DRAFT SPECIMEN MATERIAL

GCSE
PHYSICS

PAPER 1H

Mark scheme

Specimen 2018

Version 0.1

This draft qualification has not yet been accredited by Ofqual. It is published to enable teachers to have early sight of our proposed approach to GCSE Physics. Further changes may be required and no assurance can be given that this proposed qualification will be made available in its current form, or that it will be accredited in time for first teaching in September 2016 and first award in August 2018.

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

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	weight (lifted) **or** height (lifted)		1	AO3/3a 4.2.2 WS2
01.2	any **two** from: • calculate a mean • spot anomalies • reduce the effect of random errors		2	AO3/3a 4.2.2 WS3
01.3	curved line drawn on graph passing through all (or majority of) points	line should pass within ½ square of each point	1	AO2/2 4.2.2 WS3
01.4	as speed increases, the efficiency increases (but) graph tends towards a constant value **or** appears to reach a limit (and) efficiency cannot be greater than 100%		1 1 1	AO3/2b 4.2.2.1
01.5	any **one** from: • sound • heat(ing surroundings)		1	AO2/2 4.2.2.1
01.6	0 (%)		1	AO2/1 4.2.2.2
Total			**9**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	lower uncertainty in measuring 10 ˚C (compared to measuring 1 ˚C)		1	AO3/1a 4.2.1.4 WS3
02.2	power = energy transferred / time correct substitution ie 21 000 / 6000 3.5 (W)	allow P = E / t accept 3.5 (W) with no working shown for the **2** calculation marks	1 1 1	AO1/1 AO2/1 AO2/1 4.2.1.6
02.3	correct substitution ie 21 000 = m x 4200 x 10 mass = 0.5 (kg)	 accept 0.5 (kg) with no working shown for the **2** calculation marks	1 1	AO2/2 4.2.1.4
02.4	any **two** 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		2	AO3/3a 4.2.1.4 WS3
Total			**8**	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.

3	Level	Marks	Level Descriptor
	Level 3	5-6	An explanation of improving the energy efficiency of the home is given, including improving heating efficiency **and** reduction of energy loss
	Level 2	3-4	An explanation of improving the energy efficiency of the home is given, including improving heating efficiency **or** reduction of energy loss
	Level 1	1-2	A list of methods to improve the energy efficiency of the home is given
	0	0	Nothing written worthy of credit.

Examples of physics points: • install a new boiler (to heat house) • higher efficiency (than coal fire) • coal fire wastes more energy • hot air escapes up chimney • install double glazing • reduces conduction (compared with single glazing) • loft insulation • reduces convection in attic • install draught excluders • reduces convection around doors / windows • reduce temperature setting on thermostat • lower temperature difference between house and surroundings	6	AO1/2 4.2.2.1

Total			6

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	power output increases (to meet demand) due to people returning home from work / school	accept other sensible suggestions	1	AO3/1a 4.2.3.3
04.2	rapid decrease in power output		1	AO3/1a 4.2.3.3 WS3
04.3	any **two** from: • conserves fuel reserves • spare capacity to compensate for unreliable renewable resources • provides spare capacity in case of (other) power station emergency shut-down		2	AO2/1 4.2.3.3
Total			**4**	

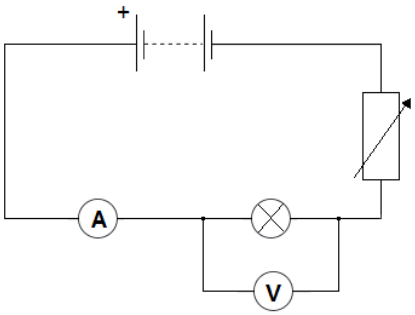
Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	negatively charged		1	AO1/1
	electrons are transferred		1	4.4.5.1
	from the (neutral) object		1	
05.2	each of the girl's hairs is positively charged		1	AO2/2
	like charges repel		1	AO1/1 4.4.5.1
05.3	minimum of four lines drawn perpendicular to surface of sphere	judge by eye	1	AO1/1 4.4.5.2
	minimum of one arrow shown pointing away from sphere	do **not** accept any arrow pointing inwards.	1	
05.4	Q		1	AO1/1 4.4.5.2
Total			**8**	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	(current that) is always in the same direction		1	AO1/1 4.4.3.1
06.2	potential difference = current × resistance correct substitution: i.e. 12 = 0.10 × R 120(Ω)	accept V = IR allow 120(Ω) with no working shown for the **2** calculation marks	1 1 1	AO1/1 AO2/1 AO2/1 4.4.1.3
06.3	15(Ω)	allow ecf value from '6.2' i.e. '6.2' – 105 provided the answer is not a negative value	1	AO2/1 4.4.2
06.4	(total) resistance decreases (so) current increases		1 1	AO1/2 4.4.1.3
Total			**7**	

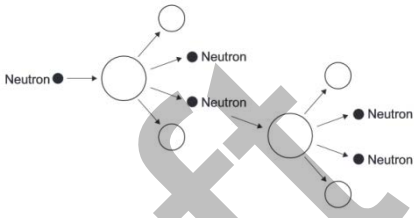
Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1		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 4.4.1.1/3 WS2.2
07.2	higher current (than lamp B at any p.d.) higher power (output than bulb B)	 accept higher energy output per second	1 1	AO2/2 4.4.4.1/3
07.3	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	AO2/2 4.4.1.3/4
07.4	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 4.4.1.3/4
Total			**10**	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	cannot predict <u>which</u> dice / atom will 'decay' cannot predict <u>when</u> a dice / atom will 'decay'	accept answers given in terms of 'roll a 6'	1 1	AO3/1b 4.7.2.3 WS1
08.2	curved line of best fit passing through majority of points	allow ½ square tolerance do not credit straight lines drawn between the points	1	AO2/2 4.7.2.3 WS3
08.3	3.6 to 3.8 (rolls)	allow **1** mark for attempt to read graph when number of dice = 50	2	AO2/2 4.7.2.3 WS3
08.4	90		1	AO2/2 4.7.2.2
08.5	uranium		1	AO2/2 4.7.1.2
08.6	beta		1	AO1/1 4.7.2.2
08.7	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 4.7.2.4
Total			**10**	

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	uranium **or** plutonium	accept uranium oxide **or** thorium	1	AO1/1 4.7.4.1
09.2	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 4.7.4.1
09.3	Any **one** from: • gamma / γ rays • energy	accept 'electromagnetic / EM radiation' allow 'heat' for energy	1	AO1/1 4.7.4.1
09.4	Lowering the control rods increases the number of neutrons absorbed (so) energy released decreases at a certain height the energy released (per fission reaction) is constant because one neutron (on average) goes on to create one further fission (reaction)	accept converse description allow for **1** mark: changing the position of the control rods affects the number of neutrons absorbed	1 1 1	AO2/2 4.7.4.1
09.5	line showing power output increasing (from 'normal') gradient increasing with time	line need not show output fluctuating as original graph shows	1 1	AO1/2 AO2/2 4.7.4.1
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	g.p.e. = mass × gravitational field strength × height	accept $E_p = mgh$	1	AO1/1
	$E_p = 50 \times 10 \times 20$		1	AO2/1
	10 000 (J)		1	AO2/1
		allow 10 000 (J) with no working shown for the **2** calculation marks		4.2.1.2
		answer may also be correctly calculated using W = Fs		
10.2	10 000 (J)	allow ecf from '10.1'	1	AO2/1
				4.2.1.2
10.3	Kinetic energy = ½ mass × speed^2	Accept $E_k = ½ mv^2$	1	AO1/1
	correct substitution:		1	AO2/1
	i.e. $10\,000 = ½ \times 50 \times v^2$			
	20 (m/s)		1	AO2/1
		allow ecf from '10.2' correctly calculated for the **2** calculation marks		4.2.1.2
		allow 20 (m/s) with no working for the **2** calculation marks		
		answer may also be correctly calculated using $v^2 - u^2 = 2as$		
10.4	extension = 35		1	AO2/2
	correct substitution ie $24\,500 = ½ \times k \times 35^2$		1	AO2/2
	40	an answer of '16.2' gains **2** marks	1	AO2/2
		allow 40 with no working shown for the **3** calculation marks		
	N/m		1	AO1/1
				4.2.1.2
				WS4
Total			**11**	

Question 11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
11	**For both:**			AO1/2
	measure mass using a balance		1	4.6.1.1
	calculate density using ρ = m/V		1	WS2.2
				Required practical
	Metal cube:			
	measure length of cube's sides using a ruler (to calculate volume)		1	
	Small statue:			
	measure volume by using immersion in water		1	
	volume of water displaced = volume of small statue		1	
Total			**5**	

Question 12

Question	Answers	Extra information	Mark	AO / Spec. Ref.
12.1	live wire potential is 230 V electrician potential is 0 V large potential difference between live and householder (causes charge to flow)	 allow voltage for potential difference	1 1 1	AO1/1 4.4.3.2
12.2	9.8 (mm^2)	allow a range between 9.7 and 9.9 (mm^2)	1	AO2/2 4.4.3.3 WS3
12.3	cable may melt / burn **or** a fire may start		1	AO3/1a 4.4.3.3
12.4	new shower would transfer more energy each second	 accept in the same time period allow **1** mark only for an answer referring to 'higher power'	1 1	AO2/1 4.4.4.2
12.5	Q = It I = 18000/300 = 60 $P = I^2R$ R = 60/13.8 3.83 (Ω)	 allow 3.83(Ω) with no working for the **3** calculation marks answer may also be correctly calculated using P = IV and V = IR if 230 V is used.	1 1 1 1 1	AO1/1 AO2/1 AO1/1 AO2/1 AO2/1 4.4.1.2 4.4.4.1
Total			**12**	