • Some seismic waves are longitudinal and some are transverse • P waves are longitudinal • S waves are transverse • Longitudinal waves need a material for the vibrations whereas electromagnetic waves can pass through a vacuum <p data-bbox="363 1059 783 1093">IGNORE irrelevant material</p>	(6)

Level	0	No rewardable content
1	1 - 2	<ul style="list-style-type: none"> • a limited explanation of: EITHER the {vibration/movement} direction and direction of {travel/movement} for transverse or longitudinal wave OR correctly identifying the wave type for at least one example from the list, e.g. <ul style="list-style-type: none"> ○ Longitudinal waves move in the same direction as the wave moves ○ Ultraviolet waves are transverse • the answer communicates ideas using simple language and uses limited scientific terminology
2	3 - 4	<ul style="list-style-type: none"> • a simple explanation linking: EITHER directions of {<u>vibration/oscillation</u>} and wave travel for both types of wave OR direction of {<u>vibration/oscillation</u>} and wave travel of one type of wave with at least one example of a wave from the list OR the direction of 'movement' and direction of {travel/movement} for transverse AND longitudinal waves AND correctly identifying the wave type for at least one example from the list e.g. <ul style="list-style-type: none"> ○ In longitudinal waves the vibrations are in the same direction as the wave travels. In transverse waves the vibrations are at right angles to the direction the wave travels. ○ In longitudinal waves the vibrations are in the same direction as the wave travels. Ultraviolet waves are transverse. ○ Longitudinal waves move in the same direction as the wave moves. Transverse waves move at right angles to the direction the wave moves. Ultrasound waves are longitudinal. • 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	<ul style="list-style-type: none"> • a detailed explanation clearly differentiating between the directions of {<u>vibration/oscillation</u>} for longitudinal AND transverse waves AND at least one example of <u>each type of wave</u> from the list, e.g. <ul style="list-style-type: none"> ○ In longitudinal waves the vibrations are in the same direction as the wave travels. In transverse waves the vibrations are at right angles to the direction the wave travels. Ultrasound waves are longitudinal and ultraviolet waves are transverse. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Total for Question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	<p>Substitution (1) $2900 = 230 \times \text{current}$</p> <p>Transposition (1) $\frac{2900}{230}$</p> <p>Evaluation (1) 13 (A)</p>	<p>Award full marks for correct answer with no working</p> <p>Allow substitution and transposition in either order</p> <p>Ignore powers of ten errors until evaluation</p> <p>Allow numbers which round up to 13</p>	(3)

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	<p>Substitution (1) $97 = 2.9 \times \text{time} \times 17$</p> <p>Transposition (1) $\frac{97}{2.9 \times 17} \quad \text{OR} \quad \frac{97}{49.3}$</p> <p>Evaluation (1) 2.0 (h)</p>	<p>Award full marks for correct answer with no working</p> <p>Allow substitution and transposition in either order</p> <p>Ignore powers of ten errors until evaluation</p> <p>Allow $\frac{97}{17} = 5.7$ for 1 mark</p> <p>Allow numbers which round up to 2.0</p>	(3)

Question Number	Indicative Content	Mark
QWC * 6(b)	<p>An explanation including some of the following points</p> <ul style="list-style-type: none"> • a current/voltage/emf is induced when there is relative movement between a magnet and a coil of wire • the current is bigger when the movement is faster • the current is alternating/regularly changing direction • the current is zero when the magnet is not moving • points P and R on the graph correspond to the fastest movement of the magnet • the magnet is changing direction at points O, Q, S on the graph (quoting positive and negative current values from graph is sufficient to indicate a change in direction of current on graph) • the magnet is at the top/bottom of its movement at points O, Q, S on the graph • the magnet is not moving at points O, Q, S on the graph <p>IGNORE references to number of turns or stronger magnet</p>	(6)

Level	0	No rewardable content
1	1 - 2	<ul style="list-style-type: none"> a limited explanation linking induced current to idea of <u>movement</u> of magnet OR limited reference linking graph to type of current with no link to model e.g. magnet moving in coil (induces a current) / (magnetic) field lines cut coil OR (the graph shows) an alternating current spelling, punctuation and grammar are used with limited accuracy the answer communicates ideas using simple language and uses limited scientific terminology
2	3 - 4	<ul style="list-style-type: none"> a simple explanation linking the motion of the magnet to the size/direction of the induced current OR {a limited explanation linking induced current to idea of <u>movement</u> of magnet AND limited reference linking graph to type of current with no link to model} e.g. Magnet moving in the coil induces a current. The faster it moves the bigger the induced current. OR Magnet moving in the coil induces a current. When the magnet changes direction, the current changes direction. OR Magnet moving in the coil induces a current. The graphs shows an alternating current. OR Magnet moving in the coil induces a current. The current is positive at P and negative at R. the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately
3	5 - 6	<ul style="list-style-type: none"> a detailed explanation linking the motion of the magnet to the size/direction of the induced current AND reference to graph for one factor e.g. Magnet moving in the coil induces a current. The faster it moves the bigger the induced current. The magnet is moving fastest at point P on the graph. OR Magnet moving in the coil induces a current. When the magnet changes direction the current changes direction. At P and R the magnet is moving in opposite directions. OR Magnet moving in the coil induces a current. The current is positive at P and negative at R. The magnet is moving up at P and down at R. the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately spelling, punctuation and grammar are used with few errors

Total for Question 6 = 12 marks

