OCR
Oxford Cambridge and RSA

GCSE

Physics B

Unit **B751/01:** Modules P1, P2, P3 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2014

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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.

1. Annotations used in scoris

Annotation	Meaning
BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt **not** given
ECF	error carried forward
^	information omitted
I	ignore
R	reject
CON	contradiction

2. Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/ = 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

MARK SCHEME

Question	Answer	Marks	Guidance
1 a	**any two from** (idea of) narrow beam / parallel beam AW [1] (idea so) concentrated beam / intense beam / powerful beam / high energy beam / AW [1] (idea this causes) heating effect / AW [1]	2	 **allow** covers small surface area [1] **ignore** bright **ignore** strong beam **Ignore** particles **allow** heats the material up [1] **allow** higher level answers as extra marking points eg. laser light is coherent [1] monochromatic [1] in phase [1]
b	continuous path showing at least 2 reflections at the surfaces and having all angles not less than 45^0 (by inspection) [1]	1	more than 5 reflections scores [0]
c	**any two from** weapons guidance [1] light shows [1] surgery or dentistry [1]	2	**allow** other valid uses e.g. laser / gun / weapon sight [1] idea of laser gun [1] eg. laser quest [1] (laser) pointers / laser pen [1] supermarket / barcode scanners [1] security beams [1] CD / DVD players [1] Distance measurement [1] Eye surgery [1] Skin / cosmetic surgery [1] Removal of varicose veins [1] named medical use qualified e.g. endoscope / removing tattoos [1] named communication system qualified e.g. cable television / internet / landline [1] **ignore** mobile phone **ignore** disco lights **BUT** disco light show scores [1] **ignore** 'medical use' / entertainment [0] if unqualified
	Total	**5**	

Question	Answer	Marks	Guidance
2 a	80 (%) **or** 0.8 [2] **but if answer is incorrect** 100 x 800 / 1000 **or** 800 / 1000 [1]	2	0.8% [0] Take the answer on the answer line first. If this answer is absent or incomplete then mark the answer in the table. **ignore** any units
b	**any one from** both 50% efficient [1] both 50% efficient or 0.5 [1] both use (only) 50% of energy (input) [1]	1	 **Ignore** equally efficient **allow** half energy lost / they are both half [1] idea that both have same ratio of input: absorbed energy / AW [1] **allow** 600/1200 = 700/1400 [1]

Question	Answer	Marks	Guidance
c	**appropriate equipment** **any one from suitable equipment or use of equipment:** thermometer [1] stopwatch [1] Measure time to cook the food [1] Measure a temperature [1] **fair test** **any two from** same amount of food / same mass of food / same volume of food / same meal [1] same container [1] same time / same time intervals [1] same starting temperature [1] **method / procedure** **maximum of two from** measure temperature rise [1] (by) measuring the start and finishing temperatures [1] measure time to heat the food up to same temperature) [1]	3	**maximum 3 marks** **award same marking points if shown on a diagram** **ignore** 'same food' or 'same type of food'
	Total	**6**	

Question	Answer	Marks	Guidance
3	**Level 3: (5 – 6 marks)** **Temperature rises calculated correctly** **AND** **correct judgement made** **AND** **a detailed explanation of one or more mechanisms** Quality of written communication does not impede communication of the science at this level. **Level 2: (3 – 4 marks)** **Temperature rises calculated correctly** **AND** **correct judgement made and a part explanation.** Quality of written communication partly impedes communication of the science at this level. **Level 1: (1 – 2 marks)** **Temperature rises calculated correctly** **OR** **correct judgement made.** 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 up to grade E** **Indicative scientific points may include:** **Explanation and mechanisms:** • (colour) black absorbs heat / energy (better) • (surface) shiny reflects heat / energy (away) **or** • air is a good insulator / AW • (material) expanded polystyrene is a better insulator • (material) expanded polystyrene traps air • Polystyrene without air bubbles is a better conductor **Judgement made (any one judgement):** • C chosen as the best cup to keep the drinks cooler • C heats up the least • A B and D are worse at keeping the drinks cool • A B and D heat up more • **Temperature rises calculated:** • A – 8^0C • B – 14^0C • C – 2^0C • D – 5^0C **allow** heat for IR **ignore** light **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
4 a	Idea that more (Male) skin exposed(to UV light) (which causes skin cancer) ORA [1]	1	**allow** (Short Hair) less (UV) absorbed / blocked greater exposure(to UV) [1] less protection (to UV) eg less protected by hair [1] eg female skin more shaded by hair (1)
b	**any two from** idea of surveying people [1] large sample size [1] example of fair test/ comparison [1] type of exposure[1] eg. sunbed or sun	2	 surveying lots of people (2) eg time exposure /comparing outcomes/similar skin types [1] **allow** suitable experiments e.g. expose people or animals / cells to sunbed and compare with people or animals not exposed to sunbed [2]
c i	**darker skins:** absorb UV [1] let less UV reach **underlying** tissue AW [1]	2	 **allow** contains (more) pigment / melanin (1) **ignore** filters
ii	A **and** C [1]	1	**both** required in either order
	Total	**6**	

Question	Answer	Marks	Guidance
5	(radio) **microwave** (infrared) **(visible) light** (ultraviolet) **X-rays** **(**gamma)	2	3 correct [2] any 1 correct [1]
	Total	**2**	

Question	Answer	Marks	Guidance
6 a	(highest power) water heater [1] 3450 [2] (unit) W or watt [1] **but if 3450 answer incorrect** 230 x 15 **or** any other power correctly worked out in the table [1]	4	**allow** all correct answers in the table including watts /W **allow** alternative power units e.g. joules per second or J/s [1] **allow** room heater is 1840 / fish tank heater is 200 [1]
b	time / hours it is on for / AW [1]	1	**allow** any units of time [1] **allow** how long it is used [1] **allow** how much it is used [1] **allow** number of times it is used [1] **allow** how often it is used
	Total	**5**	

Question	Answer	Marks	Guidance
7 a	**Risk max 1** radiation **leak** / **leak** of nuclear material / **leak** of nuclear waste [1] power station / reactor may get damaged / attacked by terrorist / earthquake [1] radiation sickness / poisoning (1) **how the risk is reduced/managed max 1** monitor people (for contamination) [1] monitor radiation around the nuclear power station [1] safe storage or disposal of nuclear materials [1] idea of better control of reactor [1] better shielding against radiation loss [1] have good shut down / emergency procedures [1] extra protection if in earthquake risk area [1] better security at nuclear power station [1]	2	**ignore** power stations emit radiation **allow** correct examples such as radioactive materials stored (deep) underground / encased in (thick) concrete / lead (1) **allow** correct examples such as surround the reactor with (thick) concrete walls (1)

Question	Answer	Marks	Guidance
b	Idea of voltage change [1] but voltage increase / steps up voltage [2] reduces energy loss / reduce the cost [1]	3	**allow** higher level answers e.g. idea of current change (1) **BUT** to reduce current [2] **allow** voltage reduces (1) **allow** reduces power loss **allow** increases efficiency (1) **ignore** stops energy loss
	Total	**5**	

Question	Answer	Marks	Guidance
8 a	(used) telescopes / naked eye / AW [1]	1	**allow** idea of high altitude balloon [1]
b	nearby / within reach / AW [1]	1	**allow** other places are too far away [1] **allow** takes too long to get to other places [1] **allow** can reach Moon and Mars within a lifetime [1] **allow** (current) spacecraft are not able to travel any further [1] **allow** 'easy to get to' [1] **ignore** temperatures / composition / gravity
c	gravity / forces too great (close to black holes) [1]	1	e.g. black holes are much further away from Earth [1] pulling in spacecraft [1] **very** strong pull or force [1] stretching or pulling apart of objects near black holes [1]
d	**any two from** oxygen [1] water [1] food [1]	2	**allow** air [1] **ignore** gas **allow** specialist clothing eg spacesuits [1]
	Total	**5**	

Question	Answer	Marks	Guidance
9 a	explosion / start of universe (from a point) / expansion / AW [1]	1	**NOT** just 'creation of the Earth' **NOT** just 'creation of life' **BUT** 'an explosion created the Earth and the Universe' / AW scores [1] **NOT** colliding rocks / matter
b	**any three from** dust created or dust in atmosphere [1] sunlight reduced [1] causing a change in the climate [1] plants affected [1] food chain affected [1] lack of food / food source destroyed / extreme environment [1]	3	 **allow** (widespread) fire**s** [1] but causes 'a fire' [0] **allow** change in weather[1] **ignore** Tsunami / earthquake idea **Ignore** 'asteroids hit dinosaurs' **ignore** 'asteroids contain harmful materials'
	Total	**4**	

Question	Answer	Marks	Guidance
10	**Level 3: (5 – 6 marks)** **One realistic safety point <u>AND</u> idea of partial differential penetration of beta related to paper thickness** Quality of written communication does not impede communication of the science at this level. **Level 2: (3 – 4 marks)** **One basic safety point <u>AND</u> idea that beta penetrates OR why beta is used** Quality of written communication partly impedes communication of the science at this level. **Level 1: (1 – 2 marks)** **One basic safety point <u>OR</u> idea that beta penetrates paper OR why beta is used** 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 up grade C** **Indicative scientific points may include:** **Thickness – radiation relationship** • thick paper low radiation detected / ORA • the thicker the paper the less beta penetrates the paper ORA • if paper too thin more beta penetrates so thickness needs adjusting (rollers need to move apart) **Why beta is used** • beta gets through paper • alpha cannot be used as it cannot go through / alpha cannot indicate thickness • all gamma would get through / gamma cannot indicate thickness **Safety / Protection** **realistic** safety points (**level 3**): • workers at a distance / protected by barrier / source shielded at the sides • source not pointed at workers • monitoring / radiation badge • limit the time of exposure • (clear) labelling (of radioactive source) / hazard warning sign **basic** safety points (**levels 1 and 2** only): • protective clothing / gloves / masks / goggles **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
11 a	**A** walking at a **steady** or **constant** speed (1) **B** stationary / AW (1) **C** walking at higher / faster (steady speed) (1)	3	**allow A** walking at a **steady** or **constant** pace (1) **allow C** walking at higher / faster (steady pace) (1) **Ignore** acceleration
b	1.5 (m/s^2) (2) **but if answer is incorrect answer** $\frac{15}{10}$ (1)	2	
	Total	**5**	

Question	Answer	Marks	Guidance
12 a	Yaj (no mark) (idea of) ball is moving so has kinetic energy / KE (1) (idea of) ball is off the ground so has (gravitational) potential energy / PE / GPE (1)	2	**if answer is not Yaj no marks** eg ball moves so has KE [1] eg. ball falls so must have GPE / ORA [1]
b i	1.2 (kg m/s) (2) **but if answer incorrect** 4 x 0.3 (1)	2	
ii	**any two from** (correct use of) drag / air resistance / weight (1) forces are balanced (1) not accelerating (1)	2	 **eg.** weight / (force of) gravity pulls downwards [1] **eg.** air resistance pushes upwards' [1] **ignore** wind resistance (1) **allow** gravity = drag (1) **allow** higher level answer e.g. weight = drag or air resistance (2) **not** merely steady speed **allow** drag stops it accelerating (2)
iii	(Moon has) no atmosphere / no drag (1)	1	**allow** less / no drag or less / no air resistance / no upward force (1) **ignore** less / no gravity
	Total	**7**	

Question	Answer	Marks	Guidance
13			
	[Level 3] **calculates the force** **AND** **Gives a detailed linked answer in terms of forces or acceleration** Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** **calculates the force** **AND** **Gives a simplistic answer in terms of forces or acceleration** Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** **calculates the force** **OR** **Gives a simplistic answer in terms of forces or acceleration** 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 targeted up to grade C** **Indicative scientific points at level 3 may include:** **The calculation from level 1 and 2 and a link between change in distance or stopping time to acceleration or force.** • increases distance travelled by dummy so this reduces force / acceleration of dummy • increase stopping time of dummy so this reduces force / acceleration of dummy • reduced acceleration so reduced force • reduces the rate of change of momentum **Indicative scientific points at level 1 and 2 may include:** • force = 28020 or 28000 N **seatbelts** • hold dummy in seat / stop dummy hitting windscreen • stretches • reduce forces on dummy • increase stopping time of dummy • decrease acceleration of dummy **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
14 a	**C** (1)	1	
b	**C** (1)	1	
c	**Either:** • **A B C** and **D:** increase with engine size / follow the pattern (1) • **E** doesn't follow the pattern [1] **OR** • **A B C** and **E:** increase with engine size / follow the pattern (1) • **D** doesn't follow the pattern / doesn't show link / support (1) • **OR** • **D** to **E** does not follow the pattern [1]	2	**award a maximum of [1] from these general points:** **allow** some of the data show a link / not all the data show a link (1) **allow** (idea that) more data needed (for confidence in the data) (1) **allow** increase in engine size gives an increase in top speed for most cars (1) **allow** high level answers relating to cars' aerodynamics (1)
	Total	**4**	

Question	Answer	Marks	Guidance
15 a	using a battery (1) charged from mains / at home / charging facility (1)	2	 **ignore** 'charging car up' on own unless source specified **allow** solar (1)
b	**any one from** idea of not enough charging points on journey (1) takes time to recharge (during journey so journey will take a long time) (1) limited size of battery (1) low maximum speed (so journey would take a long time) (1)	1	 **allow** short range / could run out of charge quickly [1] **allow** cannot charge after sunset / in the dark / AW [1]
		3	

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