SPECIMEN MATERIAL

GCSE
PHYSICS

PAPER 1H

Mark scheme

Specimen 2018

Version 1.0

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 aqa.org.uk

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening and underlining

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working.

Full marks can however be given for a correct numerical answer, without any working shown.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

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.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

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

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	range of speeds moving in different directions	 accept random motion	1 1	AO1/1 4.3.3.1
01.2	internal energy		1	AO1/1 4.3.2.1
01.3	density = mass / volume		1	AO1/1 4.3.1.1
01.4	0.00254/0.0141 0.18 kg/m^3	 accept 0.18 with no working for the **2** calculation marks	1 1 1	AO2/1 AO2/1 AO1/1 4.3.1.1
Total			**7**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2	**Level 3:** A detailed and coherent explanation is provided. The student gives examples that argue a strong case and demonstrate deep knowledge. The student makes logical links between clearly identified, relevant points.	5–6	6	2xAO2/2
	Level 2: An attempt to link the description of the experiment and the results with differences between the two models. The student gives examples of where the plum pudding model does not explain observations. The logic used may not be clear.	3–4		1xAO1/1 1xAO2/2
	Level 1: Simple statements are made that the nuclear model is a better model. The response may fail to make logical links between the points raised.	1–2		2x AO1/1 4.4.1.3
	No relevant content	0		
	Indicative content • alpha particle scattering experiment • alpha particles directed at gold foil • most alpha particles pass straight through • (so) most of atom is empty space • a few alpha particles deflected through large angles • (so) mass is concentrated at centre of atom • (and) nucleus is (positively) charged • plum pudding model has mass spread throughout atom • plum pudding model has charge spread throughout atom			
Total			**6**	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	power output increases (to meet demand) due to people returning home from work / school	accept many electrical appliances are switched on (which increases demand) accept other sensible suggestions	1	AO3/1a 4.1.3
03.2	00.00	accept midnight allow answers between 00.00 and 04.00	1	AO3/1a 4.1.3 WS3
03.3	any **two** from: • conserves fuel reserves • spare capacity to compensate for unreliable renewable resources • provides spare capacity in case of power station emergency shut-down • so as to not make unnecessary environmental impact		2	AO2/1 4.1.3
Total			**4**	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	0.1 (ºC)		1	AO3/3a 4.1.1.3 WS2.3
04.2	power = energy transferred / time	allow P = E / t	1	AO1/1 4.1.1.4
04.3	correct substitution ie 1050 / 300 3.5 (W)	accept 3.5 (W) with no working shown for **2** marks	1 1	AO2/1 AO2/1 4.1.1.4
04.4	1050 = m x 4200 x 0.6 m = 1050 / (4200 x 0.6) m = 0.417 (kg)	(substitution) (rearrangement) (answer) accept 0.417 (kg) with no working shown for **3** marks	1 1 1	AO2/2 4.1.1.3
04.5	any **one** from: • energy used to heat metal pan (as well as the water) • energy transfer to the surroundings (through the insulation) • angle of solar radiation will have changed during investigation • intensity of solar radiation may have varied during investigation		1	AO3/3a 4.1.1.3 WS3
Total			**8**	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	weight (lifted) **or** height (lifted)		1	AO3/3a 4.1.2.2 WS2
05.2	any **two** from: • calculate a mean • spot anomalies • reduce the effect of random errors		2	AO3/3a 4.1.2.2 WS3
05.3	as speed increases, the efficiency increases (but) graph tends towards a constant value **or** appears to reach a limit	accept efficiency cannot be greater than 100%	1 1	AO3/2b 4.1.2.1
05.4	heating the surroundings		1	AO1/1 4.1.2.1
05.5	0 (%)		1	AO1/1 4.1.2.2
Total			**7**	

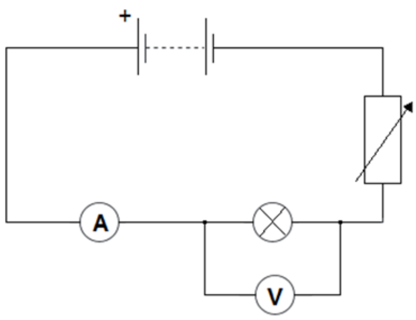
Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	negatively charged electrons are transferred from the (neutral) object		1 1 1	AO1/1 4.2.5.1
06.2	minimum of four lines drawn perpendicular to surface of sphere minimum of one arrow shown pointing away from sphere	judge by eye do **not** accept any arrow pointing inwards.	1 1	AO1/1 4.2.5.2
06.3	Q		1	AO3/1a 4.2.5.2
Total			**6**	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	V = 0.10 x 45 4.5 (V)		1 1	AO2/1 4.2.2 4.2.1.3
07.2	R = 12 / 0.10 total resistance = 120 (Ω) R = 120 – 105 = 15 (Ω)		1 1 1	AO2/1 4.2.2 4.2.1.3
07.3	(total) resistance decreases (so) current increases		1 1	AO1/2 4.2.2 4.2.1.3
Total			**7**	

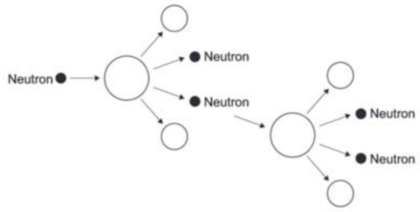
Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1		battery in series with bulb and ammeter voltmeter in parallel with bulb variable resistor **or** variable power pack **or** potentiometer	1 1 1	AO1/2 4.2.1.1/3 WS2.2
08.2	A is brighter because it has a higher current (than lamp B at any p.d.) (therefore A has a) higher power output (than bulb B)	accept higher energy output per second	1 1	AO3/1a AO1/1 4.2.4.1/3
08.3	lower current (than lamp A) for the same potential difference lower gradient (than lamp A)	accept answer in terms of R = V/I	1 1	AO1/1 AO2/2 4.2.1.3/4
08.4	0 – 2 Volts (for an ohmic conductor) current is directly proportional to potential difference (so) resistance is constant	allow a range from 0 V up to any value between 1 and 2 V. allow lines (of best fit) are straight and pass through the origin	1 1 1	AO3/2b 4.2.1.3/4
Total			**10**	

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	cannot predict which dice / atom will 'decay' cannot predict when a dice / atom will 'decay'	accept answers given in terms of 'roll a 6'	1 1	AO3/1b 4.4.2.3 WS1
09.2	3.6 to 3.7 (rolls)	allow **1** mark for attempt to read graph when number of dice = 50	2	AO2/2 4.4.2.3 WS3
09.3	90		1	AO2/1 4.4.2.2
09.4	uranium		1	AO2/1 4.4.1.2
09.5	beta proton number has gone up (as neutron decays to proton and e^-)		1 1	AO1/1 AO3/2a 4.4.2.2
09.6	prevents contamination **or** prevents transfer of radioactive material to teacher's hands which would cause damage / irradiation over a longer time period.		1 1	AO1/1 AO2/1 4.4.2.4
Total			**10**	

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	Nucleus splitting into two fragments and releasing two or three neutrons (at least one) fission neutron shown to be absorbed by additional large nucleus and causing fission two or three additional neutrons released from fission reaction	This diagram would gain all **3** marks:  	1 1 1	AO1/1 4.4.4.1
10.2	lowering the control rods increases the number of neutrons absorbed (so) energy released decreases	accept converse description allow changing the position of the control rods affects the number of neutrons absorbed for **1** mark	1 1	AO2/2 AO1/1 4.4.4.1
10.3	rate of increase between 240 and 276 (MW / min)	allow **1** mark for attempt to calculate gradient of line at 10 minutes	2	AO2/1 4.4.4.1
Total			**7**	

Question 11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
11.1	g.p.e. = mass × gravitational field strength × height	accept E_p = mgh	1	AO1/1 4.1.1.2
11.2	E_p = 50 × 9.8 × 20 9800 (J)	allow 9800 (J) with no working shown for **2** marks answer may also be correctly calculated using W = Fs ie allow W = 490 x 20 for **1** mark or answer of 9800 (J) using this method for **2** marks	1 1	AO2/1 4.1.1.2
11.3	7840 (J)	allow ecf from '11.2'	1	AO2/1 4.1.1.2
11.4	7840 = ½ × 50 × v^2 $v = \sqrt{\frac{7840}{1/2 \times 50}}$ 17.7(0875) (m/s) 18 (m/s)	allow $v^2 = \frac{7840}{(1/2 \times 50)}$ for this point allow ecf from '11.3' correctly calculated for **3** marks allow 18 (m/s) with no working for **2** marks answer may also be correctly calculated using $v^2 - u^2 = 2as$	1 1 1 1	AO2/1 4.1.1.2

11.5	extension = 35 (m) and conversion of 24.5 kJ to 24500 J 24 500 = ½ x k x 35^2 40	allow 40 with no working shown for **3** marks an answer of '16.2' gains **2** marks	1 1 1	AO2/2 4.1.1.2 WS4.3
Total			**11**	

Question 12

Question	Answers		Extra information	Mark	AO / Spec. Ref.
12	**Level 3:** Clear and coherent description of both methods including equation needed to calculate density. Steps are logically ordered and could be followed by someone else to obtain valid results.	5-6		6	AO1/2 4.3.1.1 WS2.2 Required practical
	Level 2: Clear description of one method to measure density **or** partial description of both methods. Steps may not be logically ordered.	3–4			
	Level 1: Basic description of measurements needed with no indication of how to use them.	1–2			
	No relevant content	0			
	Indicative content **For both:** • measure mass using a balance • calculate density using ρ = m/V **Metal cube:** • measure length of cube's sides using a ruler • calculate volume **Small statue:** • immerse in water • measure volume / mass of water displaced • volume of water displaced = volume of small statue				
Total				**6**	

Question 13

Question	Answers	Extra information	Mark	AO / Spec. Ref.
13.1	(because the) potential of the live wire is 230 V		1	AO1/1 4.2.3.2
	(and the) potential of the electrician is 0 V		1	
	(so there is a) large potential difference between live wire and electrician		1	
	charge / current passes through his body	allow voltage for potential difference	1	
13.2	diameter between 3.50 and 3.55 (mm)	allow correct use of value of cross-sectional area of 9.5 to 9.9 (mm^2) with no final answer given for **1** mark	2	AO2/2 4.2.3.2 WS3
13.3	18000 = I x 300		1	AO2/1
	I = 18000/300 = 60		1	AO2/1
	13 800 = (60^2) x R		1	AO2/1
	R = 13 800 / 60^2		1	AO2/1
	3.83 (Ω)		1	AO2/1
		allow 3.83(Ω) with no working shown for **5** marks answer may also be correctly calculated using P = IV and V = IR if 230 V is used.		4.2.1.2 4.2.4.1
Total			**11**	