

OXFORD

INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL GCSE

COMBINED SCIENCE DOUBLE AWARD PHYSICS

9204/PE

PAPER 3 – EXTENSION TIER

Mark scheme

Specimen material

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.

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.

Question 1

Question	Answers	Extra information	Mark
01.1	neutrons and protons		1
01.2	polonium-213 has (three more neutrons in its nucleus)		1
01.3	it is a gamma emitter so the radiation will be detectable outside the body		1
	it has a short half-life so will not remain radioactive for a long time		1
01.4	18		1
01.5	systematic	allow zero error	1
01.6	alpha radiation has a very short range (in air) so reading would be zero/18 at 0.4m		1
01.7	points plotted correctly		2
	line of best fit drawn correctly		1
Total			10

Question 2

Question	Answers	Extra information		Mark
02.1	Examiners should also refer to the information on page 3.			6
0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)	
No relevant content.	Simple statements are made which demonstrate some understanding of some of the relevant scientific techniques and procedures. The response may lack a logical structure and would not lead to the production of valid results.	A coherent method is described with relevant detail, which demonstrates a broad understanding of the relevant techniques and procedures. The steps in the method are logically ordered. The method would lead to the production of valid results.	A coherent method is described with relevant detail, which demonstrates a broad understanding of the relevant techniques and procedures. The steps in the method are logically ordered. The method would lead to the production of valid results.	
<p>Indicative content</p> <p>Equipment Measuring cylinder, stop watch, thermometer, cups.</p> <p>Variables Independent variable – Cup Dependent variable – Temperature change Control variables(s)– mass/volume/amount of water, starting temperature.</p> <p>Method Measure temperature change in a given time Measure time taken for a given temperature change</p>				
02.2	table with heading of Time and Temperature change			1
	units of time (s) or (min) and units of temperature (°C) or (K)			1
02.3	spot anomalous results			1
	take a mean of results to reduce the effect of anomalous results	allow take a mean of results		1
Total				10

Question 3

Question	Answers	Extra information	Mark
03.1	frequency		1
03.2	echoes		1
03.3	25 000 × 0.0136 340 (m/s)	allow 340 (m/s) with no working shown for 2 marks allow 0.34 for 1 mark	1 1
03.4	(a wave where the) oscillations are parallel to the direction of energy transfer causing (areas of) compression and rarefaction	allow correct description in terms of particles	1 1
03.5	use of infrared any one from: <ul style="list-style-type: none"> • remote controls • fibre optic (communications). use of microwaves any one from: <ul style="list-style-type: none"> • mobile/cell phones • satellite (communications/ TV) • wi-fi • Bluetooth. 		1 1

MARK SCHEME – INTERNATIONAL GCSE COMBINED SCIENCE DOUBLE AWARD
PHYSICS – EXTENSION TIER – SPECIMEN MATERIAL

Question	Answers	Extra information	Mark
03.6	any two from: <ul style="list-style-type: none">• same speed or travel at the speed of light (in a vacuum)• transverse• transfer energy (from one place to another)• can be reflected• can be refracted• can be diffracted• can be absorbed/ transmitted• can travel through a vacuum/space• can be polarised.	allow a full description of a transverse wave	2
Total			10

Question 4

Question	Answers	Extra information	Mark
04.1	only the particles with the most energy leave the surface	allow water for sweat allow fastest particles	1
	this reduces the (average) energy (of the remaining particles)		1
	(and hence) the temperature of the sweat decreases		1
	the sweat will now be at a lower temperature than the skin		1
04.2	any two from: <ul style="list-style-type: none"> • increased speed of air flow across the skin • increased surface area • decreased humidity. 	allow there is a wind/draught allow a description of humidity	2
04.3	hot air rises or cold air falls		1
	(close to the ceiling) the air conditioner collects warmer air		1
04.4	$6000 = m \times 1250 \times 15$		1
	$m = 6000 / 1250 \times 15$		1
	0.32 kg	allow 0.32 kg with no working shown for 3 marks	1
Total			11

Question 5

Question	Answers	Extra information	Mark
05.1	dc flows in (only) one direction		1
	ac changes direction (twice every cycle)		1
05.2	case is plastic		1
	which is an insulator/does not conduct electricity		1
05.3	S ₁ only		1
	S ₁ and S ₂		1
05.4	S ₁ must be on (for either heater to work)		1
	S ₁ switches the fan on		1
05.5	Power = 6.5 x 230		1
	1 500 (W)	allow 1 495 (W) allow 1 500 (W) with no working shown for 2 marks	1
Total			10

Question 6

Question	Answers	Extra information	Mark
06.1	acceleration		1
06.2	L		1
06.3	mass of chest pack = $54 / 9.8$ 5.5 (kg)	allow 5.5 (kg) with no working shown for 2 marks	1 1
06.4	$0 < a < 10$ some upward force reduced resultant force	allow some drag or air resistance	1 1 1
06.5	A – B velocity/speed increases C – D velocity/speed is constant		1 1
06.6	$2000/80 = 25$ (m/s)		1
Total			10

Question 7

Question	Answers	Extra information	Mark
07.1	nuclear reactor star		1 1
07.2	nuclei are joined (not split)	allow converse for nuclear fission do not accept atoms are joined	1
07.3	any four from: <ul style="list-style-type: none"> • neutron • (neutron) absorbed by U (nucleus) • forms a larger nucleus • (this larger nucleus is) unstable • (larger nucleus) splits into two (smaller) nuclei / into Ba and Kr • releasing three neutrons and energy. 	ignore atom do not accept reacts do not accept added to allow fast moving for energy	4
07.4	56 (Ba) 57 (La) ${}_{-1}^0\beta$	if proton number of Ba is incorrect, allow this mark if proton number of La is 1 greater allow e for β allow ${}_{56}^{139}\text{Ba} \longrightarrow {}_{57}^{139}\text{La} + {}_{-1}^0\beta$ for 3 marks	1 1 1
Total			10

Question 8

Question	Answers	Extra information	Mark
08.1	the oscillation/vibration (causing the wave)		1
	for a transverse wave is perpendicular to the direction of energy transfer		1
	and for a longitudinal wave is parallel to the direction of energy transfer	the marks may be scored by the drawing of two correctly labelled diagrams if no marks awarded allow 1 mark for correctly linking perpendicular with transverse and parallel with longitudinal	1
08.2	frequency		1
08.3	10^{-15} to 10^4		1
08.4	$3.0 \times 10^8/1500$		1
	2.0×10^5 (Hz)		1
08.5	skin cancer or blindness		1
08.6	risk of cancer very low		1
Total			9

Question 9

Question	Answers	Extra information	Mark
09.1	raising the temperature of the surroundings		1
09.2	80%/0.8		3
09.3	230 x 2000 460 000 (J)	allow 460 000 (J) with no working shown for 2 marks	1 1
09.4	3000 = 460000 / t t = 460000 / 3000 153.333333 (s) 150 (s)	allow 150 (s) with no working shown for 4 marks	1 1 1 1
Total			10

Question 10

Question	Answers	Extra information	Mark
10.1	light dependent resistor/LDR		1
10.2	25 (k Ω)		1
10.3	voltmeter reading = $0.0002 \times 25\,000$ 5 (V)	allow 5 (V) with no working shown for 2 marks	1 1
10.4	linear scale using all of the available axis, must cover the range 4 - 6 v negative gradient line passing through 20 lux and their 10.3	only scores if the first mark is awarded only scores if line does not go above 6 volts	1 1
10.5	37.5 (k Ω)		2
10.6	light intensity value would be unreliable/not accurate due to variation in resistance value		1 1
Total			10

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