

OXFORD

**INTERNATIONAL
AQA EXAMINATIONS**

INTERNATIONAL GCSE COMBINED SCIENCE 9204/PC

Paper 3 Physics Core

Mark scheme

June 2019

Version: 1.0 Final



Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from oxfordaqaexams.org.uk

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

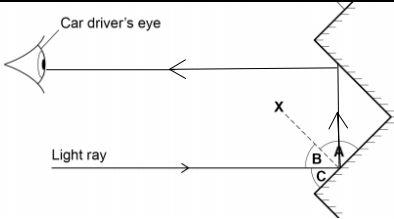
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	a vector quantity has magnitude and direction		1	AO1 3.17.1d
01.2	acceleration		1	AO1 3.17.1d
01.3	5.5 (N)		1	AO2 3.17.1e
01.4	gravitational field strength is less on the Moon		1	AO3 3.17.1e
01.5	a moon orbits a planet	allow planets orbit the Sun and moons do not	1	AO1 3.24.2a
	a moon is smaller than a planet		1	
01.6	comets		1	AO1 3.24.2a
	star		1	
01.7	Milky Way		1	AO1 3.24.2b
Total			9	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	resultant force = 508 N – 343 N		1	AO2 3.17.1b
	resultant force = 165 N		1	
02.2	$a = \frac{6.0}{4.0}$	an answer of 1.5 (m/s ²) scores 2 marks	1	AO2 3.17.3d
	$a = 1.5 \text{ (m/s}^2\text{)}$		1	
02.3	$E_k = \frac{1}{2} \times 110 \times 6.0^2$	an answer of 1980 (J) or 2000 (J) scores 2 marks	1	AO2 3.17.3h
	$E_k = 1980 \text{ (J)}$		1	
02.4	resultant force is backwards	allow there is no forwards force allow the only (horizontal) force is friction	1	AO1/AO2 3.17.3h
	therefore acceleration / deceleration is in the direction of the resultant / frictional force		1	
02.5	stopping distance increases	allow less grip / traction for less friction allow the road is slippery	1	AO1/AO2 3.17.4e
	because there is less friction between the tyres and the road (when the road is wet)		1	
02.6	normal		1	AO1 3.19.4b
02.7	B		1	AO1 3.19.4a

02.8	45°	allow 44° to 46° allow ecf from 02.7	1	AO2 3.19.4a
02.9	 <p>ray reflects off the two 'mirrors'</p> <p>up to top mirror and reflects parallel to original ray</p> <p>angle of incidence = angle of reflection</p>	judged by eye	1 1 1	AO1/AO2 3.19.4a
Total			16	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	mass added to the string		1	AO4 3.18.2c
03.2	$\frac{1.0}{16}$ = 0.0625	an answer of 0.06 / 0.0625 / 0.063 scores 2 marks $\frac{1.0}{16} \times 100\%$ = 6.25 %	1 1	AO2 3.18.2e
03.3	x-axis labelled mass in kg and y-axis labelled efficiency all points plotted correctly a curved line of best fit passing within 1 mm of all points	allow 1 mark for 3 correctly plotted points	1 2 1	AO2 3.18.2c
03.4	as mass increases efficiency increases efficiency reaches a maximum value or becomes constant at a mass of 0.6 kg	allow efficiency of 0.13 for mass of 0.6 kg allow the relationship is non-linear/not directly proportional	1 1	AO3 3.18.2c
03.5	the energy heats the surroundings		1	AO1 3.18.2d

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03.6	greater		1	AO3 3.18.1f
	greater		1	
03.7	$P = \frac{16}{0.80}$	an answer of 20 (W) scores 2 marks	1	AO2 3.18.1f
	20 (W)		1	
Total			14	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	they do not contribute to global warming	allow do not add to the greenhouse effect allow reduces air pollution	1	AO1 3.18.3c
04.2	the car needs charging twice $40 \times 2 \times 0.2$ \$16	an answer of \$16 scores 3 marks allow 2 marks if \$8 is given as the cost of charging the car once	1 1 1	AO2 3.22.3f
04.3	the petrol car needs to be filled with fuel less often than the electric car needs to be charged. it takes less time to fill a petrol car with fuel than to charge an electric car.		1 1	AO3 3.18.3a/c
04.4	car is stationary for 160 s between B and C car is stationary for 80 s between D and E total time = 240 s	allow a range of 140 s to 180 s allow a range of 60 s to 100 s allow an answer in the range 200 s to 280 s consistent with their allowed readings	1 1 1	AO2 3.17.2b
04.5	C to D the gradient is steepest	allow greatest distance travelled per unit time	1 1	AO1/AO2 3.17.2b

04.6	time = 980 s and distance = 10 000 m	an answer of 10.2 /10 (m/s) scores 3 marks	1	AO2 3.17.2c/d	
	average speed = $\frac{10000}{980}$	allow a range of 970 s to 990 s and a range of 9900 m to 10100 m			1
	average speed = 10.2 (m/s)	allow a correct substitution of incorrectly read values from the graph			1
Total			14		

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Question	Answers	Extra information	Mark	AO / Spec. Ref.	
05.1	1.2 (A)		1	AO2 3.21.1o	
05.2	6.0 (V)		1	AO1 3.21.1o	
05.3	$R = \frac{6.0}{1.2}$ R = 5.0 (Ω)	an answer of 5.0 (Ω) scores 2 marks allow ecf from 05.1 and 05.2	1	AO2 3.21.1g	
			1		
05.4		Effect	Reason	5	AO1 3.21.1g/n/o
	Resistance	increases	in series, the total resistance is the sum of the resistances		
	Current	decreases	when resistance increases, current decreases		
	Potential difference across Y	decreases	in series, supply pd is shared between resistors		
Total			9		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	decommissioning costs are high		1	AO3 3.18.3c
	radioactive waste is produced and is difficult to dispose of		1	
06.2	the splitting of a large (unstable) nucleus	do not allow atom / particle / molecule for nucleus	1	AO1 3.23.3a
06.3	number of protons = 55		1	AO1/AO2 3.23.1f
	number of neutrons = 82		1	
06.4	concrete can withstand very high temperatures		1	AO3 3.23.3d
	concrete has lower density so the lower mass is easier to move		1	
06.5	number of nuclear power stations = $\frac{30}{100} \times 450$		1	AO2 3.18.3c
	= 135		1	
06.6	any two from: <ul style="list-style-type: none"> • demand for power in has increased • nuclear power is more reliable than most renewable sources • current power stations need replacing • to conserve supplies of fossil fuel • lower / no carbon dioxide emissions 	allow higher population	2	AO3 3.18.3c
Total			11	
Question	Answers		Mark	AO / Spec. Ref.

07.1	Level 3: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO4 3.20.2c/d
	Level 2: The design/plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	<p>Indicative content</p> <p>Measurements</p> <ul style="list-style-type: none"> • time using a timer / stopwatch • temperature using a thermometer • record starting temperature • record temperature after 5 minutes • vary the starting temperature <p>Control variables</p> <ul style="list-style-type: none"> • volume of water • sensible suggestion of volume eg 200 ml • volume / surface area of the beaker • material of the beaker <p>Safety</p> <ul style="list-style-type: none"> • hot water • risk of burns • glass risk of breakage • risk of cuts <p>To access level 3 students must correctly describe the use of a thermometer and stop watch and mention at least one control variable</p>		

07.2	1 °C		1	AO4 3.20.2d
07.3	<p>the greater the starting temperature the greater the temperature change</p> <p>so the rate of cooling increases when the starting temperature is greater</p>	<p>allow converse</p> <p>an explanation of how the difference in temperature between the water and the surroundings affects rate of cooling can score 2 marks</p>	<p>1</p> <p>1</p>	AO3 3.20.2d
07.4	<p>shiny surfaces are poor emitters / good reflectors (of radiation)</p> <p>so the rate of energy transfer is reduced</p>	allow converse for matt, black surfaces	<p>1</p> <p>1</p>	AO2/AO1 3.20.2a
Total			11	

08.3	12 kHz = 12 000 Hz	an answer of 336 (m/s) or 340 (m/s) scores 4 marks	1	AO2 3.19.1h
	2.8 cm = 0.028 m		1	
	speed = 12 000 × 0.028	allow correct substitution of incorrectly/not converted values for frequency and wavelength	1	
	speed = 336 (m/s)	allow a correctly calculated answer using incorrectly/not converted values for frequency and wavelength	1	
08.4	to calculate a mean		1	AO3 3.19.3c
	which reduces the effect of random errors	allow to identify anomalous results	1	
08.5	improvement : use a greater distance	do not allow stand closer to the wall	1	AO4 3.19.3c
	reason: reduces the effect of timing errors starting and stopping the stop watch OR improvement: electronic sensor/timer that calculates the time automatically (1) reason: avoids reaction time errors (1)		1	
Total			16	