AQA

General Certificate of Secondary Education

Physics (Modular) 3453/H
Specification A

Mark Scheme

2005 examination – June series

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.

GCSE PHYSICS (MODULAR) 3453/H
MARK SCHEME – HIGHER TIER (TERMINAL PAPER)
SUMMER 2005

3453/H Q1

		answers	extra information	mark
(a) (i)		Work (done) = force (applied) × distance (moved in direction of force)	must be an equation **or** a correctly transposed version accept joule = newton **x** metre do **not** accept J = Nm accept W **or** WD, F, d, x, s do **not** accept weight for force do **not** accept length for distance	1
(ii)		8J	if incorrect allow 1 mark (max. 2) for:- • W.D. = 20 × 0.4 • = 8 • joule / J / Nm accept 8kJ for 2 marks	3
(b) (i)		elastic/potential (energy)	accept strain/PE/Ep do **not** accept gravitational	1
(ii)		kinetic	accept movement, KE, E_K	1
total				6

3453/H Q2

		answers	extra information	mark
(a)	dust		} **either** order	1
	gas			1
	gravitational		accept gravity	1
	planets/comets		accept <u>natural</u> satellites/moons	1
(b)	<u>From the top</u> White dwarf			1
	Supernova			1
	Red giant			1
	Neutron (star)			1
total				8

3453/H Q3

		answers	extra information	mark
(a) (i)		concentric arcs	straight **or** concave waves = 0	1
		same λ as incident waves	judged by eye – dependent mark	1
(ii)		diffraction		1
(b)		**Quality of written communication**		
		one mark for correct use of scientific term – <u>diffraction</u>	refraction loses first 3 marks	1
		waves (reach house) by spreading round **or** over hill		1
		longer (wavelength) waves spread more	accept reverse argument accept λ	1
		LW radio has the longest wavelength	accept comparison with TV and VHF	1
total				7

3453/H Q4

		answers	extra information	mark
(a)		gives out/emits radiation	accept unstable nuclei/nuclei decay **or** gives out alpha/beta/gamma radiation do **not** accept radio active particles/rays	1
(b) (i)		43		1
(ii)		56		1
(c) (i)		time taken for half the nuclei to decay **or** time taken for <u>number</u> of (parent) nuclei to halve **or** the time taken for the count <u>rate</u>/activity to halve	} accept atoms do **not** accept time taken for the mass to halve do **not** accept time for radioactivity to halve	1
(ii)		β can enter the body and α cannot β can reach/harm organs/cells/tissue	OWTTE	1 1
(iii)		α more strongly absorbed by cells/more ionizing	accept reverse argument	1
total				7

3453/H Q5

	answers	extra information	mark
(a)	the Earth cooling down		1
(b) (i)	centimetres		1
(ii)	(natural) radioactive processes cause		1
	heating of the magma/mantle		1
	causing convection currents		1
(c) (i)	at the boundaries between plates/on fault lines	OWTTE	1
(ii)	any **one** from • they can occur without warning • measurements are difficult to make	OWTTE OWTTE	1
total			7

3453/H Q6

		answers	extra information	mark
(a)		any **three** from (1 mark each) • rays actually pass through a real image • (projected) rays only <u>appear</u> to pass through/come from a virtual image • a real image can be formed on a screen • a virtual image cannot be formed on a screen		3
(b)		upper & lower rays shown to diverge	converging rays = 0 arrows **not** necessary	1
		from a point on principal axis		1
		F correctly placed at the point		1
total				6

3453/H Q7

		answers	extra information	mark
(a)		**Quality of written communication**		
		one mark for correct use of scientific terms -<u>nuclei</u> & <u>nuclear fusion</u>		1
		• lighter elements join together	accept hydrogen/helium	1
		• to form heavier elements		1
		• <u>releases</u> energy (mark dependent on first bullet point)		1
(b)		materials common to Sun and planets		1
		heavier nuclei/heavy elements		1
		inner planets/mention of one named inner planet		1
total				7

3453/H Q8

	answers	extra information	mark
(a) (i)	acceleration = 8	accept 7.7 to 8.3 if incorrect allow 1 mark each (max. 2) for:- acceleration = gradient **or** acceleration = <u>change</u> in velocity/ time $\frac{24}{3}$ (allow $\frac{23}{3}$ **or** $\frac{25}{3}$)	3
(ii)	distance = 36	accept 34.5 to 37.5 if incorrect allow 1 mark each (max. 2) for:- • distance = area under graph • = 0.5 x 3 x 24 **or** • distance = <u>average</u> speed x time • = 12 x 3 **or** • distance = area under graph • one square = 0.8 accept 33.6 to 36.8 for 3 marks	3
(b)	(eventually) air resistance = weight/force of gravity	do **not** accept gravity	1
	resultant force equals zero	accept forces balance **or** accept upward force = downward force	1
	<u>acceleration</u> equals zero		1
total			9

3453/H Q9

		answers	extra information	mark
(a)		rectangular ON/OFF trace	e.g.	1
(b)		(random) additions to the signal	unwanted signal accept interference/disturbance to/ distortion of/signal	1
(c)		any **four** from (1 mark each) Analogue: • different frequencies in the signal weaken by different amounts • when signal is amplified the differences are amplified • noise is also amplified Digital: • as signal weakens it is still ON/OFF **or** 1/0 • noise is insignificant compared with the difference between ON and OFF	 accept weakening/noise distorts signal accept distortion amplified accept when amplified it is still ON/OFF	4
total				6

3453/H Q10

	answers	extra information	mark
(a) (i)	electrons	accept positrons	1
	with high energy/from nuclei (dependent on answer to first point)	**or** with high speed **or** with great energy	1
(ii)	a neutron changes to a proton	accept proton to neutron	1
(iii)	<u>electromagnetic</u> radiation	EM	1
	of (very) short wavelength (dependent on answer to first point)	**or** of (very) high frequency/energy	1
(b)	3.9 billion years	unit essential if incorrect allow 1 mark each (max. 2) for:- $\dfrac{1}{8}$ of the rock sample is potassium $\dfrac{1}{8} = \dfrac{1}{2} \times \dfrac{1}{2} \times \dfrac{1}{2}$ **or** 3 × half-life	3
total			8

3453/H Q11

	answers	extra information	mark
(a)	Mt = force x perpendicular distance from pivot	if incorrect allow 1 mark for:- Mt = force/weight × distance from pivot do **not** accept mass accept turning effect and torque	2
	(Mt =) 450 (Ncm)	if incorrect allow 1 mark for:- (Mt =) 20 x 22.5	2
(b)	100 (N)	allow ecf from (a) if incorrect allow 1 mark for:- • anticlockwise mts = clockwise mts **or** F × 4.5 = 20 × 22.5 • $F = \dfrac{450}{4.5}$	3
total			7

3453/H Q12

		answers	extra information	mark
(a)		3.5 (m/s)	if incorrect allow 1 mark each for:- • Mtm before = mtm after **or** $0 = 4v + (0.05 \times 280)$ accept $4v = 0.05 \times 280$ • $v = -\dfrac{14}{4}$ (minus sign not essential)	3
(b)		moving hands back increases time of impact	**or** momentum of ball changed in longer time **or** time for speed/velocity of ball to fall to zero is greater	1
		F = <u>change</u> in mtm/time	**or** (so) deceleration is less	1
		so force is less		1
total				6

3453/H Q13

Maximum 1 mark for each box. Answers must have reference to the electronic system. Assume system is working properly.

		Advantages	Disadvantages	mark
	CCTV	• increased security • better crime detection/ prevention	• invasion of privacy	max. 2
	mobile phones	• portable (communication) • ability to summon help • ability to access information	• possible health hazard • invasion of privacy	max. 2
	Internet	• access (large amounts of) info • worldwide communication • shopping/banking from home	• chance of seeing unsuitable images • hacking • viruses	max. 2
total				6