OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics A
Twenty First Century Science

General Certificate of Secondary Education **J635**

Mark Schemes for the Units

June 2008

J635/MS/R/08J

Oxford Cambridge and RSA Examinations

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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.

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MARK SCHEMES FOR THE UNITS

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Guidance for Examiners

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Each separate marking point is indicated by a (1) at the end of that marking point.
4. Abbreviations, annotations and conventions used in the detailed Mark Scheme:

   ORA = or reverse argument
   NOT = point that is not given credit
   AW/owtte = alternative wording/or words to that effect: allow any expression that is clearly equivalent
   / = Alternative and acceptable answers for the same marking point
   <u>point</u> = point must be present to gain the mark
   (description) = description which need not be present to gain the mark

   E.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy'
   work done = 0 marks
   work done lifting = 1 mark
   change in potential energy = 0 marks
   gravitational potential energy = 1 mark
5. If a candidate alters his/her response, examiners should accept the alteration.
6. The list principle: if a list of responses greater than the number requested is given, you work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, i.e. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.
7. Marking method for tick boxes:
   If there is a set of boxes, some of which should be ticked and others left empty, then you need to judge the entire set of boxes.

   E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

   the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out). For a two-mark question, the rationale would be:

   All boxes are indicated scores 0 marks.
   All boxes blank scores 0 marks.
   All four boxes correct scores 2 marks.
   Three boxes correct scores 1 mark.
   Two boxes correct scores 1 mark.

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

A331/01 Modules P1, P2, P3 Foundation Tier

Question			Expected Answers	Marks	Rationale
1	a		(B) A C D E	3	A before C (1) C before D (1) D before E (1)
	b		similar fossils in SA and Africa ✓ (1) same pattern of rocks in the crust ✓ (1) shapes of continents ✓ (1)	3	1 mark for each of third, fifth and sixth boxes indicated. if more than three boxes indicated deduct one mark for each incorrect box
	c		explains how continents might move ✓ (1)	1	no extra ticks allowed
			Total	**7**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Rationale</th></tr>
<tr><td>2</td><td>a</td><td></td><td>starshade will block out light ✓ (1)
starshade will have thruster rockets ✓ (1)</td><td>2</td><td>2 marks for correct pattern
1 mark for just one mistake
0 marks for more than one mistake

see point 7 of Guidance for Examiners</td></tr>
<tr><td></td><td>b</td><td></td><td>Light pollution will affect telescope ✓ (1)

Earth’s atmosphere will not reduce the quality of the image ✓ (1)</td><td>2</td><td>2 marks for correct pattern
1 mark for just one mistake
0 marks for more than one mistake

see point 7 of Guidance for Examiners</td></tr>
<tr><td></td><td></td><td>c</td><td><table><tr><th>Hilton</th><th>Churchill</th></tr><tr><td>✓</td><td></td></tr><tr><td>✓</td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td>✓</td><td></td></tr></table>(1)
(1)
(1)
(1)</td><td>4</td><td>each correct row for [1]

accept any clear unambiguous response</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

Question			Expected Answers	Marks	Rationale
3	a		Q P R	2	all correct (2) 2 correct (1) this is possible only if there is no response in one box, or one letter repeated.
	b	i	Alex ✓ (1) Beth Carys ✓ (1) Derek	2	correct pattern for [2] one mistake for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
		ii	Alex Beth ✓ (1) Carys Derek ✓ (1)	2	correct pattern for [2] one mistake for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
		iii	Alex ✓ (1) Beth Carys ✓ (1) Derek	2	correct pattern for [2] one mistake for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
			Total	**8**	

Question			Expected Answers	Marks	Rationale
4	a		penetrating (1) ionising (1)	2	
	b		infrared ☐ ✓ ☐ (1)	1	no extra ticks allowed
	c		the energy in each photon ☐ ✓ ☐ (1) the number of photons arriving ☐ ✓ ☐ (1)	2	2 marks for correct pattern 1 mark for just one mistake 0 marks for more than one mistake see point 7 of Guidance for Examiners
			Total	**5**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Rationale</th></tr>
<tr><td>5</td><td>a</td><td>i</td><td>£150 million (1)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>ii</td><td>maintenance & operating costs ☐ ☐ ✓ ☐ (1)</td><td>1</td><td>no extra ticks allowed</td></tr>
<tr><td></td><td>b</td><td></td><td>
<table>
<tr><th>Sonya</th><th>Trevor</th><th>Neither</th></tr>
<tr><td>✓</td><td></td><td></td></tr>
<tr><td></td><td>✓</td><td></td></tr>
<tr><td>✓</td><td></td><td></td></tr>
<tr><td></td><td>✓</td><td></td></tr>
</table>
(1)
(1)
(1)
(1)
</td><td>4</td><td>per correct row (1)</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

Question			Expected Answers	Marks	Rationale
6	a		900 (1)	1	accept clear indication of choice
	b		the fraction of dose ... ✓ (1) dose from food & drink ... ✓ (1)	2	correct pattern for [2] one mistake for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
	c	i	33% (1)	1	accept clear indication of choice
		ii	C (1)	1	
		iii	(C) B D E A	3	B before D (1) D before E (1) E before A (1)
			Total	**8**	

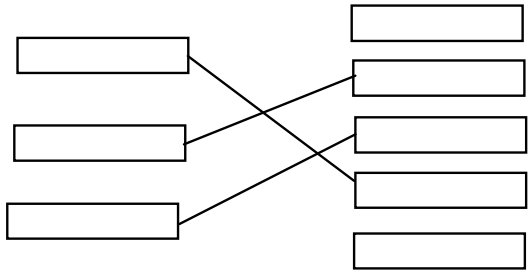
			Paper Total	**42**	

A331/02 Modules P1, P2, P3 Higher Tier

Question			Expected Answers	Marks	Rationale
1	a		C B A E D	3	B anywhere before A for [1] A anywhere before E for [1] E anywhere before D for [1] **b**ees **a**nnoy **e**rrant **d**ogs
	b		seafloor spreading ... ☐ ☐ ✓ ☐ ☐ (1)	1	one tick (✓) in the middle box for [1] accept any clear unambiguous response
	c		rocks in Earth's crust ... ☐ ✓ (1) mountain ranges formed ... ✓ (1) ☐ earthquakes and volcanic ... ✓ (1)	3	correct pattern for [3] one mistake for [2] two mistakes for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
			Total	**7**	

Question			Expected Answers	Marks	Rationale
2	a		starshade will block light ... ✓ (1) light from a planet is much ... ✓ (1) light from a distant planet ... ✓ (1)	3	correct pattern for [3] one mistake for [2] two mistakes for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick (see point 7 in Guidance)
	b		there will be no light ... ✓ (1) the Earth's atmosphere ... ✓ (1)	2	correct pattern for [2] one mistake for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
	c		Hilton / Churchill ✓ / (1) ✓ / ✓ (1) / (1) ✓ / (1)	4	each correct row for [1] accept any clear unambiguous response
			Total	**9**	

Question			Expected Answers	Marks	Rationale
3	a		P: gamma (rays) / γ Q: X (rays) R: visible / light S: microwave(s)	2	all four correct for [2] any three correct for [1]
	b	i	Alex ✓ (1) Beth Carys ✓ (1) Derek	2	correct pattern for [2] one mistake for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
	b	ii	Alex Beth ✓ (1) Carys Derek ✓ (1)	2	correct pattern for [2] one mistake for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
	b	iii	Alex ✓ (1) Beth Carys ✓ (1) Derek	2	correct pattern for [2] one mistake for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
			Total	**8**	

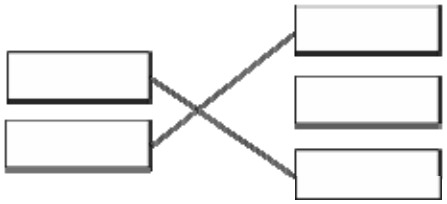
Question			Expected Answers	Marks	Rationale
4	a			3	correct pattern for [3] one mistake for [2] two mistakes for [1] a mistake is: • an incorrect line • a missing line • an extra line accept lines which are not straight
	b		infrared ✓ (1)	1	one tick in the second box for [1] accept any clear unambiguous response
			Total	**4**	

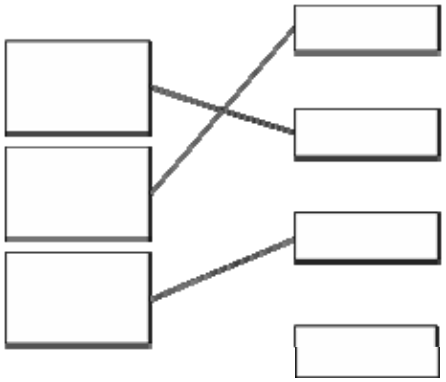
Question			Expected Answers	Marks	Rationale
5	a		£24 000 000 (1)	1	accept clear indication of choice
	b		Sonya ✓ (1) Trevor ✓ (1) neither ✓ (1)	3	each correct row for [1] accept any clear unambiguous response
			Total	**4**	

Question			Expected Answers	Marks	Rationale
6	a		900 (1)	1	accept clear indication of choice
	b		the fraction of dose ... ✓ (1) dose from food & drink ... ✓ (1)	2	correct pattern for [2] one mistake for [1] a mistake is: • a tick in the wrong box • a missing tick • an extra tick
	c		33% (1)	1	accept clear indication of choice
	d	i	(A) B C (D)	1	clear indication of both A and D for [1]
	d	ii	(A) B C D	1	clear indication of A for [1]
	e		(C) A F D E B	4	A anywhere before F for [1] F anywhere before D for [1] D anywhere before E for [1] E anywhere before B for [1] remember AFDEB
			Total	**10**	

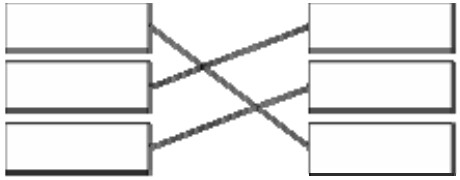
			Paper Total	**42**	

A332/01 Modules P4, P5, P6 Foundation Tier

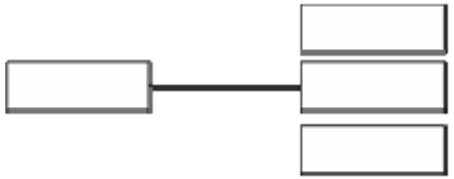
Question			Expected Answers	Marks	Rationale
1	a			2	per correct line (1) any left-hand box with more than one line coming from it counts as a mistake
	b		650 N downwards	1	**accept** any unambiguous identification
	c	i	A	1	**accept** any unambiguous identification
	d		gravitational potential energy	1	**accept** any unambiguous identification, e.g. gpe
			Total	**5**	

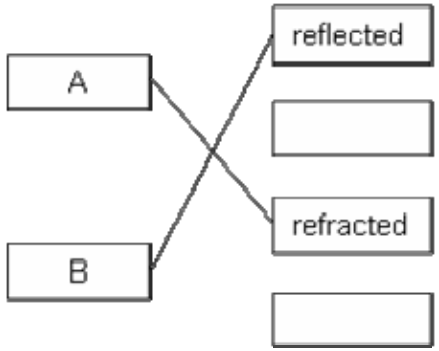
Question			Expected Answers	Marks	Rationale
2	a			3	per correct line (1) any left-hand box with more than one line coming from it counts as a mistake
	b		The kinetic energy of the lorry is reduced through heating ✓ (1) The counter force of the lorry is greater than the driving force ✓ (1)	2	two correct responses and 3 blanks (2) one correct responses and at least 3 blanks (1) everything else scores (0)
			Total	**5**	

Question			Expected Answers	Marks	Rationale
3	a		the same as (1) greater than (1)	2	must be in correct order
	b		Q	1	look for indication on the diagram if the answer line is blank
	c		0.15 W	1	**accept** any unambiguous identification
			Total	**4**	

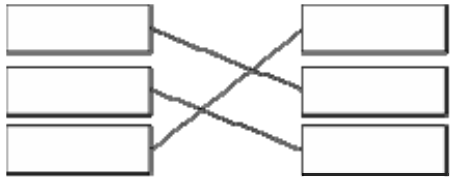
Question			Expected Answers	Marks	Rationale
4	a		The bow loses energy ✓ The arrow gains momentum ✓ The bow does work on the arrow ✓	2	three correct responses and 3 blanks (2) two correct responses and at least 3 blanks (1) everything else scores (0)
	b			2	3 correct lines (2) 1 or 2 correct lines (1) Any left-hand box with more than one line coming from it counts as a mistake.
			Total	**4**	

Question			Expected Answers	Marks	Rationale
5	a	i	electrons	1	**accept** any unambiguous identification
		ii	negative	1	**accept** any unambiguous identification
	b		there is an electric current in the wire ✓ (1) the wire contains free electrons ✓ (1) current in wire transfers energy ✓ (1)	3	three correct responses and 3 blanks (3) two correct responses and at least 3 blanks (2) one correct response and at least 3 blanks (1) everything else scores (0)
			Total	**5**	

Question			Expected Answers	Marks	Rationale
6	a		the magnet is spun round faster ✓ (1) number of coils is increased ✓ (1)	2	two correct responses and 2 blanks (2) one correct responses and at least 2 blanks (1) everything else scores (0)
	b	i	copper (1) iron (1)	2	must be in correct order.
		ii		1	any left-hand box with more than one line coming from it counts as a mistake
			Total	**5**	

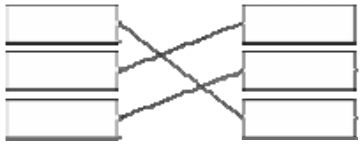
Question			Expected Answers	Marks	Rationale
7	a			2	correct response for (2) one mistake for (1) two or more mistakes for (0) a left-hand box with more than one line coming from it gets no mark for that box.
	b		increased (1) wavelength (1)	2	must be in correct order.
			Total	**4**	

Question			Expected Answers	Marks	Rationale
8	a		<table><tr><td>gamma</td><td>X-rays</td><td>UV</td><td></td><td>IR</td><td></td><td>radio</td></tr></table>	1	**accept** any unambiguous correct response **Ignore** other boxes
	b		<table><tr><td>(D)</td><td>C</td><td>A</td><td>E</td><td>B</td></tr></table>	3	C before A (1) A before E (1) E before B (1) remember Cats Always Eat Birds
	c		dense	1	**accept** any unambiguous identification
			Total	**5**	

Question			Expected Answers	Marks	Rationale
9	a			2	3 correct lines (2) 1 or 2 correct lines (1) any left-hand box with more than one line coming from it counts as a mistake.
	b		pulsing	1	**accept** any unambiguous identification
	c	i	A and C	1	both required, any order **accept** any unambiguous identification
		ii	worse	1	**accept** any unambiguous identification
			Total	**5**	

			Paper Total	**42**	

A332/02 Modules P4, P5, P6 Higher Tier

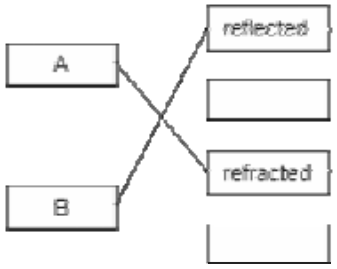
Question			Expected Answers	Marks	Rationale
1	a		The bow loses energy ✓ The arrow gains momentum ✓ The bow does work on the arrow ✓	2	three correct responses and 3 blanks (2) two correct responses and at least 3 blanks (1) everything else scores (0)
	b			2	3 correct lines (2) 1 or 2 correct lines (1) any left-hand box with more than one line coming from it counts as a mistake.
			Total	**4**	

Question			Expected Answers	Marks	Rationale
2	a		the same as (1) greater than (1)	2	must be in correct order.
	b		Q	1	look for indication on diagram if answer line is empty
	c		0.15 W	1	
			Total	**4**	

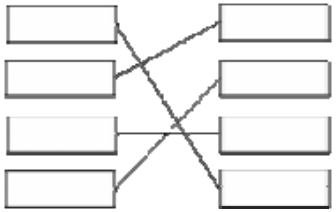
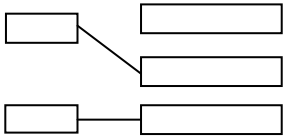
Question			Expected Answers	Marks	Rationale
3	a		equal to	1	
	b		reaction of surface under her feet ☐ ☐ ☐ ✓ (1)	1	no extra ticks allowed
	c	i	80 000 J	1	
		ii	$\frac{1}{2}\times 80\times\left(\frac{100}{40}\right)^2$	1	
	d		A	1	look for indication on diagram if answer line is empty
			Total	**5**	

Question			Expected Answers	Marks	Rationale
4	a		stopped at traffic lights D (1) making an emergency stop G (1) moving at the fastest speed B (1)	3	remember Doves Glide Beautifully (or Dirty Great Bus...)
	b	i	$\frac{800}{5}$	1	
		ii	the friction from the driver's seat ✓ (1)	1	no extra ticks allowed
			Total	**5**	

Question			Expected Answers	Marks	Rationale
5	a		electrons negative current	2	correct response for (2) one mistake for (1) two or three mistakes for (0) **be alert for giving (2) for two correct words, or (1) for one correct word!**
	b	i	metals are good insulators F the wire contains charges T plane and ground have same charge F charges cannot move freely in rubber T	2	accept true instead of T and false instead of F correct response for (2) one mistake for (1) two or more mistakes for (0) any empty box is incorrect; do not treat it as F treat F as incorrect (empty) ✓ for true and × for false is acceptable. **be alert for giving (2) for two correct boxes, or (1) for one correct box!**
		ii	2300 W	1	
			Total	**5**	

Question			Expected Answers	Marks	Rationale
6	a			2	correct response for (2) one mistake for (1) two or more mistakes for (0) a left-hand box with more than one line coming from it gets no mark for that box.
	b		increased (1) wavelength (1)	2	must be in correct order.
			Total	**4**	

Question			Expected Answers	Marks	Rationale
7	a	i	C	1	
		ii	alternating	1	
	b	i	voltage (1) efficiency (1)	2	must be in correct order.
		ii	(C) A B D	1	remember Always Breathe Deeply (or All Bow Down)
			Total	**5**	

Question			Expected Answers	Marks	Rationale
8	a			2	top 2 left-hand boxes correct (red lines on template) (1) bottom 2 left-hand boxes correct (blue lines on template) (1) no extra lines permitted.
	b		energy (1) frequency (1)	2	
	c			1	no extra lines permitted.
			Total	**5**	

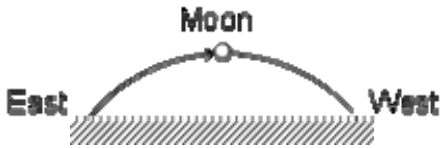
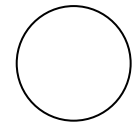
Question			Expected Answers	Marks	Rationale
9	a		(B) A D E C	3	A before D (1) D before E (1) E before C (1) remember All Dogs Eat Cats
	b		transmitted pattern recognised ☐ ✓ ☐ ☐ (1)	1	no extra ticks allowed
	c		microwaves	1	
			Total	**5**	
			Paper Total	**42**	

A333/01 Module P7 Foundation Tier

Question			Expected Answers	Marks	Rationale
1	a		any **two** from: produce power/electricity (1) treat cancer (1) track chemicals in body (1) sterilise surgical instruments(1) sterilise food (1) smoke detectors (1)	2	**allow** 'electricity' on its own nuclear fuel bombs **not** 'medicine' on its own
	b		radon (gas) (1) medical (1)	2	from article pie chart
	c		meaning: (low level) radiation exposed to all the time/radiation all around us (1) example of **Source**: radon/cosmic rays/food and drink/buildings/nuclear power (1)	2	**not** a radiation already there **not** naturally occurring from list in article **not** 'sun'
	d		explicit view (i.e. in favour, against, undecided) consistent with reasons given; (3) for: provides needed energy; provides radioactive materials for other uses; produces little/no CO_2; against: seriousness of possible accidents; disposal of nuclear waste; terrorist use; large amounts of CO_2 produced during building (with concrete) communication: clear, ordered answer (1)	4	for views **maximum** 3 for communication (1) **allow** producing materials for nuclear weapons either for or against arguments must be correct science **not** arguments about spoiling the view **not** arguments about jobs

Question			Expected Answers	Marks	Rationale
1	e	i	**any two from:** damages/kills living cells causes cancers causes mutations produces ions (in cells)/breaks apart molecules ions disrupt/take part in chemical reactions (in cell)	2	**ignore** 'harms cells' **accept** removal of electron (from atom)
		ii	benefit - may cure cancer/cancer is likely to kill/cancer high risk/extends life (1) risk - may cause other damage/side effects (1) comparison of benefits and risks e.g. benefits outweigh risk (1)	3	**accept** 'kills cancer cells is a benefit' **accept** an example of damage Candidates must address the question for this mark. **accept** implied relationship e.g. linking phrases, such as 'however' 'but'. For example 'you may live longer but healthy cells may be damaged' The 'relating' mark can be awarded if linking a benefit and risk even if the benefit and/or risk do not gain a mark.
			Total	**15**	

Question			Expected Answers	Marks	Rationale
2	a			3	all correct (3) two or three correct (2) one correct (1)
	b	i	C (1) greatest/most curved (1)	2	**allow** thickest/fattest/shortest focal length/ bigger width
		ii	C (0) most powerful/most curved (1)	1	this mark is for explaining the reason
	c	i	straight lines continued to mirror (1) lines reflect off mirror to the focal point (1)	2	
		ii	idea of collecting light; very little light; from very faint/distant objects;	2	**maximum** 2 **allow** make image brighter/sharper/clearer
			Total	**10**	

Question			Expected Answers	Marks	Rationale
3	a	i	line rising to moon on both sides (1) arrow from East to West (1)  	2	lines must reach the moon
		ii	Earth is rotating	1	**accept** Earth spins owtte
		iii	more than 24hrs	1	
	b	i	arrow pointing to the right	1	
		ii	B  (1) C (2) D (1)	4	B full moon (1) C half moon (1) dark side to the left (1) D new moon (1)
			Total	**9**	

Question			Expected Answers	Marks	Rationale
4	a		any **one** from: Major radio observatories: Socorro, New Mexico, USA Jodrell Bank, UK Arecibo, Puerto Rico Parkes, New South Wales, Australia Major optical observatories: Mauna Kea, Hawaii Roque de los Muchachos, La Palma Observatory in Canary Islands Paranal Observatory, Chile Kitt Peak, USA Observatorio Nacional de Llano del Hato, Venezuela	1	**allow** name or location **allow** other examples **allow** Hawaii and Canaries **not** allow Chile, Israel unless more specific locations given
	b	i	Pierre (1) Nanette (1)	2	
		ii	Kurt	1	
	c		advantage (1): avoids atmospheric distortion/refraction/absorption/twinkle different parts of spectrum available disadvantage (1): cost of putting in space cost/difficulty of maintenance/repair uncertainty of space programme	2	**allow** idea of fewer things in the way **not** allow vague cost comments eg it's expensive. Needs to be qualified e.g. Repair is more expensive,
	d		shared cost/pooling of expertise/knowledge	1	
			Total	**7**	

Question			Expected Answers	Marks	Rationale
5	a		gravity	1	**do not accept** 'g force'
	b	i	any **two** from: pressure increases; particles move faster/ have more kinetic energy; more frequent/energetic collisions; particles have increased momentum; increased forces during collisions;	2	**do not accept** 'moves more' or 'vibrates' or just 'more energy' **allow** collisions with 'edge' or 'boundary' **accept** 'more collisions'
		ii	-270	1	
	c	i	**name of particle** **charge on particle** proton positive neutron none	1	both required **do not accept** 'neuron' or 'nucleon'
	c	ii	electrical/electrostatic/electromagnetic (repulsion)	1	**accept** 'repulsion of charges' or 'static' **do not accept** 'magnetic' repulsion is insufficient on its own

Question			Expected Answers	Marks	Rationale
5	d	i	Hydrogen → Helium	2	per correct answer (1) **allow** H and He (symbols must be correct) **ignore** any balancing/additional numbers
	ii		**top box:** Core (1) Energy produced/fusion takes place (1) **middle box:** **either** convection zone (1) energy transferred (outwards) by convection currents (1) **or** radiative zone (1) energy transferred (outwards) as radiation/light/photons (1) **bottom box:** **either** Photosphere (1) Light/energy radiated into space/energy transferred to light (1) **or** convection zone (1) Energy transferred (outwards) by convection currents (1)	6	**do not accept** 'fission' **not** energy built up or energy increasing **accept** 'convective' or 'convectional' zone **requires** idea of convection currents or cells **accept** 'emitted' or idea of energy leaving star. **accept** 'convective' or 'convectional' zone **requires** idea of convection currents or cells
			Total	**14**	

A333/02 Module P7 Higher Tier

Question			Expected Answers	Marks	Rationale
1	a	i	any **two** from: damages/kills living cells(1) causes cancers (1) causes mutations (1) produces ions (in cells)/breaks apart molecules (1) ions disrupt/take part in chemical reactions (in cell) (1)	2	**ignore** harms cells **accept** removal of electron (from atom)
		ii	benefit - may cure cancer / cancer is likely to kill / cancer high risk / extends life (1) risk - may cause other damage/side effects (1) comparison of benefits and risks e.g. benefits outweigh risk (1)	3	**accept** 'kills cancer cells is a benefit' **accept** an example of damage candidates must address the question for this mark **accept** implied relationship e.g. linking phrases, such as 'however' 'but' for example 'you may live longer but healthy cells may be damaged' the 'comparison' mark can be awarded if linking a benefit and risk even if the benefit and/or risk do not gain a mark
	b		uranium (nucleus) decay/undergoes fission/splits (1) produces <u>neutron(s)</u> (1) idea of repeating/carrying on / neutrons trigger <u>another</u> fission (1)	3	points may be shown on a diagram idea of repeating must be in the context of Uranium fission
	c		automatically shut down - so cannot melt down/explode (1) OR water released over reactor - prevents over heating/meltdown (1)	1	mark is for explanation

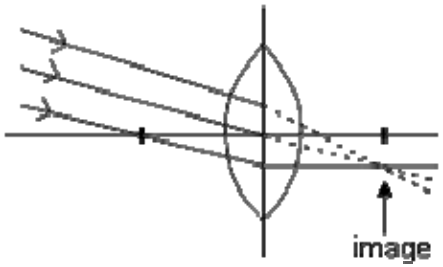
Question			Expected Answers	Marks	Rationale
1	d		any **one** from: same number of protons (1) 92 protons (1) any **one** from: different number of neutrons (1) (three) more neutrons in U-238 (1)	2	**allow** 1 mark for correct half life difference including direction (U-235 less than U-238 or quoting values from table) ora
	e		indication of 3 half lives e.g. halving three times (1) 13.5 billion (1)	2	correct numerical answer gains 2 marks
			Total	**13**	

2	a		gravity	1	do not accept 'g force'
	b	i	any **two** from: pressure increases (1) particles move faster/ have more kinetic energy (1) more frequent/energetic collisions (1) particles have increased momentum (1) increased forces during collisions (1)	2	**do not accept** 'moves more' or 'vibrates' or just 'more energy' **allow** collisions with 'edge' or 'boundary' **accept** 'more collisions'
		ii	-270	1	
	c	i	<table><tr><th>name of particle</th><th>charge on particle</th></tr><tr><td>proton</td><td>positive</td></tr><tr><td>neutron</td><td>none</td></tr></table>	1	both required **do not accept** 'neuron' or 'nucleon'

Question			Expected Answers	Marks	Rationale
2	c	ii	electrical/electrostatic/electromagnetic (repulsion) (1)	1	**accept** 'repulsion of charges' or 'static' **do not accept** 'magnetic' repulsion is insufficient on its own
	d	i	Hydrogen (1) → Helium (1)	2	per correct answer (1) **allow** H and He (symbols must be correct) **ignore** any balancing/additional numbers
		ii	**top box:** core (1) energy produced/fusion takes place (1) **middle box:** **Either** convection zone (1) energy transferred (outwards) by convection currents (1) **Or** radiative zone (1) energy transferred (outwards) as radiation/light/photons (1) **bottom box:** **Either** photosphere (1) light/energy radiated into space / energy transferred to light (1) **or** convection zone (1) energy transferred (outwards) by convection currents (1)	6	**do not accept** 'fission' **accept** 'convective' or 'convectional' zone **requires** idea of convection currents or cells **accept** 'emitted' or idea of energy leaving star. **accept** 'convective' or 'convectional' zone **requires** idea of convection currents or cells
			Total	**14**	

Question			Expected Answers	Marks	Rationale
3	a	i	49 minutes	1	**credit** "(about / approximately) 1 hour"
		ii	mentions Earth rotation and moon orbit (1) both rotate in same direction (1)	2	**ignore** reference to Earths orbit
	b		(A) E (1) D (1) H (1)	3	if **both** 3rd box is B **and** 4th box is F then award 1 mark for the two boxes e.g. for 2 marks a candidate may write (A) E B F only one letter allowed in each box
	c		moon must be between Earth and Sun / Moon blocks light from Sun (for eclipse) (1) lunar orbit tilted (relative to Earth's orbit) (1) so often above/below/not in line with Earth and Sun (1)	3	**'**Moon blocks Sun' is insufficient points may be shown on a diagram ora **accept** for 1 mark, 'lunar shadow is very small/eclipse not visible everywhere' must be stated and not just shown on diagram
			Total	**9**	

Question			Expected Answers	Marks	Rationale
4			any **four** from:	4	
			project identified/named(1)		**accept** any international named large telescope, satellites, space probes and large particle accelerators **accept** Hubble telescope **do not accept** organisations e.g. NASA and European Space Agency (ESA) as projects
			description of purpose of project (1)		**accept** any statement about what the project does
			explanation relating to cost (1) explanation relating to pooling/sharing (1) expertise/(experienced) scientists (1) explanation relating to political factors (1)		the explanation marks are high demand marks and should not be awarded for vague/weak answers **ignore** sharing data idea **ignore** sharing locations idea
			communication: answer is presented in a clear and ordered manner (1)	1	candidate's response must address the question must be understandable on first reading must consist of at least two sentences
			Total	**5**	

Question			Expected Answers	Marks	Rationale
5	a		ray through centre of lens continues straight to intersect bottom ray (1) top ray bends in lens then continues as straight line to intercept of central and bottom ray (1) image labelled at intercept of two rays (1)  	3	no mark for a ray if it is continued in more than one direction
	b	i	re-arrangement f=1÷P or f=1÷20 (1) 0.05 (1)	2	correct numerical answer (2)
		ii	correct substitution: m=0.5÷0.01 (1) 50 (1)	2	correct numerical answer (2) if units given in answer, maximum 1 mark
		iii	magnification=1 / no/little magnification (1)	1	ora **ignore** comments about focus or blurring
	c	i	(concave/curved) mirror	1	**accept** parabolic mirror
		ii	parallel light rays (1) reflected to a focus from a curved mirror (1)	2	judge parallel lines by eye - this mark is independent of whatever the reflecting/refracting object is
	d		radio waves have longer wavelength than visible light (1) links diffraction to wavelength or aperture size (1) aperture must be (much) larger than wavelength (1)	3	
			Total	**14**	

Grade Thresholds

General Certificate of Secondary Education
Physics A (Specification Code J635)
June 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A331/01	Raw	42	N/A	N/A	N/A	31	26	22	18	14	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A331/02	Raw	42	37	33	28	23	18	15	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0
A332/01	Raw	42	N/A	N/A	N/A	27	23	20	17	14	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A332/02	Raw	42	34	29	23	18	13	10	N/A	N/A	0
	UMS	50	45	40	35	30	25	23	N/A	N/A	0
A333/01	Raw	55	N/A	N/A	N/A	27	22	17	13	9	0
	UMS	100	N/A	N/A	N/A	60	50	40	30	20	0
A333/02	Raw	55	42	33	23	14	9	6	N/A	N/A	0
	UMS	100	90	80	70	60	50	45	N/A	N/A	0
A339	Raw	40	33	29	25	21	17	13	10	7	0
	UMS	100	90	80	70	60	50	40	30	20	0
A340	Raw	40	33	30	26	23	19	16	13	10	0
	UMS	100	90	80	70	60	50	40	30	20	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J635	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J635	18.9	53.4	83.5	96.2	99.0	99.8	100.0	100.0	100.0	10 692

10 955 candidates were entered for aggregation this series

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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