

Pearson
Edexcel

Mark Scheme (Results)

November 2020

Pearson Edexcel GCSE
In Physics (1PH0) Paper 1F

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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.

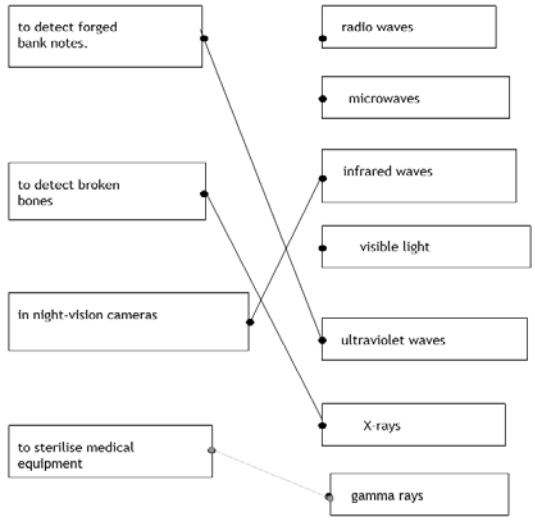
Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1*		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

*there will be situations where an AO1 question will include elements of recall of knowledge directly from the specification (up to a maximum of 15%). These will be identified by an asterisk in the mark scheme.

Question number	Answer	Additional guidance	Mark
1(a)		award 1 mark for each line from the three left-hand boxes more than one line from a box loses the mark for that box	(3)

Question number	Answer	Mark
1(b)	☒ **A** blue Green, orange and yellow all have a lower frequency than blue	(1)

Question number	Answer	Additional guidance	Mark
1(c)	a description to include two of the following: increases (at first) (1) reaches a peak (1) (then) decreases (1)	 is brightest at **410** (nm)	(2)

(Total for Question 1 = 6 marks)

Question number	Answer	Mark
2(a)(i)	☒ **C** $F = m \times a$ A, B and D have incorrect mathematical operator	(1)

Question number	Answer	Additional guidance	Mark
2(a)(ii)	140 (1) N (1)	no ecf from 2ai independent mark allow newton(s) n do **not** allow Ns ns	(2)

Question number	Answer	Additional guidance	Mark
2(b)	substitution (1) (average speed =) $\frac{1200}{80}$ evaluation (1) 15 (m/s)	 award full marks for the correct answer without working	(2)

Question number	Answer	Additional guidance	Mark
2(c)	any two from: measure {distance / length of pace} (1) use marks on the track (1) use an electronic timer (1) stand midway between the posts/stand closer to a post (1) place posts further apart/increase distance used or measured (1) use 2 people in the timing (1)	Suitable measuring device including trundle wheel / tape/ GPS light gate(s) idea of reducing systematic error such as parallax Do NOT credit repeats	**(2)**

(Total for Question 2 = 7 marks)

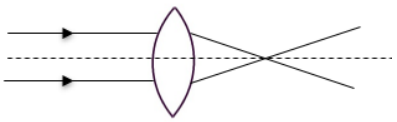
Question number	Answer	Mark
3(a)	☒ **C** Neptune	**(1)**

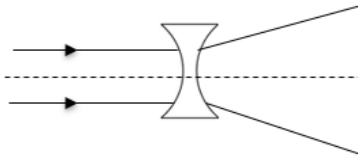
Question number	Answer	Additional guidance	Mark
3(b)	(i) planet (1) (ii) satellite (1) (iii) star (1)	in this order accept recognisable spellings	**(3)**

Question number	Answer	Additional guidance	Mark
3(c)(i)	1900 (N)	allow 1862 1864 190 × 10 190 × 9.8(1)	**(1)**

Question number	Answer	Additional guidance	Mark
3(c)(ii)	rearrangement (1) $\frac{700}{190}$ evaluation (1) 3.7 (N/kg)	(g =) $\frac{W}{m}$ allow numbers that round up to 3.7 (N/kg) award full marks for the correct answer without working	**(2)**

(Total for Question 3 = 7 marks)

Question number	Answer	Additional guidance	Mark
4(a)(i)	rays converging	 arrows not needed	**(1)**

Question number	Answer	Additional guidance	Mark
4(a)(ii)	rays diverging	 arrows not needed award 1mark if convergence and divergence are shown but with the wrong lenses	**(1)**

Question number	Answer	Additional guidance	Mark
4(a)(iii)	substitution (1) $\frac{1}{25(\times 10^{-2})}$ evaluation (1) 4(.0)	or 0.04 seen ignore powers of ten until evaluation award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
4(b)(i)	line shown on graph from intersection of two curves (1) answer in range 11 – 13 (minutes) inclusive (1)	 award full marks for the correct answer without working	**(2)**

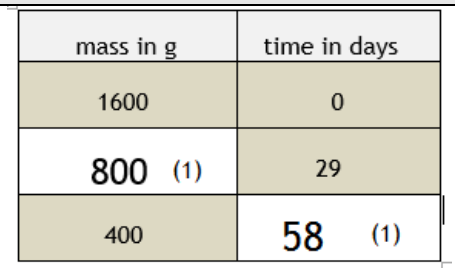
Question number	Answer	Mark
4(b)(ii)	☒ **C** 10 °C	(1)

Question number	Answer	Additional guidance	Mark
4(b)(iii)	an explanation linking: the gradient for **P** is greater/steeper than the gradient for **Q** (1) (because) **P**/black is a better emitter (of radiation) (than **Q**/white) (1)	 **P** cools quicker than **Q** **P** loses thermal energy/heat quicker than **Q** allow reverse arguments credit answers in terms of absorption in this context	(2)

(Total for Question 4 = 9 marks)

Question number	Answer	Mark
5(a)(i)	☒ **A** 38 B is number of neutrons C is mass number D is an irrelevant addition of two numbers	**(1)**

Question number	Answer	Mark
5(a)(ii)	☒ **B** 52 A is number of protons C is mass number D is an irrelevant addition of two numbers	**(1)**

Question number	Answer	Additional guidance	Mark
5(b)		numbers in correct boxes	**(2)**

Question number	Answer	Additional guidance	Mark
5(c)(i)	Geiger-Müller tube	accept Geiger (counter) geiger (counter) GM (tube) gm(tube) accept any recognisable (phonetic) spelling	**(1)**

Question number	Answer	Additional guidance	Mark
5(c)(ii)	any **two** from: keep a safe distance (1) point the source away from people (1) handle the source with tongs/at a distance (1) limit exposure time/return source to store (asap) (1) use shielding (1) use of gloves (1) use of mask (1) protective clothing (1) wear a film badge/monitor (1)	use of screen Do not credit goggles	**(2)**

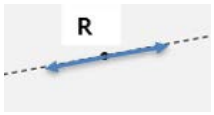
Question number	Answer	Additional guidance	Mark
5(c)(iii)	a description to include four from: take measurement without source (1) place source in front of/near/close to detector (1) increase the distance (between source and detector) (1) measure distance (from source to detector) (1) take reading from the screen/counter (1) until reading gets to background value /constant value (1) use same time for each count (1) repeat / check when down to low values (1)	 measure/account for background (count) DO NOT allow 'inside' allow reverse argument by starting with detector long way away from source allow zero as constant value mention of (count) <u>rate</u>	**(4)**

(Total for Question 5 = 11 marks)

Question number	Answer	Additional guidance	Mark
6(a)(i)	**one** from: radio(wave) (1) micro(wave) (1) infrared (1) visible (light) (1) ultraviolet (1) X(-ray) (1) gamma (rays) (1) electromagnetic/em wave(s) seismic **S**(-wave)	Do not credit if sound waves also mentioned γ earthquake **S**(-wave)	**(1)**

Question number	Answer	Additional guidance	Mark
6(a)(ii)	$\frac{32}{\text{number of wavelengths}}$ (1) $\frac{32}{10}$ evaluation (1) 3.2 (m)	 accept 9 or 11 for 10 no ecf from mp1 3.6 (3.5r) or 2.9(1) award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
6(a)(iii)	substitution (1) $\frac{12}{15}$ evaluation (1) 0.8(0) (Hz)	 award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
6(b)(i)	at least one arrow in the direction QS (1) two arrows in opposite directions (1)	allow arrows parallel to QS independent mark  scores 2 marks two arrows in opposite directions but perpendicular to QS scores 1 mark maximum	**(2)**

Question number	Answer	Additional guidance	Mark
6(b)(ii)	converts 7 km/s to 7000 m/s (1) substitution (1) $\frac{7(\times 10^3)}{12}$ evaluation (1) 580 (m)	7000 seen (1) allow numbers that round down to 580 such as 583.33…. 5.8 to any incorrect power of ten scores 2 marks award full marks for the correct answer without working	**(3)**

Question number	Answer	Additional guidance	Mark
6(c)	an explanation to include two from: waves cannot be seen (on arrival) (1) person will need another way of detecting the waves (1) (as) a person cannot count to 12 in one second / at a rate of 12 per second (1) <u>frequency</u> too high (1)	idea of coming too fast to count / easy to lose count	**(2)**

(Total for Question 6 = 12 marks)

Question number	Answer	Additional guidance	Mark
7(a)	split (1) neutrons (1) chain (1)	in this order	**(3)**

Question number	Answer	Additional guidance	Mark
7(b)	$\frac{45\,000}{5}$ (1) 9000 (kg) (1)	 award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
7(c)	using nuclear fuel: radioactive substances (1) burning oil: carbon dioxide (1)	 named radioactive substance / nuclear waste greenhouse gases named pollutant toxic/poisonous gases atmospheric pollutant / acid rain	**(2)**

Question number	Indicative content	Mark
*7(d)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO3 strand 1 (3 marks)** • americium emits alpha • cobalt emits gamma • americium has long(est) half-life • actinium has short(est) half-life **AO2 strand 1 (3 marks)** • alpha is the better ioniser • gamma is weakly ionising • alpha allows electricity to flow • alpha cannot get out of detector • gamma can get out of detector • americium won't run out • actinium would run out	**(6)**

Level	Mark	Descriptor
	0	• No awardable content
Level 1	1–2	• Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	• Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	• Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)

SUMMARY, for guidance

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance Elements of physics, i.e isolated fact from knowledge or table	Possible candidate responses americium emits alpha OR alpha needed for smoke detector
Level 2	3–4	Additional guidance Some understanding shown, i.e. link between fact from table and fact from knowledge	Possible candidate responses americium emits alpha that can't get out of the detector **OR** two facts (from either table of knowledge) americium emits alpha and has the long(est) half-life
Level 3	5–6	Additional guidance Understanding is detailed and fully developed, i.e. link between fact from table and fact from knowledge **AND** second fact (from either table or knowledge	Possible candidate responses americium emits alpha that can't get out of the detector AND americium has the long(est) half-life

(Total for Question 7 = 13 marks)

Question number	Answer	Additional guidance	Mark
8 (a)	A description to include: mention relevant energy store such as GPE or chemical (1) 'correct' transfer in context (1)	 allow KE or mechanical or thermal or heat chemical to (G)PE or chemical to KE (in lifting) allow misread GPE to KE/thermal on <u>slope</u> Allow KE to GPE in lifting	**(2)**

Question number	Answer	Additional guidance	Mark
8 (b)	A description to include: measurement of (relevant) distance (1) measurement of (relevant) time (1) use of speed = $\frac{\text{distance}}{\text{time}}$ (1) detail (1)	 one of distance down slope or distance along bench or length of toy car/card ‘record the distance the car travels and time it’ scores 2 marks for example: speed down slope × 2 mark distance along bench use a light gate speed gun at the bottom of the slope repeating AND averaging	**(4)**

Question number	Answer	Additional guidance	Mark
8 (c)	(vertical) height of slope (1) mass (of the toy car) (1)	 allow (in this context) weight if no other mark scored allow 1 mark for quoting either equation (Δ)GPE =mgh OR KE = ½ mv^2	**(2)**

Question number	Answer	Additional guidance	Mark
8 (d)	(original) GPE – KE (at bottom) (1)	allow (idea of) input – output allow wrong way round (eg output-input)	**(1)**

Question number	Answer	Additional guidance	Mark
8(e)	An explanation linking: lubricate/oil the wheels (1) (to) reduce friction (1)	 make the toy car more streamlined / different surface / lubricate slope reduce air resistance / drag accept start from lower down the slope (1) (to) reduce the total amount of energy (transfer) (1)	**(2)**

(Total for Question 8 = 11 marks)

Question number	Answer	Mark
9 (a)	☒ **B** force Options A, C and D are all scalars.	(1)

Question number	Answer	Additional guidance	Mark
9 (b)(i)	acceleration = $\frac{\text{change in velocity}}{\text{time (taken)}}$	$a = \frac{v-u}{t}$ $a = \frac{\Delta v}{t}$ $\frac{v}{t}$ allow correct rearrangements seen here or in bii	(1)

Question number	Answer	Additional guidance	Mark
9 (b)(ii)	substitution (1) $\frac{20 - 2}{12}$ evaluation (1) 1.5 (m/s^2)	$\frac{18}{12}$ -1.5 (m/s^2) award full marks (1 in bi and 2 in bii) for the correct answer without working, award 1 mark if 20-2 or 18 or 2-20 is seen and no other marks are scored If (incorrectly) $a = \frac{v^2 - u^2}{t}$ given in 3bi $a = \frac{20^2 - 2^2}{12}$ OR = 33 scores 1 mark	(2)

Question number	Answer	Additional guidance	Mark
9 (c)	distance = area under graph (1) ½ × 7 × 15 (1) 52(.5) (m) (1)	attempt to find area seen on graph correct area(s) identified including calculation 53 (m) allow 7 × 15 or 105 for 1 mark only award full marks for the correct answer with no working	**(3)**

Question number	Indicative content	Mark
*9(d)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 strand 1 (6 marks)** factors concerning driver • change in reaction time • tiredness • effect of drugs • type of footwear • how hard the driver presses the pedal effect of any of the above on stopping distance, • increased stopping distance • increased thinking distance • increased reaction time factors concerning car or road • mass / weight of car • speed of car • state of brakes • state of tyres • state of road effect of any of the above on stopping distance, e.g. • increased thinking/braking distance • increased stopping distance	**(6)**

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

SUMMARY, for guidance

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance Elements of physics, i.e. isolated factor(s) about **either** car **or** driver	Possible candidate responses worn tyres / tired driver worn tyres and icy road
Level 2	3–4	Additional guidance Some understanding shown, i.e. **either** link between factor and effect **or** a driver factor **and** a car factor	Possible candidate responses worn tyres cause increased stopping distance. **or** worn tyres and tired driver
Level 3	5–6	Additional guidance Understanding is detailed and fully developed, i.e. link between factor and effect - both for driver **AND** for car	Possible candidate responses worn tyre causes increased stopping distance. **and** tired driver causes increased stopping distance

(Total for Question 9 = 13 marks)

Question number	Answer	Additional guidance	Mark
10 (a)	substitution (1) $\frac{3.4\ (\times 10^{29})}{2.0\ (\times 10^{30})}$ evaluation (1) 0.17	 award 1 mark for 1.7 to any incorrect power of 10 ignore any units given award full marks for the correct answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
10(b)(i)	accept any temperature between 5500 and 7500 (K) (1)		**(1)**

Question number	Answer	Additional guidance	Mark
10(b)(ii)	the higher the brightness the greater the temperature	or reverse argument allow luminosity for brightness allow heat for temperature	**(1)**

Question number	Answer	Additional guidance	Mark
10(b)(iii)	the greater the mass the higher the brightness	or reverse argument allow luminosity for brightness allow bigger/ heavier for greater mass in this context	**(1)**

Question number	Answer	Additional guidance
10 (c)	A description to include any three of the following (smaller) nuclei / atoms / particles (1) come together / join (1) to produce a larger nucleus / atom / particle (1) needing high temperature / pressure (1) overcoming repulsion (between nuclei) (1) energy released (1)	 two named eg hydrogen (nuclei) allow fuse not 'bond' helium for nucleus accept fast (moving) nuclei ignore energy created

Question number	Answer	Additional guidance	Mark
10 (d)	An explanation to include any three from: nebula as a cloud of gas/dust (1) gas / atoms pulled together / towards each other (1) by gravitational force (1) temperature increase (1) hot enough for nuclear fusion (1)	 density increase gravity (acting) (resultant) heating s	**(3)**

(Total for Question 10 = 11 marks)