OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics B

General Certificate of Secondary Education

Unit **B751/02:** Unit1 – Modules P1, P2, P3 (Higher Tier)

Mark Scheme for January 2013

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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 the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction
	Level one
	Level two
	Level three

Subject-specific Marking Instructions

/ = alternative and acceptable answers for the same marking point
(1) = separates marking points
allow = answers that can 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 gain 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

Section A

Question			Answer	Marks	Guidance
1			5 (m/s) (2) **but if the answer is incorrect** 20 x 0.25 (1)	2	**allow** 1 mark for correct calculation using a wrong wavelength ie (wavelength = 40 m) speed = 10 (m/s) (1) (wavelength = 10m) speed = 2.5 (m/s) (1)
			Total	**2**	

Question			Answer	Marks	Guidance
2	(a)		30240 (from the calculation) **and** E / the 35000 heater (2) **but** if the answer incorrect or no heater selected 0.6 x 12 x 4200 **or** 30240 (1)	2	no mark for just choosing E with no working or answer no mark for choosing E with an incorrect calculation
	(b)	(i)	$\frac{48000}{20}$ or 2260 × 20 and liquid A indicated or named scores (2) **but** $\frac{48000}{(53 \text{ or } 20)}$ or s.l.h. × (20 or 53) without comment or incorrect comment scores (1)	2	Allow correct rearrangements: **Eg $\frac{48\,000}{2260}$ = 21,2 (38938) or 21 and liquid A [2]** A chosen with incorrect calculation scores (0)
		(ii)	melting or freezing / solidification	1	**allow** condensation / sublimation **allow** acceptable named change of state **ignore** evaporation **ignore** liquid to gas / boiling
			Total	**5**	

Question			Answer	Marks	Guidance
3			**Level 3 (5–6 marks)** Answers must include **high level** linked explanations of **two** of the following: • **speed** of cooking • benefit of **stirring** • relevance of **standing time** • **microwaves increase the KE of fat or water particles** Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** **Answers should include a simple reference to four of these ideas** • microwaves cannot get to the centre of the food • microwaves are absorbed by water or fat • Dishes / oven do not absorb microwaves • **Middle** of food continues to heat/cook when left to stand • Stirring or standing ensures even / full heating of the food • KE of particles increase Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** **Answers should include a simple reference to two of these ideas** • microwaves cannot get to the centre of the food • microwaves are absorbed by water or fat • Dishes / oven do not absorb microwaves • **Middle** of food continues to heat/cook when left to stand • Stirring or standing ensures even / full heating of the food • KE of particles increase Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to A*** Indicative scientific points may include: High level linked explanations: **Speed** - **all microwaves** are absorbed by food / water / fat (in food) **OR** microwaves not used to heat oven / dishes etc. **OR** outside cm heated (by microwaves) so less food needs to be heated by conduction/convection. **Stirring** – inner particles redistributed towards surface so they can be heated by microwaves/ stirred so that microwaves reach all particles or food. **Standing time** – allows time for further conduction or convection to centre of food **Kinetic energy** – **water/fat** particles increased KE. **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
4	(a)		**Maximum of 2 from**: Reduction in ozone (concentration / variable data year on year (1) **BUT** 30% reduction scores (2) 10% stays (relatively) level (1) **BUT** 90% falls more quickly than the 10% (2) narrowing of range between maximum and minimum levels / both trends move closer to the average / narrowing trends between the two (1)	2	**allow** two related coordinates that illustrate a marking point. Eg. 'average from 0.10 to 0.07 (1) **ignore** 'negative correlations' **ignore** identification of a point. Eg all peak at 1988
	(b)		CFC's reduced / AW (1) people more careful in the sun AW(1) more scientific measurements taken from that time (1)	2	**allow** fridges / aerosols / deodorants / propellants changed (1) **ignore** references to global warming / greenhouse gases **allow** (more) sun block used (1)
	(c)	(i)	**more** visiting to hot countries / **more** sun bed use/ more people using sunbeds (1)	1	**allow** people spending **more** time in the sun (1) **allow** not using enough sun-block / AW (1)
		(ii)	Radiation identified as **UV** (1) (radiation) **absorbed** (by upper layers) (1) less radiation reaches underlying skin (1)	2	 **allow** Sun's rays **absorbed** (by upper layers) (1) BUT **UV absorbed** (by upper layers) scores (2) **ignore** melanin
			Total	**7**	

Question			Answer	Marks	Guidance
5	(a)	(i)	DAB uses multiplexing (1) so signals are separated / signals don't interfere (1)	2	 **allow** less or no interference (1)
		(ii)	signals pick up **noise** (1) and **one from:** (noise) amplified for analogue (1) (noise) filtered out / not recognised for digital (1)	2	**ignore** 'signals pick up interference'
	(b)		idea that each button sends out a different signal / code (1) **or** each function on the TV needs a different digital signal / code to activate it (1)	1	**ignore** different frequency Eg different wave patterns do different things (1)
			Total	**5**	

Section B

Question			Answer	Marks	Guidance
6	(a)	(i)	24 +/- 4 scores (2) But if answer is incorrect or incomplete: correct plotting of both points (1)	2	 tolerance for points is +/- ½ a square
		(ii)	as distance increases current falls scores / AW / ORA (1) **BUT** current falls quickly at start but less quickly for greater distances / AW (2) **OR** as distance doubles current is quartered (2)	2	**ignore** stronger or weaker current **allow** inverse square law (2)
		(iii)	light diverges / spreads / becomes less intense / AW /ORA(1) **or** light intensity follows an inverse square law / AW (1)	1	(when closer) more energy /photons/ light hits solar cell / AW / ORA (1)
	(b)		Electrons knocked / released or freed (1) **BUT** electrons knocked / released or freed from silicon (2) electrons move (around the circuit) (1)	2	
			Total	**7**	

Question			Answer)	Marks	Guidance
7	(a)		416 – 364 = 52 (3) **or** 6.5 X 4 X 2 = 52 (3) **But** if answer is incorrect then: Distas: 6.5 x 4 x 16 = 416 (1) Skinner: 6.5 x 4 x 14 = 364 (1)	3	Assume units are pence unless stated otherwise If conversion has not been done, 52000(p)/£520 (2) If conversion has been attempted unsuccessfully, allow 52 and its powers of ten e.g. 5.2/520(2) **allow** 6500 x 4 x 2 (2) **allow** 6.5 x 4 x 2 (2)
	(b)		0.69 (2) **but** if answer is incorrect r incomplete then: 690 **or** 230 x 3 scores (1)	2	
	(c)		inconvenient to use / night use only (1)	1	ignore fire risks
			Total	**6**	

Question			Answer	Marks	Guidance
8			**Level 3 (5–6 marks)** Answers must refer correctly to one explanation of the comparative power / energy losses **related to currents** in each circuit. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Answers refer in part to the **relative power / energy losses OR changes in current in each circuit.** Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Answers are limited to correct **references to voltage OR** show an appreciation of how the experiment **models real situations**. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to A*** Indicative scientific points may include: **Level 3** • less power loss in B due to reduced current and heating effect • power loss is proportional to current^2 **Level 2** Answers show that • less power / energy is wasted at higher voltages / ORA • TA decreases current and TB increases current **Level 1** • TA is step-up and TB is a step-down transformer • TA increases voltage and TB reduces voltage • Simple idea of **less** energy loss linked to brighter lamp in transformer circuit • resistance wires represent transmission lines in National Grid **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
9	(a)	(i)	(improved) astronomical observation (of planets) (1) mathematical explanation or physical model used (1) reviewing previous theories or made use of previous observations / AW (1)	1	Ignore telescopes
		(ii)	(He) used a (better) telescope (1) (He) invented / developed a telescope / AW (1) (He) observed moons around Jupiter (1) (He) observed that not all bodies orbited Earth (1)	1	
		(iii)	contradicted religious views / AW (1)	1	
	(b)		galaxies move away / show red-shift / AW (1) Distant galaxies move faster (than closer galaxies) (1) BUT distant galaxies move away quicker / AW (2)	2	**ignore** background microwave radiation **ignore** planets / merely stars moving away **ignore** universe expanding
	(c)		Only current evidence explained (1) Further research done / new evidence may be found in future (1) Technological advances (1)	1	eg new data (will be found) (1)
			Total	**6**	

Section C

Question			Answer	Marks	Guidance
10	**(a)**		cruising speed = 10 (m/s) (2) **but if answer is incorrect** 30 = (v/2) x 6 **or** (2 x 30) ÷ 6 or 60 ÷ 6 (1) **then** if a correct calculation is given: Samuel / he is not correct (it is twice as fast) (1)	3	If answer says that cruising speed = 30 / 6 = 5 **AND** that Sam is correct (1). **OR** **allow** Samuel has calculated the **average speed** (5m/s) (1)
	(b)		between 0 and X is longer time than between Y and Z / AW / ORA (1) between 0 and X is lower acceleration than between Y and Z / AW / ORA (1) between 0 and X is acceleration but between Y and Z is deceleration or negative acceleration (1)	2	**allow** it is getting faster between O and X **but** slower between Y and Z (1) **ignore** just acceleration between Y and Z. **ignore** 'faster' acceleration / deceleration **allow** correct calculations to illustrate the marking points. Eg. 10/6 (1.67) compared to 10/2 (-5) (2) **allow** ecf for a correct calculation. Eg. 5/6 (0.83) compared to 5/2 (-2.5) (2) **allow** deceleration is 3 times greater / AW (2)

Question			Answer	Marks	Guidance
	(c)	(i)	108000 (W) (2) **but if answer is incorrect** (6000 + {8 x 600}) x 10 or (6000 + 4800) x 10 or 10800 x 10 (1)	2	**allow** ecf for incorrect cruising speed in 1(a)
		(ii)	1100 (kg) (2) **but if answer is incorrect** (6000 + {8 x 600}) ÷ 9.8 or (6000 + 4800) ÷ 9.8 or 10800 ÷ 9.8 (1)	2	1102.(0408) (1)
			Total	**9**	

Question			Answer	Marks	Guidance
11			**Level 3 (5 or 6 marks)** Answer identifies up to six arguments at least two for and two against. Only five arguments scores 5 marks providing there are at least two for **and** two against arguments. Quality of written communication does not impede communication of science at this level. **Level 2 (3 or 4 marks)** Answer identifies up to four arguments at least one for and one against. Only three arguments scores 3 marks providing there is a for **and** against argument. Quality of written communication partly impedes communication of science at this level. **Level 1 (1 or 2 marks)** Answer identifies two arguments either for **or** against. One argument only; award 1 mark. Quality of written communication impedes communication of science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** **Any point in the extract must be developed to gain credit.** **Indicative scientific points may include:** **For:** • no petrol / diesel or fuel **used** (in car) • no emissions **given out** (by car) or at point of use • less sound pollution / quieter environment • grants / lower tax make them less expensive • likely to **become** less costly • easily charged from mains or at home • conserves or reduces reliance on fossil fuels / fuel can be put to other uses **Against:** • fuel or power source needed for electricity • emissions / CO_2 at power station • emissions / CO_2 add to global warming • pedestrians may not hear (quiet) car • expensive to buy (at the moment) • charging facilities not always available • low top speed • idea of threats to jobs in petrochemical industry • long time / 12 hours to fully charge • easier / quicker to fill cars with fuel • short range • battery disposal or replacement issues **Use the L1, L2, L3 annotations in scoris. Do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
12	(a)		**A – (acceleration section)** acceleration because weight is greater than drag (1) OR acceleration reduces because drag increases (1) **B – (terminal speed section)** terminal speed because weight = drag (1) OR forces are equal and opposite/balanced (1) **C - (deceleration section)** decelerating as drag increases (greatly) (1) OR decelerating as drag now greater than weight (1) **D – (**(lower) **terminal speed section)** drag = weight (1) **OR** forces are equal and opposite/balanced (1)	4	for max marks (4) the links must be there on all four points e.g. part A – acceleration **because** weight is greater than drag (1) without links max (2) for correctly describing the motion OR the forces in the 4 sections without links max (1) for correctly describing the motion OR the forces in 2 or 3 sections **ignore** gravity (rather than weight) **ignore** upthrust **ignore** GPE and KE **allow** air resistance / friction (rather than drag) **allow** for terminal speed – steady / constant speed **allow** for acceleration – increasing speed **allow** for deceleration – decreasing speed **allow** negative acceleration (for deceleration) **Three links plus one description scores 3** **Two links and two descriptions scores 3** **Two links and one description scores 2** **One link and two or three descriptions scores 2** **One link and one description scores 1** **The links and the descriptions must be from different sections.**

Question	Answer	Marks	Guidance
(b)	At **A** all of Susie's energy is GPE. (✓) Between **A** and **B** Susie gains **both** GPE and KE. ✗ Between **A** and **B** Susie gains **only** KE. ✓ At **B** her KE is **exactly** half her GPE at **A**. ✗ Just before touching the ground at **C** Susie has her maximum KE. ✓ On the ground at **C** Susie has zero KE. ✓ On the ground at **C** Susie has her maximum GPE. ✗	3	Use marking tool on scoris to identify the crosses all 6 correct (3) 4 or 5 correct (2) 2 or 3 correct (1) only 1 correct (0) ignore blank boxes
	Total	**7**	

Question			Answer	Marks	Guidance
13			thinking **and** braking distances increase (with more speed) (1) thinking distance doubles (as speed doubles) (1) braking distance quadruples (as speed doubles) (1) braking distance increases due to reduced friction or grip (if road is wet) (1)	3	
			Total	**3**	

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