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 June 2012

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Annotations

Annotation	Meaning
	Correct response
	Incorrect response
	Benefit of doubt
	Benefit of the doubt not given
	error carried forward
	Omission Mark
	Ignore
	reject
	contradiction

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	alternate wording
ora	or reverse argument

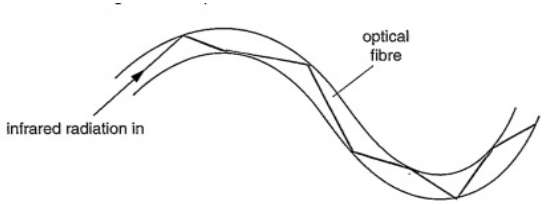
<table>
<tr><th colspan="3">Question</th><th>Answers</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>4.5 [1]</td><td>1</td><td>allow 4 years 6 months [1]
allow 4 ½ years [1]</td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><td></td><td>Old fire</td><td>New fire</td></tr>
<tr><td>Input</td><td>2 000</td><td>1023 [1]</td></tr>
<tr><td>Room output</td><td>880</td><td>900</td></tr>
<tr><td>wasted</td><td>1220</td><td>123 [1]</td></tr>
<tr><td>Effic’y</td><td>0.44 /
44 (%)</td><td>0.88 /
88 (%)</td></tr>
</table>
</td><td>3</td><td>allow 1022 – 1024 [1]

allow 122 - 124 [1]
allow ecf answer to first line minus 900
e.g. 1000 in first line so 1000 – 900 = 100 [1]

efficiencies both correct [1]</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

Question			Answers	Marks	Guidance
2	(a)		number of waves or wavelengths or oscillations or vibrations or cycles **per** second [1]	1	**allow** waves per unit time [1] **allow** waves per e.g. minute [1]
	(b)		**laser beam** **any two from:** (waves of) same frequency or same wavelength or same colour [1] in phase / in step [1] intense beam (of monochromatic light) [1] **but** coherent source [2] **CD** **any two from:** (series of) pits [1] digital information stored [1] reflect beam [1] back to receiver or back to sensor [1]	4	 **allow** monochromatic [1] **allow** constant phase difference [1] **allow** pits and lands / dips and ridges / dips [1] **ignore** bumps / cavities **ignore** bounce **allow** returns to receiver / returns to sensor [1]
	(c)		2.4 [1]	1	mark the answer line first if answer line blank allow correct answer circled, underlined or ticked on list

Question			Answers	Marks	Guidance
	(d)	(i)	**water** particles gain **kinetic energy** [1]	1	**both ideas needed for mark** **allow** KE for kinetic energy **allow** vibrate **more** or move **more** for idea of increased kinetic energy
		(ii)	idea of reflection (of waves or of microwaves) [1]	1	**ignore** bounce **ignore** microwaves cannot get out **not** reflects heat or reflects infrared or reflects (just) energy
		(iii)	**any one from:** microwaves absorbed about 1cm into food / AW [1] microwaves can get to centre (of 2cm depth of food) [1]	1	**allow** microwaves cannot penetrate far into food [1] **allow** microwaves only penetrate a few cm [1] **allow** because microwaves can (just) penetrate the meal [1] **allow** only penetrate the top layer of the food [1] **ignore** microwaves penetrate quicker
		(iv)	(microwaves) pass through / are not absorbed [1]	1	**not** heat or infrared
			Total	**10**	

Question			Answers	Marks	Guidance
3	(a)	(i)	reflects from side(s) (internally) [1] with angle of incidence greater than or equal to critical angle [1] **but** total internal reflection / TIR [2]	2	**ignore** bounce **not** refract / diffract **not** total internal refraction [0] **allow** correct diagrams only if the writing on the answer line is neutral, when written answer is incorrect diagrams **cannot** score award marks from a diagram with all reflections at the surface (no need for ray to emerge) and TIR correct by observation e.g.  [2] ray shown reflected from side with one or more reflection(s) [1] **but** for TIR angle of incidence = angle of reflection ($\geq 42^0$ approximately) [2] **maximum 1 mark if more than seven reflections**

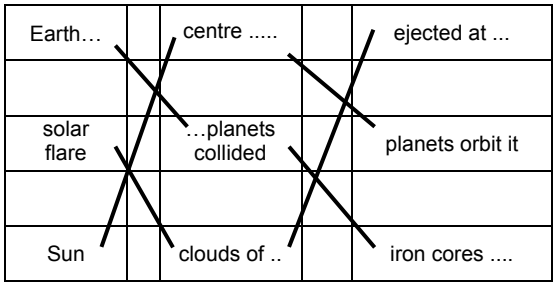
Question			Answers	Marks	Guidance
		(ii)	**analogue** is continuously variable / can have many values (within a range) / AW [1] **digital** can have two values or 2 states / off or on / 0 or 1 / high or low [1]	2	award **one** mark for analogue and **one** mark for digital e.g. digital has two values but analogue does not [1] **allow** has a range of values [1] **ignore** just vary in amplitude / just vary in frequency **ignore** analogue signals are waves **allow** a series of binary codes / a series of pulses [1] **ignore** idea that digital carry more information / interference is less **not** a range between 0 and 1 / 2 settings / 2 variables **not** can be turned or switched on and off **not** any two values **allow** higher level answers e.g. analogue signals can only send one signal at a time / ora [1] digital can be multiplexed / multiple signals can be sent at once [1] digital has a better output quality / ora [1] **allow** correct diagrams only if there is no writing on the answer line or the answer is neutral, if written answer is incorrect diagrams **cannot** score correct labelled diagram:  analogue digital [2]

Question			Answers	Marks	Guidance
3	(b)		**any two from:** noise / interference is not recognised [1] noise is not amplified [1] final signal is clean [1]	2	**allow** interference is ignored [1] **allow** less noise (in final signal) [1] **allow** better quality **sound** output [1] **ignore** clearer sound **ignore** multiplexing
			Total	**6**	

Question			Answers	Marks	Guidance
4	(a)	(i)	<u>absorb</u> **and** electrons …….. released / freed / knocked off [1] **then** movement (of) electrons [1]	2	**ignore** receive / take in **allow** removed or separated or lost for idea of released **allow** flow (of) charge [1] **allow** flow (of) electrons [1] **allow** movement (of) charge [1] **allow** electron movement [1] **ignore** displacement of electrons
		(ii)	30 (W) [2] **but if answer is incorrect** 12 x 2.5 [1]	2	

Question	Answers	Marks	Guidance
(b)	**advantage** **any one from:** renewable energy / sustainable energy [1] (idea of) no polluting **waste /** no greenhouse gases [1] rugged / hard wearing [1] require little maintenance [1] **disadvantage** **any one from:** (idea of) visual pollution [1] output depends on wind speed [1] large space / area needed [1]	2	**allow** idea of conserving fossil fuels [1] **ignore** less pollution or no pollution / environmentally friendly / reduces carbon footprint **allow** eye-sore [1] **allow** no wind no electricity or output / low wind little electricity or output [1] **as additional marking points:** **allow** kills birds [1] **allow** lots needed for the 10% or many more needed to supply more than 10% [1] **allow** idea of high building cost for same output compared to fossil fuels [1] **ignore** unreliable on it's own
	Total	**6**	

Question			Answers	Marks	Guidance
5	(a)		idea of thickness of aluminium (cooking foil) has increased [1]	1	**allow** idea of more beta (β) particles being absorbed (by thick foil) / less beta (β) particles penetrating (thick foil) [1] **allow** any suitable suggestion about the aluminium thickness being increased e.g**.** rollers have moved apart / pressure from rollers is less [1]
	(b)		alpha (α) would be stopped / alpha (α) would not get through or penetrate (foil or air) [1]	1	**allow** alpha (α) gets stopped by paper / stopped by material [1] **ignore** not strong enough
	(c)		**any one from:** taken out to or pumped into the sea [1] encased [1] reprocessed [1] stored in steel or concrete or lead or glass or sealed containers [1] idea of stored **deep** underground [1]	1	 **allow** washed out to sea [1] **ignore** fired into space **ignore** just put underwater but **allow** under **deep** water [1] **allow** stored in strong containers [1] **but not** just stored in containers or stored in metal **allow** stored in mines [1] **ignore** references to earthquake sites
			Total	**3**	

Question			Answers	Marks	Guidance
6	(a)		 [2]	2	1 mark for all lines between object and first statement correct 1 mark for all lines between first statement and second statement correct
	(b)		formation of the solar system / AW [1] ice (and) dust [1]	2	**allow** formation of the planets [1] **allow** left over when the solar system was made [1] **allow** left over from the formation of Mars and Jupiter [1] **not** Big Bang either order
			Total	**4**	

Question			Answers	Marks	Guidance
7	(a)		**advantages** **max two from:** (relatively) high fuel stocks / availability of fuel [1] independence from / preserves stocks of fossil fuels [1] no greenhouse gas emissions [1] **disadvantages** **max two from:** high decommissioning cost [1] pollution from reprocessing / problems of fuel reprocessing [1] terrorist threat [1] risk of nuclear accidents e.g. radioactive leaks or major accidents such as Chernobyl [1] relatively high maintenance costs [1] problem of disposal of **radioactive** waste [1]	3	**allow** only small amounts of fuel needed [1] **allow** no named greenhouse gases e.g. does not produce carbon dioxide [1] accidents must be qualified by being related to radioactivity **allow** produce **radioactive** waste / waste remains radioactive for a long time[1]

Question			Answers	Marks	Guidance
	(b)		720 (MJ) [2] **but if answer is incorrect** 1200 x 0.4 [1] **or** 1200 x 0.6 [1] **or** (1200 x 40) /100 [1] **or** (1200 x 60) / 100 [1]	2	look for working not final answer if answer incorrect **allow** other variations e.g.1200/10 x 4 [1]
			Total	**5**	

Question			Answers	Marks	Guidance
8			(idea of) away from the Earth / away from each other / away from a central point faster or more quickly or with increasing speed / AW (low energy) <u>microwave</u> Universe [2]	2	**all four correct for 2 marks** **any two or three correct for 1 mark** **allow** outwards **allow** away from the Sun **ignore** just away on its own
			Total	**2**	

Question			Answers	Marks	Guidance
9	(a)		battery [1] idea of (needs) charging [1]	2	**ignore** fuel cells **allow** rechargeable batteries [2]
	(b)		**any one from:** (idea that electric cars use) electricity from a (polluting) power station [1] electricity (that the car uses) come from a power station [1] power stations cause pollution [1]	1	**allow** electricity can be made from (polluting) fossil fuel [1] **allow** the making of electricity pollutes the air [1] **ignore** traffic congestion / pollution from car production
			Total	**3**	

Question			Answers	Marks	Guidance
10	(a)		Nick [1]	1	more than one answer scores [0] if answer line blank allow correct answer circled, ticked or underlined in list
	(b)		495 (m) [2] **but if answer is incorrect** 4.5 x 110 [1]	2	
			Total	**3**	

Question			Answers	Marks	Guidance
11	(a)		(change in) speed / velocity (per unit) time [1] weight greater than drag / forces are unbalanced / idea that drag has not yet become significant / gravity or weight is the bigger force [1]	2	**both required** **allow** second for time [1] **allow** weight greater than air resistance [1] **ignore** uneven forces
	(b)		**for Dan** less streamlined / more area **or** **for Gita** more streamline / less area [1] **for Dan** (so) more drag (than Gita at the same speed) **or** **for Gita** (so) less drag (than Dan at the same speed) [1] (idea that) more drag means lower terminal speed / ora [1]	3	**assume answer refers to Dan if not stated** **allow** for **Dan** more air resistance (than Gita at the same speed) [1] **allow** for **Gita** less air resistance (than Dan at the same speed) [1] **allow** idea that for same speed Dan has bigger drag so Gita will reach a higher speed before reaching terminal velocity [3]
	(c)		PE does work against friction / AW [1]	1	**allow** transferred to kinetic energy of air particles [1] **allow** transferred to heat (and sound) energy [1] **not just** transferred to sound energy
			Total	**6**	

Question			Answers	Marks	Guidance
12	(a)		54 000 (J) [2] **but if answer incorrect** 450 x 120 scores [1]	2	
	(b)		greatest mass / greatest weight / heaviest **and** greatest speed / greatest velocity [1]	1	**both required either order**
			Total	**3**	

Question			Answers	Marks	Guidance
13	(a)		**any two from:** alcohol drugs tiredness illness lack of concentration distractions older slower reaction distractions [1]	1	**two correct for one mark** **allow** examples of distraction e.g. children crying / radio / mobile phone
	(b)		**any two from:** wet / icy / slippery road surface bald tyres / low tread tyres / poor grip on tyres going down hill **increased** mass / load [1]	1	**two correct for one mark** **ignore** poor weather **/** poor road condition **allow** old tyres / poor tyres (limit of acceptability) **ignore** bad tyres **ignore** any mention of brakes

Question			Answers	Marks	Guidance
	(c)		(30 + 12 =) 42 [3] **but if answer incorrect** 0.5 x 20 x 3 = 30 [2] **if none of the above correct then** 0.5 x 20 x 3 [1] **or** 20 x 0.6 = 12 [1]	3	
			Total	**5**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553