GCSE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Physics (Modular) Specification A
(3453/H)

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' 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:

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GCSE PHYSICS (MODULAR)

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 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

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 lines 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 / ; e.g. allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates 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)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

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

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols/formulae

If a candidate 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 The marking of quantitative relationships

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm's law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

3.4 Marking procedure for calculations

3.4.1 Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.
However:

- if the answer is incorrect, mark(s) can be gained by correct substitution/working and this is shown in the 'extra information' column;
- if the answer is correct, but an incorrect relationship is written in the working, then no marks can be awarded (see 3.5.2).

3.4.2 Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

3.5 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.

3.6 Errors carried forward

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

(a) A candidate who calculates average speed using speed = time/distance **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given credit for the use of the correct acceleration relationship but none for either numerical answer.

(b) A candidate who incorrectly calculates average speed using speed = distance/time and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate of acceleration.

Papers should be constructed in such a way that the number of times errors can be carried forward are 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.

3.7 Phonetic spelling

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

3.8 Brackets

(…..) is 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.

3.9 Interpretation of marginal points

There will be times when the answer is almost, but not quite, correct. Some examiners would award a mark while others would not. In any one script, an attempt should be made to balance these nearly correct answers by giving the mark on some occasions but not on others. If this is not done, the marking would end up being too lenient or too harsh.

3.10 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

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Physics (Modular) **3453/H**
Summer 2004

3453/H Q1

	answers	extra information	mark
(a)	• **either** both increase with increasing speed	**or** thinking distance increases with speed (1) braking distance increases with speed (1)	2
(b) (i)	any **two** from • (drinking) alcohol • (taking) drugs • tiredness	accept examples accept taking medication do not accept distraction	2
(ii)	any **two** from • travelling too fast • worn brakes • worn tyres • less grip (friction)	accept water in/faulty brakes do not accept ice accept skidding/slipping/sliding	2
total			6

3453/H Q2

	answers	extra information	mark
(a)	• fossils • water		1 1
(b) (i)	• search for extra-terrestrial intelligence	accept correct description	1
(ii)	• a radio telescope	accept radio dish do not accept robot/satellite	1
(iii)	• 10-20cm		1
total			5

3453/H Q3

	answers	extra information	mark
(a)	• reflected ray drawn	any refracted ray negates mark equal angles by sight arrow not needed	1
(b) (i)	• total internal reflection	do not accept reflection on its own do not accept TIR	1
(ii)	**Quality of written communication** *The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms.* *Quality of written communication should be considered in crediting points in the mark scheme.* any **one** from • more information can be carried • less weakening of the signal • signal not affected by E/M fields/noise OWTTE QoWC – clearly expressed ideas – relevant to question	 fewer repeater stations needed accept does not cause interference/noise do not accept more efficient do not accept faster	 1 1
(c) (i)	• M		1
(ii)	• higher/better quality/less prone to interference • more information can be sent (in a given cable/optical fibre/carrier wave/time)	**or** signals do not change during transmission accept easier to decode	1 1
total			7

3453/H Q4

	answers	extra information	mark
(a)	• C	accept lorry	1
	• C has the largest/larger/heavier mass/weight	do not accept C is bigger; or mass is large	1
(b)	• F		1
	• F has the greatest velocity/fastest	accept speed do not accept: has high speed	1
(c)	• momentum = mass × velocity	accept momentum = mass × speed; momentum = m × v accept P = m × v	1
	• momentum = 1250 × 40 = 50 000	50 000 on its own (2)	1 1
	• kgm/s	accept Ns	1
total			8

3453/H Q5

	answers	extra information	mark
(a) (i)	• moment • force • distance/length	accept: turning effect/torque do not accept turning force all 3 gaps must be filled correctly	1
(ii)	• moment = 30 × 90 • 2700 (Ncm)	2700 on its own (2)	1 1
(b)	• force needed will be larger • distance from pivot is less	accept turning effect/moment of 30 N force less at 30 cm accept force is 90 N (2 marks) accept force is >30 N (1 mark)	1 1
total			5

3453/H Q6

	answers	extra information	mark
(a)	• its temperature	accept how hot it is do not accept surface area	1
(b)	• shiny surfaces are poor radiators	accept poor emitters	1
	• the potatoes cool less quickly	accept stay hot/retains the heat ignore – reference to reflection	1
(c)	• temperature falls <u>faster</u> OWTTE	accept cool more <u>quickly</u>	1
	• black surfaces are good radiators	accept good emitters	1
total			5

3453/H Q7

	answers	extra information	mark
(a) (i)	• D		1
(ii)	• C		1
(b) (i)	• potential difference = current × resistance	accept voltage/p.d. accept any correct variation	1
(ii)	• potential difference = 0.2 × 20 • 4 (V)	 4 (V) on its own (2)	1 1
total			5

3453/H Q8

	answers	extra information	mark
(a)	• reversing the current	do not accept change the current/alternate the current	1
	• reversing the direction of the magnetic field	accept change the poles around + and -	1
(b)	any **two** from • increasing the current • increasing the strength of the magnetic field • reducing the gap between the magnets • increasing number of (turns on coil)	1 mark each accept increasing the voltage do not accept bigger accept more powerful/stronger magnets	2
total			4

3453/H Q9

	answers	extra information	mark
(a)	• force = mass × accn	**or** 5 = 20 × a	1
	• accn = force / mass	**or** a = $\frac{5}{20}$	1
	• 0.25 (m/s^2)	0.25 (m/s^2) on its own (3)	1
(b) (i)	• accn = (change in) vel / time	**or** ans (a) = change in vel / 8	1
	• change in vel = accn × time	**or** change in vel = ans (a) × 8	1
	• 2 (m/s)	2 (m/s) on its own (3)	1
(ii)	• KE = ½ m × v^2	accept KE = ½ × (20)× ans (i)^2 (1)	1
	• 40 (J)	40 (J) on its own (2)	1
total			8

3453/H Q10

	answers	extra information	mark
(a)	any **three** from • remains of supernova • very dense matter • area of <u>strong</u> gravitational field • nothing can escape from it	1 mark each remains of exploding (ex)-red giant the death of a star bigger than the sun do not accept sucks/vacuum/empty space light/em radiation cannot escape	3
(b)	• X-rays • emitted from gases/dust • which spiral/enter into black hole	accept gravitational effects e.g. bending of light	1 1 1
total			6

3453/H Q11

	answers	extra information	mark
(a) (i)	• sensible scale		1
	• plotting correct to within 1 millimetre	mark lost for any error do not credit blobs (2mm diameter or more even if correctly centred)	1
	• smooth curve		1
(ii)	• 15 minutes	accept answer from their graph to within 1mm	1
(b) (i)	• B		1
	• short half-life so less effect on body	accept source/tracer not in body for long	1
	second mark dependent on first		
(ii)	• D	accept gamma	1
	• can reach cells of organs	accept penetrative/highly energetic	1
	second mark dependent on first		
total			8

3453/H Q12

	answers	extra information	mark
	Quality of written communication *The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms.* *Quality of written communication should be considered in crediting points in the mark scheme.*		
	any **three** from • neutron absorbed* • <u>nucleus</u> splits/fission occurs* • further neutrons are released* • these can split further nuclei/chain reaction can occur* • (large amounts of) energy/heat released	1 mark each	3
	QoWC mark to be awarded if the link between the points marked * is shown. min 2 ideas clearly linked		1
total			4

3453/H Q13

	answers	extra information	mark
(a)	• returns to stable position in first diagram OWTTE		1
	• line of action of W (weight) inside base	c inside base area	1
	• qualified reference to moment		1
(b)	• topples over OWTTE		1
	• line of action of W (weight) outside base	c outside base area	1
	• qualified reference to moment		1
total			6

3453/H Q14

	answers	extra information	mark
(a)	• earthquakes		1
(b) (i)	any **two** from • it is subducted • under continental plate • it melts	1 mark each accept driven down	2
(ii)	any **two** from • it is compressed • (causing) folding/faulting • (causing) metamorphism/ changing nature of rock	1 mark each	2
(c) (i)	• magma burst through OWTTE (oceanic crust) • forming underwater volcanoes/ seafloor/new rock	cooling to form mountains or ridge	2
(ii)	any **two** from • (magnetic) stripes are symmetrical (about ridge) • stripes parallel to ridge; • (magnetic) stripes show direction of field when magma solidified/(magnetic) stripes show reversal in field;	1 mark each	2
total			9

3453/H Q15

	answers	extra information	mark
(a)	• $R = \frac{V}{I}$ **or** $R = \frac{230}{3}$ (1 mark) 76.7 (ohms) (1 mark)		2
(b)	• $I = \frac{V}{R}$ **or** $I = \frac{230}{45}$ (1 mark) 5.1 (A) (1 mark)		2
total			4