OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics B

General Certificate of Secondary Education

Unit **B651/02:** Unit 1 – Modules P1, P2, P3 (Higher Tier)

Mark Scheme for January 2013

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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

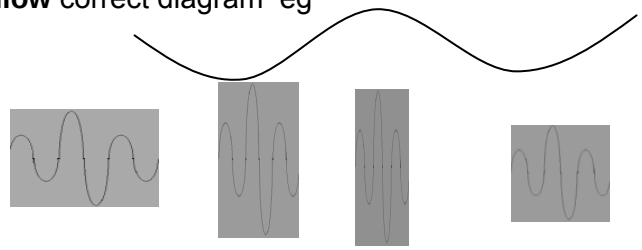
Annotation	Meaning
	correct response
	incorrect response
	benefit of doubt
	benefit of doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

Subject-specific Marking Instructions

Abbreviations, annotations and conventions used in the detailed mark scheme

/ = alternative and acceptable conventions used in the detailed mark scheme
(1) = separates marking points
allow = answers that cannot be accepted
not = answers which are not worthy of credit
reject = answers which are not worthy of credit
ignore = statements which are irrelevant
( ) = words which are not essential to earn credit
__ = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
ecf = error carried forward
AW = alternative wording
ora = or reverse argument.

Question			Answer	Marks	Guidance
1	(a)		**USE ✓'s IN THIS QUESTION** **any two from:** (walls shiny to) reflect IR / waves(1) idea of (upper) surface / outer layers or outer part / outside of food cooked (1) idea of conduction or convection to centre (1) **then** increases <u>kinetic</u> energy of (food) particles / molecules (1)	3	 **allow** reflect (micro)waves / rays / radiation **but ignore** reflect heat **ignore** bounce **ignore** so walls do not absorb or stop waves / radiation / heat **ignore** idea of penetrating a cm. or a few cms. **ignore** heats water **allow** idea of conduction or convection in food / conduction or convection so all the food is cooked **allow** description eg energy or vibrations **passed on** from one particle to another **ignore** heat **not** just energy **allow** increased **movement energy** of particles or makes particles move or vibrate more or faster **ignore** makes the particles vibrate or makes the particles move **ignore** reference to water when referring to k.e. of particles not merely the (food) particles get or are given k.e. but are given **more** k.e. (1)
	(b)	**(i)**	150 (minutes) (1)	1	
		(ii)	absorbs (1) tissue (1)	2	
	(c)		300 000 000 (m / s) (2) **but** if answer is incorrect 50 000 000 x 6 (1)	2	**allow** 3 x 10^8 or 300 x 10^6 or other 'correct' standard form type of notation **allow** correct answer in km/s if this unit is clearly stated **allow** 30Mhz x 10
			Total	**8**	

Question			Answer	Marks	Guidance
2	(a)		on (or) off / 0 (or) 1 (1)	1	**both** needed either order **allow** high (or) low **allow** examples eg 5V (or) 0V
	(b)		idea of continuously variable / continuously change / many or any or range of values (1)	1	**allow** correct diagram eg  **ignore** just more than two values **not** merely variable or changes values
	(c)		frequency **and** phase (1)	1	**both** needed **allow** wavelength **ignore** colour and amplitude **allow** in step / in sync / synchronised **but not merely** in time or in line **allow? (**consider at SSU) coherent in second answer
			Total	**3**	

Question			Answer	Marks	Guidance
3	(a)		0.25 (2) **but if answer is incorrect** 15000 ÷ 60000 (1)	2	**allow** 25 % (2) if % clearly shown 25 on its own scores (1) allow 0.25% for 1 mark but if answer is incorrect 15000 ÷ 60000 x 100 (1) ignore any units other than % on answer line eg 0.25J or 0.25N scores (2)
	(b)		decrease / AW expanded / AW rise / AW	2	all three correct (2) any two correct (1) only one correct (0)
			Total	**4**	

Question			Answer	Marks	Guidance
4	(a)		to break (inter-) molecular bonds / AW (1)	1	**allow** overcome forces between molecules or particles **allow** break bonds between molecules or particles **ignore** idea of molecules breaking free from each other **ignore** reference to latent heat or change of state eg to melt the ice (0) to break bonds between ice particles to melt the ice (1) **not** intra-molecular bonds **not** break (intermolecular) forces **not** just break bonds
	(b)		360000 (2) **but** if answer is incorrect energy ÷ mass / e ÷ m or 1260000 ÷ 3.5 (1)	2	**allow** 3.6×10^5 **allow** 360 if units clearly changed to J / g (2) if answer line units are not changed **allow** 1260000 ÷ 3500 (1)
			Total	**3**	

Question			Answer	Marks	Guidance
5			**all** 3 p-wave responses correct solid liquid layers (1) **both** s-wave responses correct liquid outer core (1)	2	any order in first response **allow** crust and liquid (any order) but not crust and crust or crust and solid
			Total	**2**	

Question			Answer	Marks	Guidance
6	(a)		150 (pence) (2) **but if answer is incorrect** 2.5 x 4 x 15 (1)	2	**allow** £1.5 if answer clearly expressed in £ £150 (1) **allow** 2500 x 4 x 15 (1)
	(b)		8.5 (A) (2) **but if answer is incorrect** 1955 ÷ 230 (1)	2	**allow** 1725 ÷ 230 = 7.5 (1)
			Total	**4**	

Question			Answer	Marks	Guidance
7			**USE ✓'s IN THIS QUESTION** **advantages – max one from** idea of low maintenance / running cost (1) no need for power (supply) cables / lines (1) no need for fuel / saves fossil fuels (1) long life (1) rugged / hard wearing (1) renewable energy source (1) no polluting waste (at point of use) / give out no greenhouse gases / do not **cause** pollution (1) can be used in remote locations (1) **disadvantages – max one from** no / low power at night / dull or cloudy weather (1) idea of low power output (1) idea of overshadowed by buildings or trees / dirt / snow on surface (of cells) reduces or stops output (1)	2	**allow** cheap to run / energy (source) is free / saves money on electricity **but not merely** cheap / cost effective / reliable **not just** its renewable / reusable **not just** no or less pollution must include idea of emitted or given out **ignore** environmentally friendly / does not harm the environment **allow** power / energy needs to be stored in a battery **allow** no sun no electricity or power **allow** idea of only working well or efficiently in sunlight **allow** will not work without sunlight / in low light levels **ignore** unspecified references to weather eg weather not reliable / bad weather (0) **ignore** references to cost **ignore** visual pollution
			Total	**2**	

Question			Answer	Marks	Guidance
8	(a)		moving the coil / wire / turns faster (1) moving the magnet faster (1) insert iron or steel (core) in the coil (1) more coils / turns or more turns per metre (1) stronger magnet (1)	2	 **not just** insert a core **ignore** longer or tighter coil **ignore** bigger magnet **allow** stronger field / flux (chage)
	(b)	(i)	W and Y (1) X and Z (1)	2	**both** needed **both** needed **allow** 0 and Y
		(ii)	3.5 cycles / AW (1) per second / per unit time (1)	2	**allow** waves / oscillations / vibrations **allow** the number of cycles per second (1) **allow** references to current alternating eg amount of times current alternates per second / AW (1) current alternates 3.5 times per second (2)
			Total	**6**	

Question			Answer	Marks	Guidance
9	(a)		gamma (waves / radiation) or γ (waves / radiation) (1)	1	
	(b)		ionised / an ion (1)	1	**allow** become charged / ions formed **allow** idea of loses or gains electrons but **not** loses all electrons **ignore** references to speed of collision **not** ionic
			Total	**2**	

Question			Answer	Marks	Guidance
10			**USE ✓'s IN THIS QUESTION** 1 dust and gas clouds form 2 gravity makes dust particles spiral together 3 protostar formed (4) (temperature becomes very high) 5 thermonuclear fusion takes place 6 main sequence star formed	3	all five correct scores (3) if not all correct **allow** max 2 marks for: first **and** last correct (1) thermonuclear fusion after temperature becomes very high (1) gravity response immediately after dust and gas cloud form (1) thermonuclear fusion followed immediately by main sequence star (1)
			Total	**3**	

Question			Answer	Marks	Guidance
11	**(a)**		centripetal (1)	1	**allow** phonetically acceptable attempts eg centripedal (1) **not** centrifugal or gravity in the answer
	(b)		X in arc from left hand edge of Sun (1)	1	**nb marking tool overlay added in scoris**
	(c)		idea of deflected by magnetic field / magnetic field pulls them in / travel along magnetic field (1)	1	**allow** higher level answers eg charged particles move along magnetic (field) lines (1) **allow** magnetic field / Earth's magnetic field / electromagnetic field / that is where the magnetic field is from **ignore** deflects to the poles / cosmic rays attracted to poles / poles are magnetic / magnetism / magnetic attraction or pull
			Total	**3**	

Question			Answer	Marks	Guidance
12	(a)		6.25 (m / s) (2) **but if answer is not correct** 200 ÷ 32 (1)	2	**allow** 6.3 (2) **allow** 6 on answer line if working and initial answer 6.25 / 6.3 (2) **allow** 6.2 (1)
	(b)	(i)	idea of increasing at a steady or constant or uniform rate (1)	1	**allow** accelerating uniformly / positive acceleration / AW **not** merely accelerating/ speed increasing
		(ii)	idea of decreasing at a steady or constant or uniform rate (1)	1	**allow** idea of slowing down more rapidly than in (i) or WX **allow** decelerating uniformly / negative acceleration AW **not** merely decelerating / speed decreasing
			Total	**4**	

Question			Answer	Marks	Guidance
13	(a)		speed / velocity ...(changes each)... unit time / seconds / minutes / hours (1)	1	ideas of speed and time both needed **allow** change of direction per unit time **not** days / weeks / months / years for time description
	(b)		3.6 (2) **but if answer is incorrect** 9 ÷ 2.5 (1)	2	**allow** 4 on answer line if working is correct and answer is 3.6
	(c)		idea of greater speed change (in same time / 2.5 seconds) (1)	1	**allow** reaches or gets to a higher speed / reaches 16 m / s (in 2.5 seconds) / AW but **not just** travels at a greater or higher speed / travels more distance in same time **allow** acceleration = 15 ÷ 2.5 / 6 is more acceleration than 9 ÷ 2.5 / 3.6

Question			Answer	Marks	Guidance
	(d)		slippery road / wet or icy road / poor or worn brakes / worn or bald tyres (1)	1	any one **but** a list containing any incorrect answers score (0) **allow** other road conditions eg leaves on road. **allow** increased mass / load of car **ignore** unqualified references to weather / road conditions / brakes / tyres how worn tyres are eg because of the tyres (0) but tyres have poor grip (1) eg weather conditions (0) but when it s raining (1)
	(e)		**USE ✓'s IN THIS QUESTION** for increased braking distance: same friction (between wheels and road) (1) greater mass or weight in car **so** idea of more K.E. to dissipate (1). OR allow: for decreased breaking distance: more friction (1) greater braking force so greater deceleration (1)	2	no mark for increased or decreased braking distance marks only gained for correct explanation
			Total	**7**	

Question			Answer	Marks	Guidance
14	(a)		**USE ✓'s IN THIS QUESTION** **max one from** idea of helps driver keep the car in a straight line when brakes applied (1) prevents car skidding during (hard) braking (1) prevents the wheels locking / brakes go on and off or applied then release (quickly) (1) **max one from** idea that maintains a higher (average) frictional force (1) idea of during skidding car is not slowing down as effectively / braking force is not as effective (1) high / hard braking force needs to be maintained / is needed (1)	2	**allow** one mark for idea of sensors / controlled by 'on board' processor / computer (1) in addition to the expected answers **ignore** stops quicker / in a shorter time
	(b)		absorb or transfer energy (1)	1	**ignore** change shape or absorb impact or absorb collision **allow** idea of increased stopping or collision distance or time / smaller acceleration or force / longer time for momentum transfer(1) **allow** idea of lowering momentum transfer to driver (1)

Question			Answer	Marks	Guidance
	(c)		**USE ✓'s IN THIS QUESTION** **any one from** idea that at 40 (mph) / higher speed more <u>kinetic</u> energy has to be transferred (1) **OR** reference to (kinetic) energy depending on the square of the speed or when the speed of the car doubles the (kinetic) energy quadruples (1) **for the second mark** recognising (braking) distance increase by 2^2 or 4 times or quadruples as speed **doubles** (1)	2	**ignore** references to driving force throughout answer **allow** longer time or distance needed to dissipate or convert the extra k.e. to heat energy (1) **not** extra time or distance to lose extra k.e. **allow** idea that work done (by the brakes) increases by a factor of 4 when the speed doubles **ignore** ½ mv^2 unless used to explain answer **allow** (braking) distance depends on the square of the speed / v^2
			Total	**5**	

Question			Answer	Marks	Guidance
15	(a)		potential / gravitational / g.p.e..... kinetic (1)	1	**both** needed **allow** movement in second part of response
	(b)		drag / (air) resistance / frictional terminal kinetic	2	**ignore** upthrust **allow** constant or steady 3 correct (2) 2 correct (1) only 1 correct (0)
	(c)		increased (surface) area **means** / **produces** more drag / (air) resistance / friction (1)	1	**link** between area and drag / AW needed
			Total	**4**	

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