OCR
Oxford Cambridge and RSA

GCSE

Additional Applied Science

Unit **A192/02:** Science of Materials and Production
(Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2017

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	answers that can be accepted
(words)	words which are not essential to gain credit
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
ORA	or reverse argument

Available in RM Assessor to annotate scripts

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt

R	reject
✓	correct response
≈	draw attention to particular part of candidate's response
^	information omitted

Subject-specific Marking Instructions

a. If a candidate alters his/her response, examiners should accept the alteration.

b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

E.g.

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (□) in the two correct boxes.

This would be worth 1 mark.

Put ticks (□) in the two correct boxes.

This would be worth 0 marks.

Put ticks (□) in the two correct boxes.

This would be worth 1 mark.

c. The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

d. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.
Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

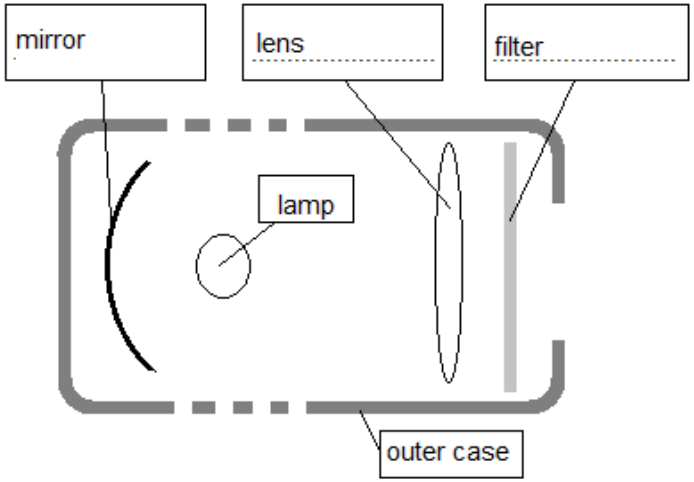
the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

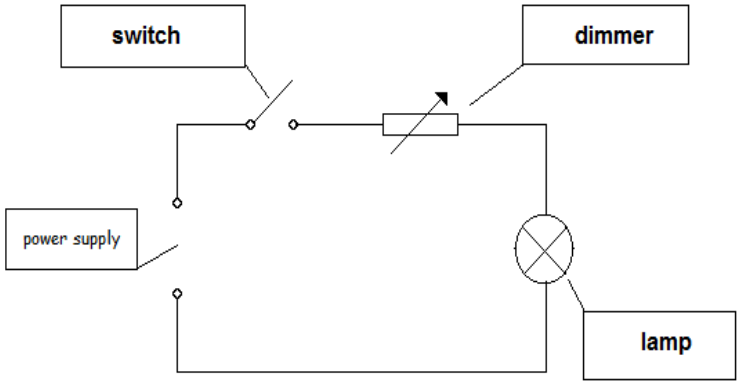
MARK SCHEME:

Question			Answer	Mark	Guidance
1	a		-15 °C	1	
	b		energy loss of LessCold is 250 W/m^2; energy loss of HotStuff is 160 W/m^2; best to use material with lowest energy loss;	1 1 1	Must have calculations to earn third mark Ecf incorrect calculations
	c		area = 1.12 m^2; total energy loss = 200 $\times$1.12 = 224 W	1 1	Allow 1.4 x0.8 within a calculation ecf from incorrect area e.g. 2 $\times$ (1.4+0.8) $\times$ 200 = 880 W for [1] 224 on its own scores two marks [2]

Question			Answer	Mark	Guidance
2			**[Level 3]** Explains, in detail, how the actions of inspectors results in continued good health of consumers. Includes description of most aspects of their work. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Links the actions of inspectors the continued good health of consumers. Includes description of some aspects of their work. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes some aspects of the work done by inspectors, with no references to its importance to the rest of us. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targetted at grades up to C.** **Indicative science points may include:** **Some possible roles for inspectors:** • health and safety of employees • storage of meat • cleanliness of machinery • quality of non-meat ingredients • equipment/machinery/refridgeration • environment/building/vehicles • test for bacteria / microorganisms • measure storage temperatures • (DNA testing for) food substitution • test for use of illegal materials • study logs of storage times • observe workers in action • check on sources of meat **importance to the public** • (Health & safety)keep food safe to eat • Infection control • maintains a nutritional standard for food • public trust/confidence

Question			Answer	Mark	Guidance
3	a			2	three correct labels for [2] two correct labels for [1]
	b		any four of the following, [1] each: • low density - to keep the weight down • opaque - to not let the light out • reflective - to keep the light in • strong / stiff - to keep its shape • hard - so that it doesn't scratch easily • tough - so that it doesn' break easily • durable - so that it lasts a long time • high melting point - so that it doesn't melt • malleable - to allow easy manufacture • non-flammable - so that it doesn't catch fire	4	**ignore** references to thermal conductivity

Question			Answer	Mark	Guidance
4			**[Level 3]** Provides enough detail for the preparation to be carried out to a successful conclusion. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** A missing step means that the preparation could not be carried out to a successful conclusion. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** One correct step seen. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targetted at grades up to B** **Indicative science points may include:** • place known volume of alkali / acid into a container • add pH indicator to alkali / acid • slowly add acid / alkali until indicator shows neutral • note volume of acid / alkali required • repeat without indicator • heat solution gently (to remove some water) • leave to allow crystals to form • dry crystals with paper **level 3** it must work and must neutralise **level 2** it must work or must neutralise **level 1** it won't work but some steps are correct

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>5</td><td>a</td><td></td><td> 
</td><td>2</td><td>all correct for [2]
any two correct for [1]

accept rheostat / variable resistor for dimmer

accept light / bulb for lamp</td></tr>
<tr><td></td><td>b</td><td></td><td>switch allows her to turn (lamp) on and off;
dimmer allows her alter brightness (of lamp);</td><td>1
1</td><td>ignore reference to power supply or lamp</td></tr>
<tr><td></td><td>c</td><td></td><td><table>
<tr><td>amplifier</td><td>converts sound into vibrations</td></tr>
<tr><td></td><td>increases the loudness of sound</td></tr>
<tr><td>microphone</td><td>converts electrical signals into sound</td></tr>
<tr><td></td><td>converts sound into electrical signals</td></tr>
<tr><td>loudspeaker</td><td>increases the strength of electrical signals</td></tr>
</table></td><td>3</td><td>each correct link for [1]</td></tr>
</table>

Question			Answer	Mark	Guidance
6			**[Level 3]** Describes the material and its use. Explains useful properties and how drawbacks are avoided. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Describes the material and its use. Explains useful properties but not how drawbacks are avoided. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes the material or its use. Little explanation of useful properties or how drawbacks are avoided. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targetted at grades up to A*.** **Indicative science points at level 3 may include:** • name of composite material and use in sport • desirable properties of the composite material • reasons why those properties are necessary • arrangement of materials within the composite • how composite avoids drawbacks of separate materials **Indicative science points at level 2 may include:** • name of composite material or its use in sport • desirable properties of the composite material • reasons why those properties are necessary **Indicative science points at level 1 may include:** • name of composite material • describe its use in sport • desirable properties of the composite material

Question			Answer	Mark	Guidance
7	a		total allotment area = 8 × 2 × 2.5 = 40 $m^{2;}$ application = 5000 g / 40 m^2 = 125 g/m^2 ; slightly too thickly because 125 > 120;	1 1 1	 **allow** 5000 / 5 = 1000 g/m^2 for [1] **look** for appropriate comparison with 120 g/m^2 **accept** alternative calculations that use 120g/m^2 e.g. 120 x 40 = 4800g and then make a relevant comparison
	b		any two of the following, [1] each • herbicide - to kill weeds • fungicide - to kill fungus on plants • insecticide - to kill insects (which eat plants)	2	award the mark for the function of each chemical Allow pesticide – kill pests Allow weedkiller – kill weeds Ignore water
	c		2 from: grow each type of plant on different soil each year; to prevent build-up of pests or disease; correct description of organic methods;	1 1	description of crop rotation [1] valid explanation (pests / nutrients) for [1]

Question			Answer	Mark	Guidance
8	a		123.5	1	
	b		Any 2 from: Na_2CO_3 + **$CuSO_4$** → **$CuCO_3$** + Na_2SO_4 **sodium sulfate**	2	
	c		mass of sodium carbonate = 40 x 5.3 = 212 g (= 2 x 106); makes 2 x 123.5 = 247 g	1 1	247 = 2 marks
	d		80 - 81 %	1	ecf on incorrect (b)(ii)

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