

Gateway Science Suite J640 - J645

Mark Schemes for the Units

June 2007

J640-5/MS/R/07

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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GCSE Science

MARK SCHEMES FOR THE UNITS

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Mark Scheme B621/01

June 2007

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

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
not	= answers which are not worthy of credit
reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant
allow	= answers that can be accepted
()	= words which are not essential to gain credit
<u> </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question		Expected Answers	Marks	Rationale	
1	a	bread (1)	1	more than one response on the line scores zero if no answer on the line accept ringed, underlined or ticked word or indicated on diagram etc	
	b	i	orange juice (1)	1	allow orange or juice more than one response on the line scores zero if no answer on the line accept ringed, underlined or ticked word or indicated on diagram etc
		ii	bread (1)	1	more than one response on the line scores zero if no answer on the line accept ringed, underlined or ticked word or indicated on diagram etc
	c	any one from (high in) protein (1) because they are growing/for repair (1) (high in) iron (1) to prevent anaemia/reference to menstruation/reference to blood (1) and second mark for correct link between protein or iron with its role	2	one mark for either protein or iron or role second mark is for correct role of iron or protein ignore strong/healthy NOT white blood cells eg 'protein and iron for growth'- 2 marks 'protein for growth' – 2 marks 'iron for growth' – 1mark	
		Total	5		

Question		Expected Answers		Marks	Rationale
2	a	D	long sighted/far sighted/colour blind/colour deficiency/glaucoma/cataracts/ tunnel vision(1)	1	allow astigmatism NOT 'blindness', double vision ignore conjunctivitis
	b	i	G cornea (1) iris (1)	2	more than one response on the line scores zero
		ii	G lens (1)	1	more than one response on the line scores zero
		iii	C the idea of a different shape/the idea of focusing light (1)	1	allow converse answers ignore incorrect eye part, refraction NOT reflection
			Total	5	

Question		Expected Answers	Marks	Rationale	
3	a	pregnancy/ovulation (1)	1	allow heavy periods, prevent egg release, babies, period pains, fertilisation ignore references to disease	
	b	do not have to remember to take it every day/pill difficult to swallow/less likely to cause problems if you are sick (1)	1	allow ' a patch lasts for a week' 'it lasts longer than a pill' 'more convenient than taking a pill everyday' 'you might forget to take the pill' 'do not have to take lots of pills' 'easier to use than swallowing a pill' 'easier to put on a patch than swallow a pill' NOT 'it is much easier' 'more convenient'	
	c	i	ovary/ ovaries (1)	1	more than one response on the line scores zero
		ii	breasts (development)/hips widen/ periods (start)/menstrual cycle/ pubic hair/hair under arms/body hair (1)	1	ignore makes hair grow (must be body hair) ignore hips larger ignore egg release/references to ovulation/specific references to changes in the uterus ignore moods and spots
	d	i	to test it/to see if it is safe/to see if it works (1)	1	
		ii	idea of cruelty / ethical objection (1) may work differently in different species/animals are not the same as humans(1)	1	allow it could harm/hurt/kill animals/inhumane allow references to animal rights eg animal can't speak for itself eg some people think animals have same rights as humans eg animals have no control over what happens to them eg it might not hurt the animal but could harm the human
Total			6		

Question		Expected Answers	Marks	Rationale
4	a	distorts what is seen and heard (1)	1	more than one box ticked scores zero
	b	idea that they may be harmful/the idea that the use can be controlled or monitored (1)	1	<p>allow 'because they are dangerous' 'they may be addictive' 'not everyone can get them' 'you only get the amount you need' 'to prevent overdose' 'to prevent misuse'</p> <p>ignore 'you may mistreat the drugs'</p>
	c	<p>some are more harmful/addictive than others (1)</p> <p>different laws apply to each group (1)</p>	2	<p>references to classes of drugs must be correct for first mark eg class A are more dangerous than class C eg depends how dangerous they are eg put into different classes according to their effect/side effects/long & short term effects eg heroin is more dangerous than cannabis ignore Class A are stronger/worse than Class C</p> <p>ignore incorrect references to class of drugs when related to penalties eg class C drugs attract a higher prison sentence than class A scores 1 eg class A drugs get prison sentence, but class C are legal scores 0 eg the more dangerous the drug (1) the heavier the penalty (1)</p>
		Total	4	

Question		Expected Answers	Marks	Rationale
5	a	25 (1)	1	correct response only
	b	propanol (1) largest (temperature) rise/change (1)	2	carry error forward if response for a) is greater than 30, do not credit propanol if response for a) is greater than 30, paraffin gets 1 mark independent of first part allow 'it starts at the lowest and ends at the highest temperature' allow it rises more allow because it went from 15 to 45 which is the highest ignore 'highest temperature at end' 'it went up by 30°' 'it starts at 15 and goes up to 45'
	c	energy or heat given out (1)	1	allow temperature increase allow heat or energy produced/made/exits/released ignore gives more energy eg energy/heat is lost (1) (limit of acceptability) NOT energy/heat is created
		Total	4	

Question		Expected Answers	Marks	Rationale
6	a	any two from microwave/conventional oven/boiling/steaming/ grilling/barbecue /bbq(1)	2	allow scramble/poach/baking/coddling ignore omelette
	b	i	1	allow 'it goes white' 'it goes solid' 'runny to hard' 'the yolk goes more orangey' ignore ref to shape changes eg ' it spreads out in the pan'
		ii	1	allow energy change takes place allow colour change allow higher level answers involving changes to molecules, eg molecules in egg change shape (ignore references to particles) ignore references to change of state
		Total	4	

Question		Expected Answers	Marks	Rationale
7	a	(catalytic) cracking (1)	1	allow decomposition
	b	i petrol (1)	1	more than one response on the line scores zero if no answer on the line accept ringed, underlined or ticked word etc
		ii ethene (1)	1	allow spelling errors, eg ethane allow C ₂ H ₄ , $ \begin{array}{c} \text{H} \quad \quad \text{H} \\ \backslash \quad / \\ \text{C} = \text{C} \\ / \quad \backslash \\ \text{H} \quad \quad \text{H} \end{array} $ mark what is on answer line first- only look at list if no answer on line allow answer circled/underlined in list
	c	used as a catalyst/speeds up reaction (1)	1	allow higher level answers such as lower activation energy 'it speeds up the experiment' NOT enzyme 'speeds up heating' 'it won't take as long to start the reaction'
		Total	4	

Question		Expected Answers	Marks	Rationale
8	a	NaHCO ₃	1	allow badly copied formula eg 'NAHCO ₃ ' or NaHCo3' etc
	b	Ca(OH) ₂	1	allow badly copied formula eg Ca(OH) ² /Ca(OH)2 NOT 'calcium hydroxide' in words
	c	<pre> H H H — C — C — H H H </pre>	1	allow C ₂ H ₆ allow badly copied structure but it must have only 2 C's and 6H's NOT HHHHHHCC
		Total	3	

Question		Expected Answers	Marks	Rationale
9	a		2	3 correct scores 2 1 or 2 correct scores 1
	b	will not decay or decompose (by bacterial action) (1)	1	allow 'does not rot'/'will not break down' ignore 'does not disintegrate/deteriorate/wear away' 'burning' 'recycling'

Question		Expected Answers		Marks	Rationale
	c	<p>property</p> <p>idea of poor conductor (of electricity)/idea of good (electrical) insulator (1)</p> <p>flexible or bendy (1)</p> <p>easy to mould (1)</p> <p>easy to colour (1)</p> <p>idea of waterproof/insoluble in water (1)</p> <p>non toxic (1)</p>	<p>explanation</p> <p>so that you do not get a shock or electrocution or idea of protection (from electrocution) (1)</p> <p>so that it can bend around corners/AW (1)</p> <p>so wires can be identified (1)</p> <p>to keep water away from (copper) wires/prevent electrocution (1)</p> <p>reason needs to be linked to health and safety eg idea of safe handling (1)</p>	2	<p>any two properties can score or one property and correct explanation for two marks</p> <p>explanation mark is conditional on correct property</p> <p>ignore tough/lightweight/non biodegradable/cheap/elastic/durable/heat insulator/any reference to melting point/does not corrode/easy to store</p>
		Total		5	

Question		Expected Answers	Marks	Rationale								
10	a	<table style="border: none;"> <tr> <td style="padding-right: 20px;">hot</td> <td>cold</td> </tr> <tr> <td>✓</td> <td>✓</td> </tr> <tr> <td>✓</td> <td></td> </tr> <tr> <td>(✓)</td> <td>✓</td> </tr> </table>	hot	cold	✓	✓	✓		(✓)	✓	2	<p>one correct 1 mark all correct 2 marks</p> <p>do not credit tick for burning match (bottom tick)</p>
hot	cold											
✓	✓											
✓												
(✓)	✓											
	b i	jacket on water tank/oven gloves (1)	1	<p>allow single word if it is clear what is meant if two answers are given, both must be correct for mark</p> <p>ignore wooden handle or other correct answers not from list</p>								
	ii	steel radiator (1)	1	ignore correct answers not from list								
	c	idea that ice is melting/ice is at melting point/ ice is at its freezing point (1)	1	<p>allow defrosting, thawing eg they are defrosting NOT they have defrosted or thawed NOT ice has melted</p> <p>ignore unfreezing</p> <p>NOT peas melting/ peas at melting point/it is melting/ they are melting etc</p>								
	d	(the amount of heat or energy needed to raise/change the temperature by 1K/°C (1) of 1 g/1 kg (1)	2									
		Total	7									

Question			Expected Answers	Marks	Rationale
11	a	i	D (1)	1	correct letter only
		ii	B (1)	1	correct letter only
	b	i	<p>any two from</p> <p>idea that light travels (very) quickly/quicker(1)</p> <p>light can be seen a long way off (1)</p> <p>idea that no need for a person to take the message/fires/beacons/flashing lights could be used (1)</p>	2	<p>read whole response and look for both marking points</p> <p>allow 'it is quick'</p> <p>NOT 'light travels a long way'</p> <p>allow 'no-one has to travel'</p>
		ii	morse (1)	1	allow digital
	c		microwave (1)	1	<p>more than one response on the line scores zero</p> <p>if no answer on the line accept ringed, underlined or ticked word etc</p>
	d		<p>any two from</p> <p>idea that foil reflects radiation/heat/ir (1)</p> <p>back into potato (1)</p> <p>keeps potato hot/insulates (1)</p>	2	<p>ignore refs to AI as a conductor</p> <p>allow 'bounce' for reflection mark</p> <p>'keeps heat in'</p> <p>allow 'foil traps air'- 1mark</p> <p>'foil traps air and air is a good insulator' – 2 marks</p>
			Total	8	

Question			Expected Answers			Marks	Rationale
12	a	i	idea that it causes damage/casualties (1)			1	allow earth shakes/ vibrates/cracks tsunami, tidal waves, plates shake ignore plates move, earth moves, volcanic activity
		ii	seismometer (1)			1	more than one response on the line scores zero
	b		feature	p-waves	s-waves	3	ignore references to primary and secondary ignore descriptions of longitudinal and transverse waves
			speed				
			travel through		solids (only) (1)		
			type	longitudinal(1)	transverse(1)		
Total						5	

Mark Scheme B621/02

June 2007

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

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
not	= answers which are not worthy of credit
reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant
allow	= answers that can be accepted
()	= words which are not essential to gain credit
<u> </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question			Expected Answers	Marks	Rationale
1	a	i	bend/refract/focus (the light entering the eye) (1)	2	NOT reflects light/diffracts light NOT control light going into the eye ignore idea of protection allow prevent damage to the retina (caused by too much light)/protects retina allow let in more light in dim conditions/ aw allow to see in the dark (limit of acceptability)
		ii	change the size of the pupil/control the amount of light entering the eye/ensure that the correct amount of light reaches the retina (1)		
	b		focused image lands on retina/focus on distant objects/aw (1)	1	allow the lens does not focus the light accurately eg to focus the light into the correct position eg to see things far away allow (lens) is the wrong shape, eg lens is too thick allow because the lens cannot accommodate NOT lens is concave or too thin or too long allow (lens) needs to be less powerful/thinner ignore lens is not working properly
	c		laser surgery (1)	1	allow cornea surgery/conductive chiroplasty NOT references to glasses or contact lenses
	d		(colour blindness is) inherited or genetic/lack of specialised cells in retina(1)	1	allow abnormal cones/lack of cones allow wrong amount of cones ignore retina is damaged/abnormal retina allow some receptor cells in the retina do not work
			Total	5	

Question			Expected Answers	Marks	Rationale
2	a	i	breast (development)/hips widen/ periods (start)/menstrual cycle/ pubic hair/hair under arms/body hair (1)	1	ignore makes hair grow (must be body hair) ignore hips larger ignore eggs released/references to ovulation/specific references to changes in the uterus ignore moods and spots
		ii	progesterone (1)	1	be lenient on spelling eg allow progesterogen / progestogen
	b		mimic pregnancy/aw (1) prevent ovulation/aw (1)	2	eg body thinks it is pregnant eg no egg produced allow a reason and an explanation eg prevents ovulation or no egg (1) to be fertilised (1) ignore references to barriers to sperm
	c		idea of cruelty / ethical objection / may work differently in different species/animals are not the same as humans(1)	1	allow it could harm/hurt/kill animals/inhumane allow references to animal rights eg animal can't speak for itself eg some people think animals have same rights as humans eg animals have no control over what happens to them eg it might not hurt the animal but could harm the human
			Total	5	

Question		Expected Answers	Marks	Rationale
3	a	a systolic pressure of 120 and a diastolic pressure of 80 (1)	1	tick in third box down if more than one box is ticked = 0 allow circled, underlined or crossed answers
	b	there does not appear to be any relationship/aw(1)	1	allow it does not matter/nothing eg whatever the height the blood pressure is around 55 eg all different at different heights (limit of acceptability)
	c	the higher the weight the higher the blood pressure/diastolic (1)	1	allow systolic eg there is a positive correlation eg they are directly proportional eg when one goes up the other goes up eg there is an exponential increase
	d	low blood pressure: dizziness/fainting/poor circulation/ kidney failure (1) high blood pressure: burst blood vessels/damage to brain/kidney damage/heart disease/stroke(1)	2	eg not enough blood reaches organs allow coma, unconscious, cold hands/feet ignore tiredness and/or weakness allow heart attacks or heart disorders allow higher level answers eg aneurysm/heart or cerebral infarction
		Total	5	

Question		Expected Answers	Marks	Rationale
4	a	LSD (1)	1	allow tick or circle on picture, if line blank
	b	<p>some are more harmful/addictive than others (1)</p> <p>different laws apply to each group (1)</p>	2	<p>references to classes of drugs must be correct for first mark eg class A are more dangerous than class C eg depends how dangerous they are eg put into different classes according to their effect/side effects/long & short term effects eg heroin is more dangerous than cannabis ignore Class A are stronger/worse than Class C</p> <p>ignore incorrect references to class of drugs when related to penalties, eg Class C drugs attract a higher prison sentence than Class A scores 1 eg Class A drugs get prison sentence, but Class C are legal scores 0 eg the more dangerous the drug (1) the heavier the penalty (1)</p>
	c	<p>any mention of synapses (1)</p> <p>slow down/reduce/block the neurotransmitter/ acetylcholine/ACh release (1)</p> <p>less nerve impulses or signals travel to brain (1)</p> <p>block the receptor sites/detection of the neurotransmitter acetylcholine/ACh (1)</p>	2	<p>eg prevents signals from the body getting to the brain</p> <p>eg they block the chemical acetylcholine (1) so less nerve impulses travel to the brain (1) eg reduce the amount of chemical transmitter released (1) at synapses (1) making for slower reactions</p> <p>ignore references to slower reactions or slowing down brain or nervous system ignore references to feeling depressed or 'down' allow any other named neurotransmitter</p>
		Total	5	

Question			Expected Answers	Marks	Rationale
5	a	i	energy or heat given out (1)	1	allow temperature increase allow heat or energy produced/made/exits/released ignore gives more energy eg energy/heat is lost (1) (limit of acceptability) NOT energy/heat is created
		ii	8400J scores (2) BUT energy = mass (of water) x SHC x temp change/ 100 x 4.2 x 20 (1)	2	126 scores (1) MAX
	b		endothermic/energy taken in or absorbed (1) given out/released (1)	2	allow heat or energy produced/made/exits/released NOT energy is created allow energy is 'lost'(1) (limit of acceptability)
			Total	5	

Question		Expected Answers	Marks	Rationale
6	a	new substance formed/difficult to reverse (1)	1	allow energy change takes place allow colour change allow higher level answers involving changes to molecules, eg molecules in egg change shape (ignore references to particles) ignore references to change of state
	b	any two from (high temperature) kills microbes/bacteria/micro-organisms/viruses/fungi/mould (1) improve the texture (1) improve the taste/flavour (1) easier to digest (1)	2	allow get rid of bacteria allow prevents food poisoning or named example eg salmonella ignore germs ignore protects from bacteria ignore make it edible ignore easier to eat allow some foods are poisonous if not cooked, eg red kidney beans
	c	any two from shape of protein molecule changes (1) process is irreversible/aw (1) (process is called) denaturing/protein is denatured (1)	2	allow protein molecule breaks down allow protein molecule unfurls ignore protein molecule expands eg molecule changes shape (1) and stays like that (1)
		Total	5	

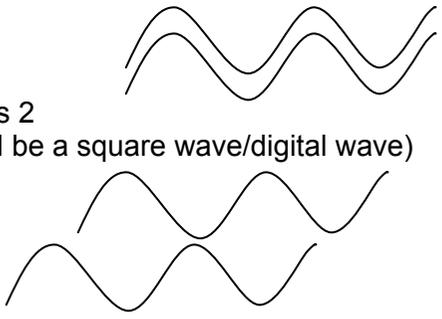
Question			Expected Answers	Marks	Rationale
7	a	i	gas oil (1)	1	
		ii	<p>any two from</p> <p>converts fraction where supply exceeds demand (into petrol) /aw (1)</p> <p>identify fraction where supply exceeds demand i.e. naphtha or paraffin or fuel oil (1)</p> <p>by cracking/large molecules broken into smaller molecules (1)</p> <p>alkenes are also produced (1)</p>	2	ignore references to mixing other fractions with petrol
	b		ethene (1)	1	<p>allow spelling errors, eg ethane</p> <p>allow C₂H₄</p> <pre> H H \ / C = C / \ H H </pre> <p>mark what is on answer line first- only look at list if no answer on line</p> <p>allow answer circled/underlined in list</p>
Total				4	

Question		Expected Answers	Marks	Rationale
8	a	Ca(OH) ₂	1	allow badly copied formula eg Ca(OH) ² /Ca(OH)2 NOT 'calcium hydroxide' in words
	b	<pre> H H \ / C = C / \ H H </pre>	1	allow C ₂ H ₄ be careful not to confuse with chloroethene: <pre> H H \ / C = C / \ H Cl </pre>
		Total	2	

Question		Expected Answers		Marks	Rationale
9	a	<p>property</p> <p>idea of poor conductor (of electricity)/idea of good (electrical) insulator (1)</p> <p>flexible or bendy (1)</p> <p>easy to mould (1)</p> <p>easy to colour (1)</p> <p>idea of waterproof/insoluble in water (1)</p> <p>non toxic (1)</p>	<p>explanation</p> <p>so that you do not get a shock or electrocution or idea of protection (from electrocution) (1)</p> <p>so that it can bend around corners/AW (1)</p> <p>so wires can be identified (1)</p> <p>to keep water away from (copper) wires/prevent electrocution (1)</p> <p>reason needs to be linked to health and safety eg idea of safe handling (1)</p>	2	<p>any two properties can score or one property and correct explanation for two marks</p> <p>explanation mark is conditional on correct property</p> <p>ignore tough/lightweight/non biodegradable/ cheap/elastic/ durable/heat insulator/any reference to melting point/does not corrode/easy to store</p>

	<p>b</p>	<p>landfill sites any one from unsightly/eyesore/smelly/causes litter/attracts vermin (1)</p> <p>plastics are non-biodegradable/do not rot/do not decompose/do not decay/not attacked by bacteria/do not break down (1)</p> <p>wastes (valuable) land/fills up quickly/destroys habitats (1)</p> <p>wastes a valuable resource (1)</p> <p>burning waste plastics any one from makes toxic/poisonous gases or fumes(1)</p> <p>wastes a valuable resource (1)</p> <p>makes carbon dioxide (1)</p> <p>makes carbon monoxide (1)</p> <p>makes greenhouse gases (1)</p> <p>leads to global warming (1)</p>	<p>2</p>	<p>allow idea of makes a mess (limit of acceptability)</p> <p>allow takes a long time to rot/does not break down easily ignore do not disintegrate/do not deteriorate</p> <p>ignore pollution ignore references to harming animals</p> <p>NOT dangerous/harmful gases or fumes allow makes carbon emissions ignore references to sulphur dioxide</p> <p>ignore pollution unless qualified, eg pollution by toxic gases</p>
		<p>Total</p>	<p>4</p>	

Question		Expected Answers	Marks	Rationale
10	a	idea of ice melting (1) idea that energy is needed to change ice to water/AW (1)	2	allow defrosting/thawing/solid melting/solid changes to liquid/change of state allow higher level answers eg energy is used to break (intermolecular) forces or bonds eg ice is absorbing latent heat allow bonds break between ice particles (limit of acceptability) beware of contradictions eg breaking intramolecular bonds or forces
	b	(the amount of heat or energy needed to) raise/change the temperature by 1K/°C (1) of 1 g/1 kg (1)	2	
	c	A (1)	1	
		Total	5	

Question		Expected Answers	Marks	Rationale
11	a	morse (1)	1	allow digital
	b	i	3	5 ¹⁴ on its own scores 0 allow abbreviations $v = f\lambda$, $c = f\lambda$, $s = f\lambda$
		<p>5 x 10¹⁴ scores 3 BUT $\frac{3 \times 10^8}{6 \times 10^{-7}}$ scores 2</p> <p>or frequency = $\frac{\text{speed}}{\text{wavelength}}$ / speed = frequency x wavelength (1)</p>		
		ii	2	both marks can be awarded from a diagram eg  scores 2 (could be a square wave/digital wave) scores 1 for same wavelength
Total			6	

Question		Expected Answers			Marks	Rationale		
12	a	feature	p-waves	s-waves	3	ignore references to primary and secondary ignore descriptions of longitudinal and transverse waves		
		speed						
		travel through		solids (only) (1)				
		type	longitudinal (1)	transverse (1)				
	b	cfc /chlorofluorocarbons (1)			1	ignore gases from aerosols or fridges		
Total					4			
13	a	any two from infrared cooks/heats/absorbed by surface(1) increasing the kinetic energy of the particles(1) passes to centre of food by conduction and/or convection (1)			2	ignore infrared bounces off surface NOT infrared penetrates surface ignore references to heating top 1cm or top few centimetres allow correct description of conduction or convection eg infrared causes particles on the surface to vibrate (1) causing the rest of the particles to vibrate (1) which heats up the food in the centre eg infrared causes particles on the surface to vibrate more scores 2		
		b	i	(reduces) radiation/heat reflected (1)			1	ignore references to incorrect direction of reflection ignore reflects light ignore bounces heat
			ii	(reduces) conduction and/or convection (1) no (air) particles present (1)			2	NOT references to heat particles
Total					5			

Mark Scheme B622/01

June 2007

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ignore	= statements which are irrelevant
allow	= answers that can be accepted
()	= words which are not essential to gain credit
<u> </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question		Expected Answers	Marks	Rationale
1	a	vertebrates (1)	1	allow any other way of indicating answer eg a tick if two answers shown the answer in a circle should be marked
	b		3	one for each correct line two lines from any box = 0 for that box beware of marking the line already given in the question allow other ways of indicating the linking eg pairing up labelled boxes
	c	no food/no herring to eat/no prey (1)	1	allow need to get more food/not enough food ignore just no herring - must mention the idea of food ignore references to hunting
	d	i	1	
		ii	1	allow shoals/herd/flock to represent a group of fish allow can hide easily/same colour as sea ignore can hide in (small) spaces ignore darting around/reference to movement
		Total	7	

Question		Expected Answers	Marks	Rationale
2	a	Asia/Latin America (1)	1	allow Latin NOT America ignore references to years
	b	i	1	allow water/steam/nitrogen dioxide/nitric oxide/oxides of nitrogen allow correct formula eg CO ₂ /CO/SO ₂ /H ₂ O/NO ₂ /NO ignore sulphur oxide/carbon oxide/sulphur trioxide/smoke if correct name and wrong formula award the mark if incorrect name and correct formula do not award mark
		ii	3	resources/water (1) waste (1) sewerage (1) (either order)
Total			5	

3	a	fur/hair (1)	1	allow (external) ears ignore other characteristics of mammals eg mammals have live young
	b	lives in unexplored area/habitat difficult to access (1)	1	allow 'scientists haven't been there'/few people visit there/jungle very dense/jungle difficult to explore allow 'very rare'/'small numbers'/'an endangered species' allow 'nocturnal' allow camouflaged/animals are timid/animals hide
	c	i	1	allow will soon be gone/soon will be killed off/near to extinction/will soon disappear ignore numbers decreasing/population falling
		ii	1	giant panda (1) allow any clear indication of the answer
Total			4	

Question		Expected Answers	Marks	Rationale
4	a	<p>any two from (better) camouflage (1) but (better) camouflage on (dark) trees (2)</p> <p>not seen by predators (1) fewer eaten (1) more survive (1)</p>	2	<p>assume reference to trees are the dark trees unless otherwise stated</p> <p>allow they cannot be seen on (polluted) trees/darker just like the trees (2) allow natural selection has occurred (2)</p> <p>ora for pale moths</p>
	b	<p>$500 \times 480/60$ (1) $= 4\,000$ (1)</p>	2	<p>look for 4 000 as an answer and providing it is a clear answer ignore working out and award 2 marks</p> <p>allow full marks for correct answer on its own 4 000</p>
		Total	4	

Question		Expected Answers	Marks	Rationale	
5	a	<p>any two from wood (1)</p> <p>aluminium (1) lead (1) zinc (1) copper (1)</p> <p>plastic/named plastic eg polystyrene/poly(chloroethene) (1)</p> <p>sand/gravel (1)</p> <p>glass (1)</p> <p>brick (1) clay (1) breeze block (1)</p> <p>plaster (1), cement/mortar (1)</p> <p>fibreglass (1), foam (insulation) (1)</p> <p>marble (1), slate (1), limestone (1), granite (1) sandstone (1)</p>	2	<p>allow any other construction material not listed</p> <p>allow 'metal' or metal (scaffolding) (1) providing marks have not been awarded for a named metal ignore iron</p> <p>allow 'rock'/stone (1) providing marks have not been awarded for a named rock or stone</p> <p>allow water</p>	
	b	i	alloy (1)	1	allow any correct indication of answer eg alloy ringed
		ii	protection/rust proofing/decoration (1)	1	allow stops steel from corroding/to prolong its life/to make it colourful/to make it pretty
	c		contain <u>steel</u> rods/contains <u>metal</u> rods/contain <u>iron</u> rods	1	<p>allow bars/mesh/wire/gauze/beam as alternatives to rod allow put in a metal stick ignore copper rods NOT contains metal i.e. without reference to a rod</p>
			Total	5	

Question			Expected Answers	Marks	Rationale
6	a	i	increases.....decreases (1)	1	both needed for mark
		ii	carbon dioxide.....oxygen (1)	1	both needed for mark
	b	i	nitrogen (1)	1	allow N ₂ /N
		ii	carbon monoxide/hydrogen/oxygen/nitric oxide (1)	1	allow CO/H ₂ /O ₂ /NO allow H/O if more than one answer then all must be correct if correct name and wrong formula award the mark if incorrect name and acceptable formula do not award mark
		iii	(carbon) monoxide goes down (1) and (carbon) dioxide goes up (1)	2	allow carbon monoxide goes from 5.0 to 4.1 allow carbon dioxide goes from 8.0 to 9.6 ignore carbon monoxide goes to 4.1 ignore carbon dioxide goes to 9.6/carbon dioxide is higher than carbon monoxide
		c	more surface area/more exposed particles/more area/more surface (1) more collisions (1)	2	ignore more attraction between particles NOT faster collisions eg more quicker collisions will not score the more collisions mark
			Total	8	

7	a		lava (1)	1	allow any correct indication of answer eg lava ringed
	b		igneous (1)	1	allow any correct indication of answer eg igneous ringed
	c		fertile soil/crops grow better/AW (1)	1	answer must address why they still want to live near a volcano and not why they have to live near a volcano allow provided geothermal energy/cheap source of heat/because scientists may want to study the volcano/want to live in same place as rest of family/housing may be cheap/may want to build a hotel for tourists ignore because there is no where else to go NOT soil is good unless qualified eg can grow bigger crops
			Total	3	

Question		Expected Answers	Marks	Rationale
8	a	MgCl ₂ /H ₂ (1)	1	allow hydrogen/magnesium chloride allow hydrogen and chloride NOT magnesium chlorine NOT chloride as only product
	b	use concentrated acid/more concentrated acid/less dilute acid (1)	1	allow 'add a catalyst'/'stir'/'shake' allow use non-diluted acid/use higher molar(ity) ignore use stronger acid ignore use more acid/use more powder
	c	particles move faster/particles have more (kinetic) energy (1) more collisions (per second) (1)	2	allow ora if candidate specifically refers to colder acid allow more energetic collisions (2) allow more successful collisions (2) allow more particles have enough energy to overcome the activation energy (1) ignore acid moving faster NOT faster collisions/not quicker collisions/move around more
		Total	4	

Question		Expected Answers	Marks	Rationale
9	a	damages living cells/cause cancer/cause a named cancer/ <u>radiation</u> sickness (1)	1	allow kills cells/ <u>radiation</u> poisoning/burns skin/burns cells/causes mutation/mutation of cells/causes a faulty gene/infertility/hair loss/can kill you ignore mutates the skin ignore brain damage/skin damage
	b	controls cancer/detects cancer/kills cancer cells/cures cancer/kills microbes/tracers/scans/non destructive testing i.e. NDT/smoke detectors/thickness testing (1)	1	allow food preservation/sterilisation of medical equipment ignore in power stations/generating electrical energy
	c	alpha/ α (1)	1	
	d	paper - YES/tick and aluminium - NO/cross (1)	1	both needed for 1 mark
Total			4	

10	a	...coil of wire current ...magnets.....more.... four correct (3) two or three correct (2) one correct (1)	3	maximum of three marks only allow answers from the list
	b	DC/direct (current) (1)	1	ignore direct electricity
	c	AC/alternating (current) (1)	1	ignore alternating electricity/alternative current/alternate current
Total			5	

Question		Expected Answers	Marks	Rationale	
11	a	high(est) power/more (most) kW/AW (1) long(est) time/more (most) hours/AW (1)	2	allow 'more current'/more energy (1) NOT more electricity allow used for longer/takes longer ignore used more allow higher level answers eg 'most kWh' (2)	
	b	i	12 (2) but power x time/6 X 2 (1)	2	maximum of two marks allow full marks for correct answer with or without working if in doubt with an answer use the one on the answer line
		ii	cost = 120 (pence)/ ECF from (b)(i) (1)	1	allow £1.20 if in doubt with an answer use the one on the answer line
		Total	5		

Question		Expected Answers	Marks	Rationale
12	a	north and south (1)	1	allow N and S
	b	<p>any three from detected using a compass/detected using a magnet (1)</p> <p>caused by (molten) iron/nickel (1) but caused by iron or nickel moving/caused by currents of (molten) iron or nickel/caused by iron or nickel in the core (2) but caused by iron or nickel moving in the core/caused by (molten) iron or nickel currents in the core (3)</p> <p>idea that there is a 'north and a south pole'/AW (1) but north at 'the south pole'/south at 'the north pole' (2)</p>	3	<p>please mark showing ticks and crosses and annotation</p> <p>maximum of three marks can be obtained by answering one bullet point or two bullet points or all three bullet points</p> <p>allow one mark for caused by (magnetic) metal in the core/one mark for caused by (magnetic) metal moving allow two marks for caused by (magnetic) metal moving in the core</p> <p>allow use of top and bottom of Earth or Arctic and Antarctic rather than north pole and south pole</p>
		Total	4	

13	a	getting bigger (1)	1	allow any clear indication of getting bigger
	b	gas (cloud)/dust/matter/hydrogen/AW (1)	1	allow nebula/rock grains ignore rock on its own NOT comets/planets
		Total	2	

Mark Scheme B622/02

June 2007

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

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
not	= answers which are not worthy of credit
reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant
allow	= answers that can be accepted
()	= words which are not essential to gain credit
<u> </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question		Expected Answers	Marks	Rationale
1	a	fur/hair (1)	1	allow (external) ears ignore other characteristics of mammals eg mammals have live young
	b	lives in unexplored area/habitat difficult to access (1)	1	allow 'scientists haven't been there'/few people visit there/jungle very dense/jungle difficult to explore allow 'very rare'/'small numbers'/'an endangered species' allow nocturnal' allow camouflaged/animals are timid/animals hide
	c	loss of habitat/loss of food (1) lead to reduction in numbers/extinction (1)	2	allow 'disturbance stops breeding'/'loss of nesting sites' allow absolutes eg 'no food' (1) die (1) loss of nesting site (= loss of habitat)/lost homes (1) ignore predators (0)
		Total	4	

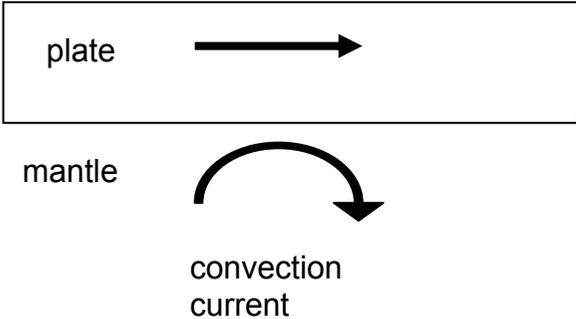
Question		Expected Answers	Marks	Rationale	
2	a	<p>any two from (better) camouflage (1) but (better) camouflage on (dark) trees (2)</p> <p>not seen by predators (1) less eaten (1) more survive (1)</p>	2	<p>assume reference to trees are the dark trees unless otherwise stated</p> <p>allow they cannot be seen on polluted trees/darker just like the trees (2) allow natural selection has occurred (2)</p> <p>ora for pale moths</p>	
	b	i	500 x 480/60 (1)AW but = 4000 (2)	2	<p>look for 4 000 as an answer and providing it is a clear answer ignore working out and award 2 marks</p> <p>allow full marks for correct answer on its own 4 000</p>
		ii	<p>any one from sample size may not be large enough (1) flaws in sampling technique eg sampled at different times of day does not take into account movement in/out of (wood) (1)</p>	1	<p>allow not enough data/evidence AW</p> <p>allow changes in behaviour patterns (1) inactivity at certain times of day/type of weather (1) ignore references to birth & death</p>
	b	iii	predators would see better if on the upper wing/does not spoil camouflage/ predators can't see them as easily (1)	1	
Total			6		

Question		Expected Answers	Marks	Rationale	
3	a	<p>from (increase/more) carbon dioxide (1) global warming/(increased) greenhouse effect/ climate change /melting ice caps/rising sea levels(1)</p> <p>OR</p> <p>sulphur dioxide (1) oxides of nitrogen (1) acid rain/damages trees/ kills fish/damages buildings (1)</p>	2	<p>must have correct pollutant linked for second mark allow any reasonable pollution for one mark and its consequence for second mark eg smoke (1) causes breathing problems</p> <p>mark example and result together (can reverse answers) allow oxides of nitrogen NO_x/NO/NO₂</p> <p>ozone for results = 0</p>	
	b	i	Latin America/Africa/Asia (1)	1	any wrong answer negates mark eg Africa & USA (0)
		ii	<p>any two from more cars/vehicles (1) more factories/industry/goods produced/more resources consumed (1) more electricity/energy produced or used (using fossil fuels)/more fossil fuels (burned) (1)</p>	2	<p>NOT 'more people' ora eg fewer cars used in Africa</p> <p>NOT merely 'more affluent'/more developed/more technology</p>
			Total	5	

Question		Expected Answers	Marks	Rationale	
4	a	variation/description of variation/mutation/random fertilisation (1) selection/best adapted survive (1) inheritance of adaptation/gene frequency changes/slow change over generations (1)	2	eg wider feet/differences in width (1) NOT characteristics learnt more likely to survive (1) wider foot genes passed on (1)	
	b	i	net sizes/quotas (1)	1	NOT fishing ban but limit fishing (1) allow fish farming NOT artificial environment large mesh/reduce quotas (1) NOT small mesh/increase quotas assume net size refers to mesh size unless stated otherwise eg use larger net (1) use larger mesh (1) use smaller mesh (0) use smaller net (0)
		ii	if not sustained : orca leaves the area (1) tourist industry reduced (1) if sustained orca remain (1) tourist industry unaffected	2	allow example eg hotels lose business ignore references to human food/fisherman
		Total	5		

Question		Expected Answers	Marks	Rationale
5	a	combines hardness of concrete (1) with strength of steel (1)	2	not merely reinforced concrete is stronger (0) but if implied that steel makes concrete stronger (1) allow concrete good under compression AW (1) allow steel good under tension if no other mark reinforced concrete good under tension/combines best properties of both materials (1)
	b	marble is metamorphic rock and limestone is sedimentary rock (1) idea that(particles of) limestone rock are compressed and/or heated together to make marble (1)	2	limestone must be named or clearly implied for second marking point
Total			4	

6	a	nitrogen (1) oxygen any value between 20 and 22 (1)	2	allow N/N ₂ (1) not N ₃ or n	
	b	(carbon) monoxide goes down (1) and (carbon) dioxide goes up (1)	2	allow carbon monoxide goes from 5.0 to 4.1 allow carbon dioxide goes from 8.0 to 9.6 ignore carbon monoxide goes to 4.1 ignore carbon dioxide goes to 9.6/carbon dioxide is higher than carbon monoxide	
	c	i	carbon monoxide + nitric oxide → carbon dioxide + nitrogen (1)	1	allow correct formulae (CO, NO, CO ₂ and N ₂) or mix of formulae and words allow correct reactants and products in either order
		ii	more surface area/more exposed particles/more area/more surface (1) more collisions (1)	2	ignore more attraction between particles NOT faster collisions eg more quicker collisions will not score the more collisions mark
Total			7		

Question		Expected Answers	Marks	Rationale
7	a	magma is less dense (than the crust) (1)	1	allow magma lower density not merely magma low density
	b	different type /composition/ viscosity of lava/magma/different pressure/different temperatures (1)	1	NOT merely forces ignore density
	c	to find out about the structure of the Earth/to predict future eruptions/volcanoes (risks)(1)	1	allow 'to protect lives' (1) allow evacuation plans (1)
	d	idea of convection current of material in the mantle (1) idea of convection current dragging along the tectonic plate in the correct direction (1)	2	all marks an be awarded from a diagram which covers all marking points to include label of convection current or mantle or plate 
		Total	5	

Question		Expected Answers	Marks	Rationale
8	a	$\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ correct reactants and products (1) correct balancing (1)	2	allow any correct multiple of this equation formulae must be correct for balancing mark eg mg(0) H ₂ Cl(0) MgCl(0) H(0) MgCl ₂ (0) = acceptable for arrow NOT and for + ignore state symbol ie (aq)
	b	particles move faster/particles have more (kinetic) energy (1) more collisions (per second) (1)	2	allow ora if candidate specifically refers to colder acid allow more energetic collisions (2) allow more successful collisions (2) allow more particles have enough energy to overcome the activation energy (1) NOT faster collisions/not quicker collisions/move around more
		Total	4	

Question		Expected Answers	Marks	Rationale
9	a	...current.....magnet.....more... all three correct (2) but 1 or 2 correct (1)	2	only allow answers from the list
	b	(higher voltage) = lower current (1) lower current = less heat loss/reduced temperature (1) but for the same power voltage increases and current decreases (2)	2	ignore references to cost/thinner wires needed (0) NOT merely recall of $P = V \times I$
	c	i cheaper (1)	1	NOT free
		ii any two from available at inconvenient times/inconvenient(1) another meter required/extra wiring/time switches, storage heaters (1) day-time electricity can be more expensive than non off-peak users/extra standing charge (1)	2	allow he can only use electrical appliances at night/night time use only/washing machine noisy at night/risk from unattended appliances = inconvenience
	d	i 12 (2) but power x time/6 x 2 (1)	2	maximum of two marks allow full marks for correct answer with or without working if in doubt with an answer use the one on the answer line
		ii cost = 120 (pence)/ ECF from (d)(i) (1)	1	allow £1.20 if in doubt with an answer use the one on the answer line
		Total	10	

Question		Expected Answers	Marks	Rationale
10	a	paper - YES/tick and aluminium - NO/cross (1)	1	both needed for 1 mark
	b	i any two from remains radioactive for a long time (1) terrorist risk (1) easy to remove (1) may get into groundwater /streams/rivers/water supply (1) acceptable radiation level may change in the future (1) harmful to humans/animal /crops /food chain (1)	2	allow terrorist risk/gets into wrong hands NOT nuclear bombs (0) allow dirty bomb (1) eg presently considered safe levels may in future prove to be harmful
		ii encased (1)/buried underground (for a long time) (1)/reprocessed (1)	1	NOT recycled allow no (completely) safe way found yet
Total			4	

11	a	nearby galaxies move away (1) slower (1)	1	mark (a) and (b) together- award the relative speed mark once only Universe expanding = move away NOT galaxies expand allow local galaxies (andromeda) moving closer
	b	distant galaxies move away (1) quicker (1)	2	mark (a) and (b) together- award the relative speed mark once only Universe expanding = move away NOT galaxies expand. allow local galaxies (andromeda) moving closer Red Shift = moving away
	c	all parts of the universe (1)	1	mark answer first- one answer only - look for rings around answer if not on line
Total			4	

Question		Expected Answers	Marks	Rationale
12		any two from (IR) absorbed (by wall, floor, furniture, air) (1) (IR) short wavelength entering (1) (IR) longer wavelength emitting (1) (IR) reflected back in (by glass) (1)	2	NOT attracted NOT absorbed by glass NOT light absorbed allow infrared light absorbed/heat up contents/heats up inside of conservatory NOT heats up conservatory allow higher frequency entering (1) allow lower frequency emitting (1)
		Total	2	

Mark Scheme B623/01

June 2007

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

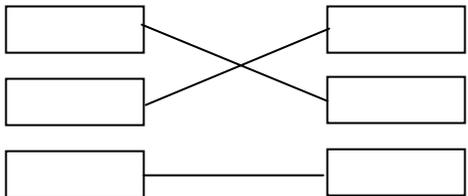
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Question		Expected Answers	Marks	Rationale
1	a	1 infancy 2 childhood 3 adolescence 4 maturity infancy just before childhood (1) childhood just before adolescence (1) adolescence just before maturity (1)	2	maximum 2 marks maximum 1 mark if any answer is in the incorrect position
	b	i	5 (years) (1)	allow 'between (age) 9 & 14'/AW
		ii	0 – 1(years) (1)	allow 'first year' NOT mass eg 10kg
Total			4	

2	a	i	2 (1) 5 4 3	2	maximum 2 marks three or four correct (2) one or two correct (1)
		ii	all from same original plant/not from seeds/only one parent (1)	1	allow have same DNA/genes allow clones allow higher level answer cell produced by mitosis
	b	(show) variation/any useful example of variation: eg if one gets disease then not all will/fruit at different times (1)	1	allow pollination may depend on presence of different varieties allow they have different taste/texture/colour/shelf life ignore size/smell	
Total			4		

Question			Expected Answers	Marks	Rationale
3	a	i	DNA (1)	1	more than one answer (0)
		ii	nucleus (1)	1	more than one answer (0)
		iii	membrane (1)	1	allow cell membrane more than one answer (0)
	b		diffusion (1)	1	mark answer on line first more than one answer on line (0) allow ringed answer
			Total	4	

4	a		bleeds more/faster (from an artery) (1) (because) blood at high(er) pressure (1)	2	allow blood pumped/spurts out allow (organs) starved of oxygen/AW
	b		blood clots (1) because of platelets (1)	2	ignore scab/blood thickens
			Total	4	

Question			Expected Answers	Marks	Rationale
5	a	i	B, C, E (1)	1	all needed any order, no others
		ii	grow towards light (1)	1	allow grow upwards answer must have direction allow points towards light/up allow high level answers eg because they are positively phototropic
	b		 <p>two or three correct (2) one correct (1)</p>	2	if two lines go to one box score zero for that box
Total				4	

Question		Expected Answers	Marks	Rationale
6	a	fluorine (1)	1	allow F/F ₂ more than one answer (0)
	b	sodium (1)	1	allow Na more than one answer (0)
	c	boron (1)	1	allow B more than one answer (0)
	d	sodium/magnesium/sulphur (1)	1	allow correct symbols allow more than one correct answer
	e	copper (1)	1	allow Cu more than one answer (0)
Total			5	

7	a	i	cathode (1)	1	mark answer on line first more than one answer (0)
		ii	lighted splint (1) small explosion/pop/squeak (1)	2	allow flame over end of tube
	b		oxygen (1)	1	allow O ₂ NOT O ² /O ₂ /O/O ₃ more than one answer (0)
Total			4		

8	a		good conductor of heat (1) high melting point (1)	2	each extra box ticked negates one mark
	b		(conduct electricity) with little/no/very small resistance (1)	1	
	c		any two from good conductor (of electricity) (1) ductile/can be drawn into wires (1) flexible (1) so it can bend around corners (1)	2	allow two properties or one property and a justification allow low resistance ignore high melting point NOT good heat conductor
Total			5		

Question		Expected Answers	Marks	Rationale
9	a	<p>two or three correct (2) one correct (1)</p>	2	if two lines go to one box score zero for that box
	b	$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ correct formulae of reactants and products (1) balancing (1)	2	allow any correct multiple balancing mark is dependent on getting the reactants and products correct allow 'heat' above arrow
Total			4	
10	a	B (1)	1	
	b	A (1)	1	
	Total		2	
11		apparatus - tape/trundle wheel (1) measurement - time (1) unit - m/s or m/s ⁻¹ or metres per second (1)	3	ignore 'meter ruler' but NOT rule/ruler allow metre wheel/measuring wheel allow mps
	Total		3	

Question		Expected Answers	Marks	Rationale
12	a	thinking distance is -the idea of the distance the car moves (1) while the driver reacts/AW (1)	2	allow how far (1) NOT 'how long' NOT the 'time' eg time it takes you to know you have to brake and putting your foot on the brake = 1 eg distance taken for the driver to think = 1 eg distance taken for the driver to think before taking action/braking = 2 eg distance car moves while the driver reacts = 2 eg allow time to react/idea of reaction time = 1
	b	braking distance is - the distance the car moves (before stopping) with its brakes on (1)	1	allow how far eg distance in which car was breaking = 1 NOT distance car goes before stopping
	c	any two from greater speed AW(1) alcohol/drugs (1) tiredness/illness (1) distractions/lack of concentration (1)	2	NOT merely speed (0) allow older ignore weather conditions
	d	any one from reduce chance of skidding (1) stop wheels locking (1) avoid losing control (1)	1	
		Total	6	

13	a	van (1)	1	mark answer on line first more than one answer on line (0) allow ringed answer
	b	450 or 30 x 15 scores (1)	1	ignore units
		Total	2	

Question			Expected Answers	Marks	Rationale
14	a		W = 1 000 (2) but W = 500 x 2 scores (1)	2	
	b	i	(gravitational) potential (energy)/PE/GPE (1)	1	NOT just gravitational (energy)
		ii	the idea of no distance is moved/AW (1)	1	NOT merely still
	c		kinetic (energy)/KE (1)	1	allow movement (1)
	d		any one from how quickly work is done or energy is transferred/AW (1) work done or energy transferred in a second/AW (1) J/s or joules per second (1)	1	
			Total	6	

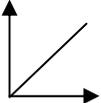
15	a	i	airbag and/or safety cage (1)	1	incorrect multiple answers (0) eg airbag and cruise control scores (0)
		ii	cruise control and/or electric windows (1)	1	incorrect multiple answers (0)
	b		seatbelts may: be damaged (1) not stretch (again) in a crash (1) not absorb energy again in a crash (1)	1	allow 'could be dangerous'/seatbelts may not be safe allow might snap/break/fail/stretched
			Total	3	

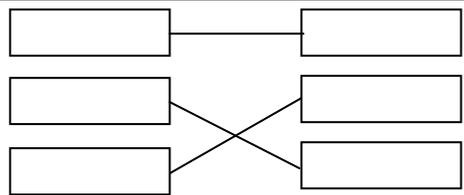
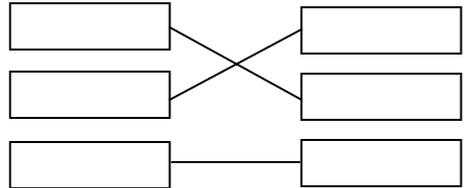
Mark Scheme B623/02

June 2007

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<u> </u>	= underlined words must be present in answer to score a mark
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AW	= alternative wording
ora	= or reverse argument

Question			Expected Answers	Marks	Rationale
1	a	i	5 (years) (1)	1	allow 'between (age) 9 & 14'/AW
		ii	0 - 1 (years) (1)	1	allow 'first year' NOT mass eg 10 kg
	b	i	 <p>line increasing, not levelling off (1)</p>	1	does not have to be a straight line
		ii	tips of shoots/ tips of roots (1)	1	allow 'ends'
			Total	4	
2	a		(show) variation/any useful example of variation: eg if one gets disease then not all will/fruit at different times (1)	1	allow pollination may depend on presence of different varieties allow they have different: taste/texture/colour/shelf-life ignore reference to smell/size
	b		any three from choose suitable cauliflower/AW (1) take small pieces /AW (1) use many pieces/ AW (1) aseptic technique/eg of aseptic technique /sterile (1) suitable growth medium/agar (1) suitable conditions/warm and light (1)	3	NOT merely clean NOT compost allow special nutrients eg hormones
			Total	4	
3	a		diffusion (1)	1	more than one answer scores zero - mark answers on line first allow ringed answers
	b	i	left strand correct: (G) C, T(A) (1) right strand correct: GC, TA (1)	2	C G C A T A
		ii	before (cell division) (1)	1	
			Total	4	

Question		Expected Answers	Marks	Rationale	
4	a	 <p>two or three correct (2) one correct (1)</p>	2	two lines going to one box scores zero for that box	
	b	plasma (1)	1	allow red blood cells NOT merely 'blood cells' NOT white blood cells	
	c	left (ventricle) is stronger/has thicker muscle wall/pumps harder (1)	1	allow tilts to left/bulges to left (1) allow high(er) pressure/more force/more power/more muscular NOT 'pumps more blood'	
Total			4		
5	a	 <p>two or three correct (2) one correct (1)</p>	2	two lines going to one box scores zero for that box	
	b	i	upwards/AW(1)	1	
		ii	it/auxin evenly distributed on all sides of shoots (1)	1	allow negative geotropism
Total			4		

Question		Expected Answers	Marks	Rationale
6	a	chlorine (1)	1	allow Cl/Cl ₂ - more than one answer scores zero
	b	copper (1)	1	allow Cu/nickel/Ni - more than one answer scores zero
	c	phosphorus (1)	1	allow P/ P ₄ - more than one answer scores zero
	d	nitrogen (1)	1	allow N/N ₂ - more than one answer scores zero
		Total	4	

7	a	oxygen (1)	1	allow O ₂ NOT O ² /O ₂ /O/O ₃ more than one answer scores zero
	b	2H ⁺ + 2e ⁻ → H ₂ (2) correct formulae of reactants and products (1) correct balancing (1)	2	allow any correct multiple balancing mark is dependent on getting the reactants and products correct
		Total	3	

8	a	(delocalised) electrons can move/AW (1)	1	allow 'free electrons (through lattice)' (1)
	b	any two from good conductor (of electricity) (1) ductile/can be drawn into wires (1) flexible (1) so it can bend around corners (1)	2	allow two properties or one property and a justification allow low resistance ignore high melting point NOT good heat conductor
	c	(conduct electricity) with little/no/very small resistance (1)	1	
		Total	4	

Question		Expected Answers	Marks	Rationale
9	a	2Mg + O ₂ → 2MgO (2) correct formulae of reactants and products (1) balancing (1)	2	allow any correct multiple balancing mark is dependent on getting the reactants and products correct allow 'heat' above arrow
	b	drawing of oxide ion 2,8 and of magnesium ion 2,8 (1) correct charges O ²⁻ and Mg ²⁺ (1)	2	charges independent of dot and cross diagrams allow a full written explanation for both marks NOT donated electrons appearing in both
Total			4	

10	a	any two from floats on water/moves on water (1) fizzes/bubbles/spits/pops/violent (reaction)/AW (1) lilac flame/pink flame (1) melts/turns into a molten ball/AW (1) colourless solution produced (1) colourless gas/hydrogen gas produced (1)	2	allow white smoke NOT just 'reaction' must be 'violent' (1) allow coloured flame
	b	potassium loses electrons more easily than sodium/potassium needs less energy to lose an electron/ora/AW (1)	1	NOT potassium loses electrons faster/potassium loses more electrons
	c	hydrogen (1) rubidium hydroxide (1)	2	allow H /H ₂ allow RbOH
Total			5	

Question		Expected Answers	Marks	Rationale	
11	a	any two from greater speed/AW (1) alcohol/drugs (1) tiredness/illness (1) distractions/lack of concentration (1)	2	NOT merely speed (0) allow older ignore weather conditions eg foggy (0)	
	b	any one from reduce chance of skidding (1) stop wheels locking (1) avoid losing control (1)	1		
	c	i	13 (m) (1)	1	
		ii	0.75 (s) (2) but 6/8 or 12/16 or 24/32 (1)	2	
		iii	thinking distance needed is greater than 15m/AW (1) driving within thinking distance/AW (1) too close (to car in front) (1) collision risk (1)	2	
		iv	KE is absorbed when braking /AW(1) when speed doubles braking distance quadruples/more than doubles (1) when speed doubles KE quadruples/KE $\propto v^2$ (1)	2	NOT just KE formula
		Total		10	

Question		Expected Answers	Marks	Rationale
12	a	increases/AW (1)	1	
	b	absorb energy (1)	1	allow change shape (1) higher level answers in terms of acceleration (1) less acceleration/force (1)/greater 'stopping' distance/time (1) change to heat (1)/ NOT change to elastic energy (0)
		Total	2	

13	a	450 or 30 x 15 scores (1)	1	ignore units
	b	any two from different: driving styles /AW (1) journey lengths/AW(1) speeds (1) loads (1) road conditions AW (1)	2	allow 'wind' if qualified eg driving into the wind (1) allow ideas of a cold engine (1) ignore size/type of van
		Total	3	

14		W = 1 000 (2) but W = 500 x 2 scores (1)	2	
		Total	2	

15	a	any three from roof box creates more drag/AW (1) (car has)lower (terminal) speed (1) force balance at terminal speed /AW (1)	3	
		Total	3	

Mark Scheme B631/01

June 2007

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

/	= alternative and acceptable answers for the same marking point
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reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant
allow	= answers that can be accepted
()	= words which are not essential to gain credit
<u> </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question		Expected Answers	Marks	Rationale
1	a	37°C (1)	1	if no ring drawn accept other indication eg underline or tick every incorrect answer negates a correct answer
	b	1. his respiration becomes faster (1) 3. he shivers more (1)	2	if no ticks shown accept other indication eg underline or ring if more than 2 ticks then deduct one mark for each incorrect tick
	c	oxygen (1) glucose (1) heart (1)	3	or vice versa
Total			6	

2	a	genes (1) nucleus (1) asexual (1) clones (1)	4	if part (i) is wrong allow genes instead of nucleus
	b	mutation (1)	1	if no ring drawn accept other indication eg underline or tick every incorrect answer negates a correct answer
Total			5	

Question		Expected Answers	Marks	Rationale	
3	a	D (1)	1	allow lettuce/vitamin C NOT C alone every incorrect answer negates a correct answer	
	b	i	3 (1)	1	mark answer line first - if blank look for answer in working
		ii	growth/repair/make new cells (1)	1	allow higher level answers eg (to make) enzymes/hormones/membrane allow make muscles stronger ignore make you stronger
		iii	any two from come from an animal (1) contain essential amino acids (1) contain amino acids that cannot be made by the body (1)	2	ignore meat allow contains amino acids that are necessary in the diet
		iv	liver/brain (1)	1	every incorrect answer negates a correct answer
Total			6		

Question		Expected Answers	Marks	Rationale
4	a	fungi/virus/protozoa (1)	1	allow any correct named examples NOT named example of bacteria eg MRSA every incorrect answer negates a correct answer NOT microbe/germ
	b		2	all three correct (2) 1 or 2 correct (1) if more than one line from a box on the left then no mark for that box ignore any incorrect lines from right hand boxes
Total			3	

Question			Expected Answers	Marks	Rationale
5	a	i	photosynthesis (1)	1	if no ring drawn accept other indication eg underline or tick every incorrect answer negates a correct answer
		ii	any two from stored (1) turned into starch (1) energy/respiration (1) growth/(to make) named part of a plant eg leaves(1)	2	allow higher answers turned into protein/fat/oil/cellulose/sucrose (1 mark each) ignore food ignore sap
	b		fish (1)	1	if no tick shown accept other indication eg underline or ring every incorrect answer negates a correct answer
			Total	4	

6	a		mammals (1)	1	if no answer written on answer line look for indication in list an incorrect answer negates a correct answer
	b	i	predator (1)	1	allow carnivore allow secondary/tertiary/quaternary consumer NOT hunter
		ii	prey (1)	1	ignore consumer
	c		any two from claws (1) sharp teeth (1) camouflage (1) built for speed (1) strong/large size (1) good sense of smell (1)	2	ignore adaptations for cold/references to eyesight/swimming ability ignore teeth allow white ignore just 'can run'
			Total	5	

Question		Expected Answers	Marks	Rationale
7	a	green head (1) grey body (1)	2	if give more than 2 answers, every incorrect answer negates a correct answer
	b	any one from food (1) mate (1) water (1) nesting material/nesting sites/nests (1)	1	
	c	feathers/beak (1)	1	reject wings unless qualified with feathers reject fly an incorrect answer negates a correct answer
	d	i	2	goes down then up (1) quantify description at start, lowest point or end (1) eg lowest in 1977/after ten or/eleven years or increases from 1978 or lowest number between 10 and 30 or starts from 520 – 580 or maximum or ends at 1100 – 1150 or doubles between start and end ignore comments about rate of change ignore incorrect references to figures

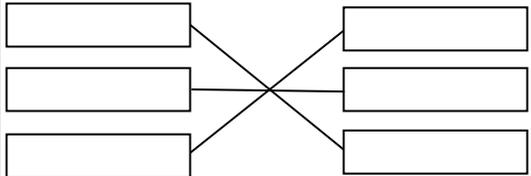
Question			Expected Answers	Marks	Rationale
7	d	ii	<p>any one from protect habitat/AW(1)</p> <p>legal protection/AW (1)</p> <p>captive breeding/AW(1)</p> <p>education of people/AW (1)</p> <p>qualified idea of reducing competition with ruddy ducks/AW (1)</p> <p>reproductive technologies/AW (1)</p>	1	<p>eg set up reserves allow put in artificial ecosystem allow stop hunting/poaching</p> <p>eg make laws against killing or taking eggs</p> <p>eg breed them in zoos ignore put in zoos allow breed them ignore selective breeding</p> <p>eg increase public awareness of the problem</p> <p>eg feed them</p> <p>eg freezing sperm/eggs/embryos/cloning</p>
Total				7	

Question		Expected Answers	Marks	Rationale
8	a	extinct (1)	1	NOT endangered/dead
	b	dodo (1)	1	if no ring drawn accept other indication eg underline, tick every incorrect answer negates a correct answer
	c	any two from covered by sediment (1) soft parts decay (1) (hard) parts replaced by mineral/mineralisation (1)	2	allow covered by mud/tar/amber/ice ignore rock/earth/soil allow hard parts/bones do not decay
		Total	4	

9	a	i	tail (1) to swim/move (to egg) (1) OR small size (1) more can be produced/to enter egg (1) OR acrosome (1) to digest egg membrane (1) OR mitochondria (1) (for) energy to swim (1)	2	must have correct linkage to get 2 marks NOT just 'shape' or 'size' i.e. needs qualification allow lack of cytoplasm (1) no need for (large) food store (1)
		ii	more chance of reaching/fertilising egg (1)	1	allow idea that many will not reach the egg allow so that at least one reaches/fertilises egg
	b		6 (1)	1	every incorrect answer negates a correct answer
			Total	4	

Question		Expected Answers	Marks	Rationale
10	a	idea that have light from one side only (1) idea of observations (of orientation) before and after (1) a valid specific eg of fair testing (1)	3	allow put on window sill/by window/in box with hole allow see which way they grow/if they grow towards hole/window ignore see if they grow towards light (in question) allow see if bend towards light ignore keep things the same allow idea of comparison with control (1)
	b	positive phototropism (1)	1	if no answer on the line accept indication on the list
		Total	4	

Question		Expected Answers	Marks	Rationale
11	a	lungs/alveoli (1) carbon dioxide/CO ₂ (1) (small) intestine (1)	3	allow water allow higher level answers: duodenum/ileum/villi
	b	B (1)	1	every incorrect answer negates a correct answer if no answer on the line accept indication on the list
Total			4	

12	a		2	all three correct (2) 1 or 2 correct (1) if more than one line from a box on the left then no mark for that box ignore any incorrect lines from right hand boxes
	b i	all points correctly plotted to within +/- 0.5 square (1) smooth line of best fit (1)	2	reject double/feathery lines/lines more than ½ sq thick lose smooth line mark if extend line towards origin
	ii	8 (1)	1	allow answer in range 7 – 9 if graph is incorrect allow ECF
Total			5	

Question		Expected Answers	Marks	Rationale
13	a	C/high milk production (1) E/resistance to disease (1)	2	in either order if give more than 2 answers every incorrect answer negates a correct answer
	b	(no/maybe - no mark) may get small number/small/sour apples (1)	1	allow higher level answer: get variation allow you may get a mixture of different types eg large & small/medium allow still have genes for small/sour
		Total	3	

Mark Scheme B631/02

June 2007

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

/	= alternative and acceptable answers for the same marking point
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reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant
allow	= answers that can be accepted
()	= words which are not essential to gain credit
<u> </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
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Question		Expected Answers	Marks	Rationale
1	a	<p>The diagram consists of three boxes on the left and three boxes on the right. Lines connect 'antibody' to 'a chemical released by white blood cells', 'antigen' to 'a chemical on the surface on pathogens', and 'toxin' to 'a chemical that is produced and released by pathogens'.</p>	2	<p>all three correct (2) 1 or 2 correct (1)</p> <p>if more than one line from a box on the left then no mark for that box ignore any incorrect lines from right hand boxes</p>
	b	<p>may not be bacteria or fungus / may be a virus/protozoa / may be resistant (1)</p>	1	<p>allow not completing course (1) allow if dose is insufficient/drug not strong enough (1) allow may stop pathogen reproducing (1)</p>
	c	<p>resistant bacteria may survive (1) resistant bacteria reproduce (1) resistant bacteria may produce a resistant strain (1)</p>	2	<p>reject the antibiotic makes the bacteria resistant/makes a resistant strain</p> <p>allow some people may not develop a natural immunity (1) allow side effects/allergies (1)</p>
		Total	5	

Question		Expected Answers	Marks	Rationale
2	a	D (1)	1	allow lettuce/vitamin C NOT C alone every incorrect answer negates a correct answer
	b	i	3 (1)	1 mark answer line first - if blank look for answer in working
		ii	any two from come from an animal (1) contain essential amino acids (1) contain amino acids that cannot be made by the body (1)	2 ignore meat allow contains amino acids that are necessary in the diet
		iii	religious/cultural reasons / ethical reasons/ food allergies/health reason qualified (1)	1 eg in hot countries heat is more likely to cause food poisoning eg it is cruel eg contains a lower saturated fat content ignore don't like the taste
	c	it breaks down/removes/ filters alcohol/toxins/substances (from the blood)/ idea that blood passes through the liver before it reaches other organs (1)	1	reject stores alcohol
Total			6	

Question		Expected Answers	Marks	Rationale
3	a	<u>hypothermia</u> (1)	1	spelling must be clearly different to hyperthermia
	b	any three from body/core temperature is rising/high (1) increase detected by the brain (1) vasodilation/blood vessels in the skin widen (1) more blood flowing close to the skin (1) to lose more heat/more radiation (1)	3	ignore he is getting hotter/warmer accept hypothalamus reject incorrect brain regions reject move closer to the skin/veins accept bigger must be an increase must be an increase
		Total	4	

4	a	fertilisation (1)	1	ignore fusion
	b	protein/(poly)peptide/mRNA/RNA/(1)	1	ignore amino acids/named proteins/enzymes
	c	any three from mutation is a change in a gene/DNA/genetic material (1) (may) change base sequence/amino acid sequence(1) protein is altered or not made (1) if an enzyme the reaction does not occur/occurs at different rate(1)	3	change in DNA base sequence = 2 accept different protein is made
		Total	5	

Question		Expected Answers	Marks	Rationale
5	a	feathers/beak (1)	1	reject wings unless qualified with feathers an incorrect answer negates a correct answer
	b	i	2	eg lowest in 1977/after ten or/eleven years /increase starts in 1978 or lowest number between 10 and 30 or starts from 520 – 580 or maximum or ends at 1100 – 1150 ignore comments about rate of change ignore incorrect references to figures
		ii	1	eg set up reserves allow stop hunting/poaching accept artificial ecosystem eg make laws against killing or taking eggs eg breed them (in zoos) ignore put in zoos eg increase public awareness of the problem eg feed them eg freezing sperm/eggs/embryos/cloning
		Total	4	

Question		Expected Answers	Marks	Rationale
6	a	<p>any two from covered by sediment (1)</p> <p>soft parts decay (1)</p> <p>(hard) parts replaced by minerals /mineralisation (1)</p>	2	<p>allow covered by tar/amber/ice/mud ignore rock/earth/soil</p> <p>allow hard parts/bones do not decay</p>
	b	<p>any two from all parts may decay (1)</p> <p>fossilisation is rare (1)</p> <p>many fossils not yet discovered (1)</p>	2	<p>allow some organisms have not fossilised/most organisms do not fossilise ignore the type of organism</p>
	c	<p>i Lamarck - characteristics gained during lifetime/organisms become adapted during their life /</p> <p>Darwin - born with characteristic/best suited survive (1)</p>	1	<p>answers only need to give views of one of the scientists</p> <p>allow suitable examples</p>
		ii both involved variation/adaptation/change	1	
		Total	6	

Question		Expected Answers	Marks	Rationale
7	a	any two from colourful/petals are large (1) nectar (1) sticky pollen (1) enclosed anthers/stigma (1) scented (1)	2	reject just bright/plant is colourful reject anthers are not feathery
	b	i	1	both needed for mark accept symbols if correct
		ii	2	must qualify answer ignore sun allow more chlorophyll (1) ignore water/minerals
	c	bacteria - gain sugars/glucose (1) pea - gain nitrates/nitrogen compounds (1)	2	ignore food accept amino acids reject nitrogen
		Total	7	

Question			Expected Answers	Marks	Rationale
8			<p>any three from hare numbers increasing/high because less lynx to eat them (1)</p> <p>lynx numbers increasing/high as there are more hares to eat (1)</p> <p>hare numbers low/decrease as more lynx to eat them (1)</p> <p>lynx numbers decrease/low as less hares to eat (1)</p>	3	<p>reject die out or become extinct (once only)</p> <p>ignore descriptions must be an explanation</p>
Total				3	

9	a	i	6 (1)	1	every incorrect answer negates a correct answer
		ii	12 (1)	1	every incorrect answer negates a correct answer
	b	i	D (1)	1	every incorrect answer negates a correct answer if no answer on the line accept indication on the list
		ii	A (1)	1	every incorrect answer negates a correct answer if no answer on the line accept indication on the list
Total				4	

Question		Expected Answers	Marks	Rationale
10	a	positive phototropism (1)	1	if no answer on the line accept indication on the list
	b	auxin (1) collects on/sent to/passes to shady side/higher concentration on shady side (1) causes cell elongation (1)	3	accept IAA not causes growth not causes cell division
		Total	4	

11	a	B (1)	1	every incorrect answer negates a correct answer if no answer on the line accept indication on the list	
	b	i	alveoli (1)	1	allow alveolus
		ii	any two from greater surface area (1) better blood supply/more vessels (1) greater concentration difference (1)	2	answers must be comparative
		Total	4		

Question			Expected Answers	Marks	Rationale
12	a	i	all points correctly plotted to within +/- 0.5 square (1) smooth line of best fit (1)	2	reject double/feathery lines/lines more than ½ sq thick lose smooth line mark if extend line towards origin
		ii	8 (1)	1	allow answer in range 7 – 9 if graph is incorrect allow ECF
	b		amylase denatured/ active site changed/ starch/substrate does not fit into active site(1)	1	not 'killed'
			Total	4	

13	a		any two from chooses fastest dogs from offspring (1) breed them (1) repeat (1)	2	must be clear that the fastest dogs are being bred cannot score without either of the first two marking points
	b		any two from if different parents then less accumulation of harmful (recessive) characteristics/inbreeding depression (1) if different parents then more variation (1) if different parents then increases the gene pool (1)	2	accept converse for each point if clear which is being referred to ignore inbreeding unless qualified eg runts accept less genetic disorders reject no variation
			Total	4	

Mark Scheme B641/01

June 2007

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()	= words which are not essential to gain credit
<u> </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question			Expected Answers	Marks	Rationale
1	a	i	fractional distillation (1)	1	allow 'distillation'/'fractionation' allow indication of the correct answer from the list by \surd , <u> </u> or circling- note that the answer on the line takes precedence
		ii	boiling points (1)	1	NOT 'melting point' allow indication of the correct answer from the list by \surd , <u> </u> or circling- note that the answer on the line takes precedence
	b		oil spill/damage to wildlife/kills fish/kills sealife/kills marine animals/damages beaches/aw/other specified pollution (1)	1	allow harms wildlife/animals allow specific effect on wildlife, eg oil/tar on bird's feathers ignore catching fire/producing black clouds NOT 'causes pollution' unless qualified
	c		any two from converts large molecules to small/breaks (large molecules) to small(er) molecules (1) small molecules are more useful/makes petrol (1) makes alkenes (for polymers)/makes ethene/named alkenes/make small alkanes or named alkanes (1) ideas about oil refinery matching supply to demand/AW(1) and example (1)	2	allow hydrocarbon as molecule ignore particles or substances do not credit fractional distillation/mixing other fractions with petrol/using other fractions instead of petrol allow monomer as small molecule ignore hydrogen produced large alkanes to small alkanes scores (2) allow equations either word or symbol eg decane \rightarrow octane + ethene scores (2) decane \rightarrow octane + ethane scores (1) if symbols given, equations need not balance and ignore incorrect subscripts/ superscripts possible example is lubricating oil/ fuel oil changed into petrol scores (2)
			Total	5	

Question			Expected Answers	Marks	Rationale
2	a	i	monomers (1)	1	allow any suitable indication of the correct answer from the list. Note that the answer on the line takes precedence.
		ii	polymers (1)	1	allow any suitable indication of the correct answer from the list. Note that the answer on the line takes precedence.
	b		poly(ethene) (1)	1	allow 'polyethene'/'polythene'
	c		carbon (1) hydrogen (1)	2	allow any order not atomic symbols
	d		any two from do not rot/do not decompose/not chemically broken down/not biologically broken down (1) use up (valuable) space (1) idea of a (valuable) resource being used up (1) animals choke (1)	2	allow decomposes or rots over a long period of time ignore disintegrates/deteriorates/degrades/unqualified references to broken down allow landfill sites get filled up (more quickly)/need more and more landfill sites/ difficult to get a licence for landfill site/not many landfill sites left ignore smells allow throwing away plastics which can be reused or recycled ignore poisons/harms/damage animals ignore damage wildlife
Total				7	

Question		Expected Answers	Marks	Rationale
3	a	oxygen (1)	1	allow O ₂
	b	water/hydrogen oxide (1) carbon dioxide (1)	2	allow steam/water vapour/H ₂ O allow CO ₂ ignore wrong formula if name correct allow any order
	c	carbon monoxide (1)	1	allow CO
		Total	4	

Question		Expected Answers	Marks	Rationale
4	a	6 (1)	1	allow 6 next to the words 'finish the table' or next to the table if clearly unambiguous ignore 22-16
	b	B (1)	1	if answer to part a is greater than 9 then correct response is A
	c	Exothermic (1)	1	allow indication of the correct answer from the list by \surd , <u> </u> or circling- note that the answer on the line takes precedence
	d	C ₂ H ₆ O (1)	1	allow C ₂ H ₅ OH allow any order of symbol reject superscripts or incorrect subscripts
Total			4	

5	a	any two from sand (1) water (1) stones/AW (1)	2	allow hydrogen oxide/H ₂ O allow 'gravel' for stones/'aggregate' ignore rock/mud/calcium oxide/lime/clay	
	b	i	CaCO ₃ → CaO + CO ₂ (1)	1	allow any correct multiple allow = / \rightleftharpoons NOT and / + heat ignore state symbols
		ii	thermal decomposition (1)	1	allow 'decomposition' allow indication of the correct answer from the list by \surd , <u> </u> or circling- note that the answer on the line takes precedence
Total			4		

Question		Expected Answers	Marks	Rationale	
6	a	nitrogen (1) oxygen (1)	2	allow any order allow N ₂ , O ₂ , N and O	
	b	i	photosynthesis (1)	1	allow any suitable indication of the correct answer from the list-note that the answer on the line takes precedence
		ii	respiration (1)	1	allow any suitable indication of the correct answer from the list- note that the answer on the line takes precedence
	c	burning fossil fuels/burning sulfur / volcanoes/hot springs/geysers/ sulfur reacting with oxygen/ striking matches (1)	1	allow burning coal/burning oil/burning gas/petrol/diesel ignore burning methane/octane etc/burning in cars/power stations	
Total			5		

7	a	60 (1)	1	allow correct numerical answers written on graph unit not needed
	b	graph rises more steeply from origin (1) levels off at same volume (1)	2	graph must have same general shape as original if goes more than one 'square' above highest in original penalise levels off at same volume mark line must end up at same volume as original (need not join original line) ignore quality of line mark two points independently.
	c	any two from increase concentration (of acid)/use concentrated acid (1) increase surface area/reduce particle size/make into a powder/crushing tablets/AW (1) add a catalyst (1) shake/stir (1)	2	allow use undiluted acid/use stronger acid/decrease pH/more acidic ignore use a stronger tablet/use more tablets/increase/change the temperature
Total			5	

Question		Expected Answers	Marks	Rationale
8	a	plastic/glass/leather/rubber (1)	1	allow named plastic/polymer eg polyester, polyurethane ignore named elements eg carbon/metals if more than one response is given
	b	allow any order water (1) air/oxygen (1)	2	allow rain/H ₂ O (formula must be correct) allow O ₂ (formula must be correct) allow 'moist air' (2) allow 'damp air' (2) ignore steam
	c	idea of a mixture of at least two elements one of which is a metal (1)	1	ignore named alloys reject metal and non-metal/2 metals together/combination of metals
	d	any two from oxide layer/layer of aluminium oxide(1) coherent/does not flake away/AW (1) layer is impermeable to water/impervious layer/ protective layer (1)	2	ignore aluminium less reactive allow prevent reaction with air/ oxygen
		Total	6	

Question		Expected Answers	Marks	Rationale
9	a	atom Na ion K ⁺ molecule O ₂ (2)	2	all three correct (2) one or two correct (1) allow any suitable indication of pairing reject for each box if multiple lines from that box
	b	gains electrons (1)	1	allow adds electrons/gets an extra electron/gains one electron/reduction ignore number of electrons reject chloride ions gain electrons
	c	elements (1)	1	allow 'atoms'
	d	covalent (bonding) (1)	1	allow covalent
		Total	5	

Question		Expected Answers	Marks	Rationale
10	a	alkali metals (1)	1	allow alkali allow indication of the correct answer from the list by \surd , <u> </u> or circling- note that the answer on the line takes precedence
	b	potassium, sodium then lithium (1)	1	allow correct symbols allow most reactive potassium, least reactive lithium
	c	i any two from clean wire (in acid) (1) idea of substance in flame (1) observe colour/named colour(1)	2	marks may be awarded for labelled diagram allow blow chemical into flame/dips flame test wire in chemical then wire into flame/AW ignore burning metals in flame allow colour mark even if wrong colour for named metal
		ii yellow/orange (1)	1	reject yellow or orange in combination with other colours eg yellow/red
		Total	5	

Question		Expected Answers	Marks	Rationale
11	a		3	1 mark for each correct line reject for each box if multiple lines from that box
	b	fluorine/bromine/astatine (1)	1	allow F ₂ /F/Br ₂ /Br/At ₂ /At ignore chlorine/iodine
	c	sodium + chlorine → sodium chloride (1)	1	allow correct formulae Na + Cl ₂ → NaCl equation does not need to be balanced allow mix of name and formulae allow =/⇌ reject 'and' in place of +
		Total	5	

Question		Expected Answers	Marks	Rationale
12	a	lighted splint (1) pop/explodes (1)	2	allow ignite with a flame/AW if first marking point is incorrect cannot gain the second mark
	b	anode (1)	1	allow indication of the correct answer from the list by \surd or ___
		Total	3	

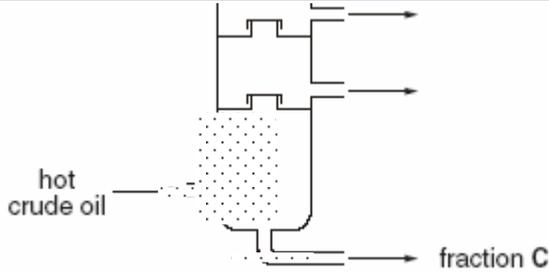
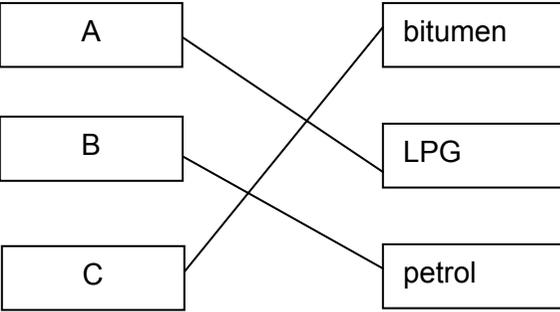
13	a	bauxite (1)	1	allow any suitable indication of the correct answer from the list- note that the answer on the line takes precedence
	b	aluminium oxide \rightarrow aluminium + oxygen (1)	1	allow correct formulae $\text{Al}_2\text{O}_3 \rightarrow \text{Al} + \text{O}_2$ allow incorrectly or unbalanced equation allow = / \rightleftharpoons allow mix or names and formulae
		Total	2	

Mark Scheme B641/02

June 2007

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

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
not	= answers which are not worthy of credit
reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant
allow	= answers that can be accepted
()	= words which are not essential to gain credit
<u> </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question		Expected Answers	Marks	Rationale
1	a	cannot be replaced within any reasonable timespan/AW (1)	1	<p>must refer to aspect of replacement AND time NOT burning/can be re-used/finite ignore can't renew, not made again, will run out, used faster than is formed reference to time must indicate 'long' time or 1000 yrs or more</p>
	b	i	1	<p>X below lowest bubble cap but inside column or tubes (1)</p>  <p>X anywhere in shaded area scores (1)</p>
		ii	2	 <p>(2)</p> <p>all three correct scores (2) one or two correct scores (1) if more than one line from box A,B or C one mark is lost</p>

Question	Expected Answers	Marks	Rationale
c	<p>any two from converts large molecules to small/breaks (large molecules) to small(er) molecules (1)</p> <p>small molecules are more useful/makes petrol (1)</p> <p>makes alkenes (for polymers)/makes ethene//named alkenes/make small alkanes or named alkanes (1)</p> <p>ideas about oil refinery matching supply to demand/AW(1) and example (1)</p>	2	<p>allow hydrocarbon as molecule ignore particles or substances do not credit fractional distillation/mixing other fractions with petrol/using other fractions instead of petrol</p> <p>allow monomer as small molecule ignore hydrogen produced</p> <p>large alkanes to small alkanes scores (2)</p> <p>allow equations either word or symbol eg decane → octane + ethene scores (2) decane → octane + ethane scores (1) if symbols given, equations need not balance and ignore incorrect subscripts/ superscripts</p> <p>possible example is lubricating oil/ fuel oil changed into petrol scores (2)</p>
	Total	6	

Question		Expected Answers	Marks	Rationale
2	a	double bond or C=C (1)	1	allow the double bond circled on the displayed formula or C _n H _{2n}
	b	i	1	ignore clear or white allow decolourises or brown/orange/yellow colour fades/ AW
		ii	1	allow stays orange/brown/yellow NOT turns orange/brown/yellow allow no reaction or decolourises after a long time ignore nothing
	c	any two from do not rot/do not decompose/not chemically broken down/not biologically broken down (1) use up (valuable) space (1) idea of a (valuable) resource being used up (1) animals choke (1)	2	allow decomposes or rots over a long period of time ignore disintegrates/deteriorates/degrades/ unqualified references to broken down allow landfill sites get filled up (more quickly)/need more and more landfill sites/ difficult to get a licence for landfill site/not many landfill sites left ignore smells allow throwing away plastics which can be reused or recycled ignore poisons/harms/damage animals ignore damage wildlife
		Total	5	

Question		Expected Answers	Marks	Rationale
3	a	more travel/more industry/increasing population/AW (1)	1	allow idea of increasing energy demand/more cars/more transport/more power stations/ more electricity being used (1)
	b	exothermic (1)	1	allow indication of the correct answer from the list by ✓, __ or circling answer on the line takes precedence more than one answer given scores (0)
	c	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ correct reactants and products (1) balancing (1)	2	allow correct multiples of this equation, including halves symbols and numbers must be in correct order NOT superscripts or incorrect subscripts eg C3H8 or C ³ H ⁸ scores (0) balancing mark is dependent on first mark being awarded allow = / \rightleftharpoons not 'and' ignore state symbols
	d	idea that energy released during bond making/bond making is exothermic (1) more energy released than taken in (1)	2	allow 'heat' instead of 'energy' beware of rewording of question eg energy taken in when bonds are broken scores (0) any references to numbers of bonds loses second mark eg energy given out when bonds are broken and bonds are made scores (1) BUT energy is taken in when bonds are broken and bonds are made scores (0)
		Total	6	

Question		Expected Answers	Marks	Rationale
4	a	C ₂ H ₆ O (1)	1	allow C ₂ H ₅ OH allow any order of symbol NOT superscripts or incorrect subscripts
	b	2600 (2) but $\frac{780}{0.3}$ or $\frac{\text{energy released}}{\text{mass}}$ (1)	2	ignore units correct answer with no working scores (2)
		Total	3	

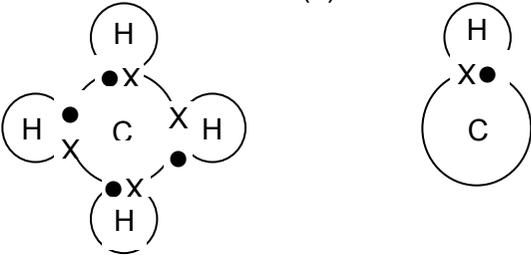
5	a	CaCO ₃ → CaO + CO ₂ (1)	1	allow any correct multiple allow = / ⇌ not and / + heat ignore state symbols
	b	clay (1)	1	allow china clay
		Total	2	

Question		Expected Answers	Marks	Rationale
6		statement or labelled diagram showing oceanic (plate) going under continental (plate) (1) subduction (1)	2	only one plate needs to be labelled in diagram
Total			2	

7	a	A – between 20-22% (1) B - nitrogen (1)	2	allow N ₂ ignore N
	b	burning fossil fuels/burning sulfur / volcanoes/hot springs/geysers / sulfur reacting with oxygen/ striking matches (1)	1	allow burning coal/burning oil/burning gas/petrol/diesel ignore burning methane/octane etc or burning in cars/ power stations
	c	$2\text{CO} + 2\text{NO} \rightarrow \text{N}_2 + 2\text{CO}_2$ correct reactants and products (1) balancing (1)	2	allow correct multiples of this equation including halves allow = / \rightleftharpoons not 'and' balancing mark is dependent on first mark being awarded ignore state symbols
Total			5	

Question		Expected Answers	Marks	Rationale
8	a	graph rises more steeply from origin (1) levels off at same volume (1)	2	graph must have same general shape as original if goes more than one 'square' above highest in original penalise levels off at same volume mark line must end up at same volume as original (need not join original line) ignore quality of line mark two points independently.
	b	particles have more energy/particles moving faster (1) more collisions per second/increased collision frequency/collisions more often/more chance of a collision (1) more successful/more energetic/harder or more forceful collisions (1)	3	NOT vibrate faster or move more NOT faster collisions if no other mark awarded then 'more collisions' scores (1)
		Total	5	

Question		Expected Answers	Marks	Rationale														
9	a	iron + oxygen + water → hydrated iron (III) oxide all 3 reactants (1) product (1)	2	allow correct formulae for Fe, O ₂ and H ₂ O and rest as Fe ₂ O ₃ .xH ₂ O allow mix of names and formulae allow hydrated iron oxide as product (1) allow = / ⇒ NOT 'and'														
	b	any two from oxide layer/layer of aluminium oxide(1) coherent/does not flake away/AW (1) layer is impermeable to water/impervious layer/ protective layer (1)	2	ignore aluminium less reactive allow prevents reaction with air/oxygen/water														
	c	suitable material and use (1) suitable property (1)	2	property must relate to material AND use eg plastic for light covers as it is easily moulded or transparent scores (2) BUT plastic for light covers as it is strong scores (1)														
				<table border="1"> <thead> <tr> <th>material and use</th> <th>reason</th> </tr> </thead> <tbody> <tr> <td>rubber tyres;</td> <td>grip/durable/shock absorbing/easily moulded;</td> </tr> <tr> <td>iron /steel for car body; aluminium for car body; leather seats/trim; plastic components;</td> <td>strong/malleable;</td> </tr> <tr> <td>plastic wire covering; copper wiring; paint on body work;</td> <td>lightweight/corrosion resistant;</td> </tr> <tr> <td></td> <td>comfort/appearance/durable; easily coloured/easily shaped;</td> </tr> <tr> <td></td> <td>insulator</td> </tr> <tr> <td></td> <td>conducts electricity; protects against rust/appearance;</td> </tr> </tbody> </table>	material and use	reason	rubber tyres;	grip/durable/shock absorbing/easily moulded;	iron /steel for car body; aluminium for car body; leather seats/trim; plastic components;	strong/malleable;	plastic wire covering; copper wiring; paint on body work;	lightweight/corrosion resistant;		comfort/appearance/durable; easily coloured/easily shaped;		insulator		conducts electricity; protects against rust/appearance;
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	comfort/appearance/durable; easily coloured/easily shaped;																	
	insulator																	
	conducts electricity; protects against rust/appearance;																	
Total			6															

Question		Expected Answers	Marks	Rationale
10	a	covalent (bonding) (1)	1	allow covalent
	b	gains electrons (1)	1	allow adds electrons/gets an extra electron/gains one electron/reduction ignore number of electrons not chloride ions gain electrons
	c	at least one covalent bond between carbon atom and hydrogen atom shown as electron pair (1) rest of structure correct (1)  would score 2 would score 1	2	ignore missing inner electrons or carbon allow electrons as all crosses or dots the electron pair needs to be near or in the intercept of orbitals
	d	2.8.8.1 (1)	1	allow commas
		Total	5	

Question		Expected Answers	Marks	Rationale
11	a	<p>any two from metal floats (1) metal moves (1) bubbles (1) purple/lilac/pink colour and/or flame/catches fire/sparks/ explodes (1)</p> <p>metal melts (1) makes a colourless solution (1)</p>	2	<p>allow metal stays on surface (1) metal moves on the surface (of the water) scores (2) allow fizzing ignore burns allow pops or bang/AW yellow flame scores (1) allow dissolves/metal gets smaller ignore references to metal disappearing, an indicator or water changing colour</p>
	b	<p>any two from clean wire (in acid) (1) idea of substance in flame (1)</p> <p>observe colour/named colour(1)</p>	2	<p>marks may be awarded for labelled diagram allow blow chemical into flame/dips flame test wire in chemical then wire into flame/AW ignore burning metals in flame allow colour mark even if wrong colour for named metal</p>
	c	$\text{Na} \rightarrow \text{Na}^+ + \text{e}^- / \text{Na} - \text{e}^- \rightarrow \text{Na}^+ (1)$	1	<p>allow correct multiples allow = / \rightleftharpoons allow E^-</p>
Total			5	

Question		Expected Answers	Marks	Rationale
12	a	gas (1) brown/orange/red (1) iodine/astatine (1)	3	allow any combination of colours eg red-brown scores (1) allow symbols (I/ I ₂ /At/At ₂)
	b	sodium + chlorine → sodium chloride (1)	1	allow correct formulae Na + Cl ₂ → NaCl equation does not need to be balanced allow mix of name and formulae allow ⇌ reject 'and' in place of +
	c	easier to gain an electron/outer electrons closer to nucleus/less electron shielding/more attraction from nucleus (1)	1	NOT gains more electrons/gains electrons faster ignore chlorine has less electrons assume answers refer to chlorine unless otherwise stated
		Total	5	

13		2H ⁺ + 2e ⁻ → H ₂ correct reactants and products (1) balancing (1)	2	allow correct multiples of this equation including halves balancing mark is dependent on first mark being awarded allow E ⁻
		Total	2	

Question		Expected Answers	Marks	Rationale
14	a	aluminium oxide → aluminium + oxygen (1)	1	allow correct formulae allow incorrectly or unbalanced equation $\text{Al}_2\text{O}_3 \rightarrow \text{Al} + \text{O}_2$ scores (1) allow = / \rightleftharpoons allow mix of names and formulae
	b	lowers melting point of mixture/aluminium oxide (1)	1	NOT lowers melting point of aluminium allow used as a solvent/aluminium oxide dissolves in it allow process is cheaper since it helps reduce energy costs ignore electrolyte or conducts electricity
	c	extraction costs are greater/needs electricity (1)	1	ignore mining costs/harder to extract/higher in reactivity series allow needs electrolysis
		Total	3	

Mark Scheme B651/01

June 2007

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

/	= alternative and acceptable answers for the same marking point
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allow	= answers that can be accepted
()	= words which are not essential to gain credit
<u> </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question		Expected Answers	Marks	Rationale
1	a		3	1 correct (1) 2 correct (2) all correct (3) mark incorrect any box that has two or more lines from the left hand side
	b	3 years (2) but payback time = $\frac{\text{cost}}{\text{saving}} = \frac{300}{100}$ (1)	2	correct answer on its own (2) 3 on its own = (2) only look at the working if the answer is incorrect. if units stated they must be correct but 3 with wrong unit eg 3 weeks or 3 days would score 1
		Total	5	

Question			Expected Answers	Marks	Rationale
2	a	i	A (1)	1	more than one answer scores (0) mark the answer on the line first if there is no response mark the list.
		ii	B (1)	1	more than one answer scores (0) mark the answer on the line first if there is no response mark the list.
	b		decreases/AW (1)	1	allow AW if clearly means decreases (1) mark the answer on the line first if there is no response mark the list.
	c	i	microwave (1)	1	more than one answer scores (0)
		ii	infrared (1)	1	allow IR
	d		concern over frequent/long-term use (1) ideas that microwaves can be absorbed by living tissue (1) cause an increased temperature (1) (may) damage tissue/brain (1) children's brains are developing (1) worry it may cause cancer/AW (1)	2	any two sensible suggestions ignore reference to cost
			Total	7	

3	a	i	thermometer (1)	1	allow temperature probe/thermocouple
		ii	stop-clock/balance/heater/joule meter ammeter/voltmeter/power supply (1)	1	allow weighing machine NOT scales
	b		(kilo) <u>joule</u> (1)	1	NOT just J allow megajoule/Mjoule/kjoule (1)
			Total	3	

Question	Expected Answers	Marks	Rationale
4	any three from cup/polystyrene/foam is an insulator (1) contains air/bubbles (1) (air/bubbles) trapped (1) BUT air/bubbles are trapped (2) air is (good) insulator/poor conductor (1) trapped air prevents convection (1)	3	allow higher level responses eg reduced convection currents (1) in air pockets (1) allow answers in terms of particles that cover marking points
	Total	3	

Question			Expected Answers	Marks	Rationale
5			digital (1)	2	multiple answers score (0)
			intense (1)		
Total				2	

6	a	i	coal (1)	1	allow answers marked on the list if no answers on line
		ii	straw (1)	1	allow answers marked on the list if no answers on line
	b		idea of heat/energy lost to atmosphere or environment/AW (1)	1	allow lost as steam to the environment/lost from cooling towers to the environment /lost as heat from the chimney/lost as heat from the wires/AW
		c	AC/alternating (current) (1)	1	allow 'alternating voltage' (1)
	d	i	change/increase/decrease voltage (1)	1	allow answers in terms of current
		ii	power lines/connects consumers (or named consumer) to supply/power station/(1)	1	allow distributes energy/electricity/power (1)
Total				6	

Question		Expected Answers	Marks	Rationale
7	a		2	2 or 3 correct (2) 1 correct (1) 0 correct (0) two lines from any box on the left hand side must be marked incorrect
	b	hot (1) give out their own light/AW (1)	2	shine/glow (1) bright (0) allow burn/AW (1)
		Total	4	

Question		Expected Answers	Marks	Rationale
8	a	any two from navigation (1) weather (forecasting) (1) spying/military (1) TV/radio (1) collecting astronomical information (1) scanning Earth's surface/monitoring (1)	2	NOT mobile or telephone messages (0)
	b	i ideas of gas/clouds/particles/heat/radiation/energy ejected (AW) (1)from Sun (1)	1	allow cosmic rays NOT just gas/cloud/particles /heat/radiation/ energy on own must have idea of ejected/thrown out/pushed out NOT protrusion/ given out or released
		ii distorts (signals) /AW (1)	1	ignore damage to satellite/satellite system/ scrambled allow stops signal (1) allow higher level answers charged particles/magnetic fields distorted/AW
		Total	4	

Question		Expected Answers	Marks	Rationale
9	a	<p>one from making craters/hot rock thrown out/fires/dust/earthquake/tsunami (1) and one other from less (sun)light (1) climate change (1) fewer or different plants grow (1)</p>	2	<p>ignore asteroid kills dinosaurs allow weather change (1)</p>
	b	i	1	<p>ignore dust/rock BUT if any other contents and ice no mark allow frozen water but NOT solid water</p>
		ii	1	<p>allow drawing of ellipse or oval (1) allow egg shaped ignore idea of flattened circle</p>
		iii	2	<p>speed change/increase/decrease/AW (1) speed increases as it approaches Sun (2) or speed decreases as it moves away from the Sun (2)</p> <p>close to the sun it is fast AND far away it is slow (2) close to the sun is fast ER/ORA (2) allow because of greater gravity closer to the Sun speed increases/ORA (2)</p>
		Total	6	

Question		Expected Answers	Marks	Rationale
10	a	stopclock (1) measuring tape (1)	2	allow clock and/or tape
	b	any three from two pictures taken (1) fixed/known time apart (1) distance between the markings known/can be measured (1) distance travelled can be measured (1) using the markings on the road (1) speed can be calculated (1) photographs used to record registration number (1)	3	NOT two flashes
		Total	5	

Question			Expected Answers	Marks	Rationale
11	a	i	Fiat (1)	1	mark answer on line first- if no answer mark list
		ii	Rover (1)	1	mark answer on line first
	b	i	distance travelled (1) between putting brakes on and coming to a stop (1)	2	NOT how long or time allow distance travelled (1) with brakes on (until stopped) (1)
		ii	faster moving car/heavier load/car/poor brakes /faulty brakes/bald/wrongly inflated tyres/slippery road/poor road surface (1)	1	allow poor suspension allow correct weather condition ice/snow/rain/leaves NOT just road surface NOT "the weather" or "poor weather"
		iii	25 (m) (1)	1	
			Total	6	

12	a	i	aeroplane in flight (1)	1	
		ii	book on shelf (1)	1	
			Total	2	

Question		Expected Answers	Marks	Rationale
13	a	any two from idea that seat belts - stretch/change shape (1) - absorb energy (1) - increase stopping time/AW (1) - reduce acceleration deceleration (1) - reduce force on body (1) prevents/reduces impact (with windscreen/steering wheel/etc)	2	ignore idea of locking or keeping you in your seats/prevents being thrown forward
	b	they stretch/become deformed/AW	1	allow weakened/damaged (1) NOT broken (0)
	c	crumple zone/air bags/abs/low profile tyres/safety cage/side impact bars/AW (1)	1	any 1
		Total	4	
14		4250 (J) scores (3) but $W = 85 \times 50$ (2) $W = \text{force} \times \text{distance}$ (1)	3	correct answer on its own = (3) $4.25\text{KJ} = 3$ incorrect conversion to KJ from correct answer will only score 2 for correct substitution 85×5000 gains the formula mark for 1
			Total	3

Mark Scheme B651/02

June 2007

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ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question		Expected Answers	Marks	Rationale
1	a	<p>any three from foam/polystyrene/cup is an insulator (1) contains air/bubbles(1) but air/bubbles are trapped (2) air is (good) insulator/poor conductor (1) trapped air prevents convection (3)</p>	3	<p>allow higher level responses eg reduced convection currents (1) in air pockets (1)</p> <p>allow correct answers in terms of particles that cover marking points</p>
	b	<p>any two from particles in coffee (continually) moving/have KE (1) collide with (wall of) cup (1) particles in cup gain (kinetic) energy/vibrate more/have extra kinetic energy (1) energy passed from one particle to next (through cup) (1) air (in contact with the cup) gains energy/gets hot (1)</p>	2	<p>must be increased vibrations – ignore just move more/start to move/start to vibrate</p> <p>ignore references to ‘this cup is not as good an insulator’/does not contain air bubbles’ ignore references to convection in air outside cup</p>
	c	<p>3 years (2) but payback time = $\frac{\text{cost}}{\text{saving}} = \frac{300}{100}$ (1)</p>	2	<p>correct answer on its own (2) 3 on its own = 2 only look at working if answer is incorrect if unit is stated it must be correct but 3 with incorrect unit still gains one mark eg 3 days, 3 weeks would score 1</p>
		Total	7	

Question		Expected Answers	Marks	Rationale
2	a	any two from laser all same frequency/wavelength/colour (1) all waves in phase (1) intense (1) filament lamp range of frequencies/wavelengths/colours (1) not in phase (1) not intense (1)	2	any order ignore reference to visible spectrum/energy/power allow description of 'in phase' ignore 'in step'
	b	decreases/AW (1)	1	allow AW if clearly means decreases (1) mark answer on line first- if no answer on line, mark the list
		Total	3	
3	a	reflection (1) diffraction (1) interference (1)	3	uncertainty over refraction does not score eg. 'reflaction' is no mark
	b	any two from ideas that: ozone absorbs UV/hole allows UV through (1) (greater) UV damage/harm (to humans)/(skin) cancer risk (on Earth) (1) damage/harm to plant or other animals (1)	2	2 marks can be gained in either answer space do not award 'humans' mark twice
		Total	5	
4		line to left of original line, steeper, starting at 20°C (1) line finishing at 100°C then horizontal for at least 1 minute (1)	2	independent marks allow short but steeper line starting at 20°C that runs for a minimum of 1 minute
			Total	2

Question		Expected Answers	Marks	Rationale
5	a	idea that a signal can take any value/continuously changing (1)	1	allow 'more than 2 values/signals' (1) but not '2 or more'
	b	reflected (at side/surface/wall/fibre) (1) no refraction/idea of no light escaping by transmission (1) idea that angle $i > c$ (1) BUT total internal reflection/TIR (2)	2	ignore diagrams ignore hits/bounces off/rebounds allow 'all the light going in one end comes out the other end' 'internal reflection' is only 1 mark max 1 mark for labelling reflection on the diagram.
		Total	3	

6	a	i	no pollution/waste/conserves fossil fuels/ wind is renewable/idea of once built no energy costs (1)	1	allow higher level answers eg spare energy can be sold to the grid (1) ignore references to maintenance/power output
		ii	depends on wind speeds/space or suitable site needed/visual pollution/kills birds (1)	1	allow noise ignore references to cost
	b		idea of tracking direction of sunlight/paint (matt) black/darker AW (1)	1	eg tilting/turning panel (1) ignore references to raising the panels/putting on house roof/using mirrors
	c		radiation/Sun's rays/energy/IR/heat enters through glass (1) absorbed by walls/surfaces/floors/air/contents (1) hot surfaces emit radiation/rays/infrared/heat/energy/(1) IR/heat/energy reflected (by the glass)/can't leave/ is trapped (1)	3	ignore light/light rays. NOT just 'Sun' ignore 'greenhouse effect'
		Total		6	

Question		Expected Answers	Marks	Rationale
7	a	fuel burns in 1st box (1) then max 2 marks available for: <i>(water boils)</i> steam produced steam drives turbine turbine spins generator <i>(electrical energy produced)</i>	3	3 in correct order (2) 2 in correct order (1) eg steam drives turbine – turbine spins generator – steam produced gains 1 mark
	b	20 000 (V) (3) but $V = 5\,000\,000/250$ (2) voltage = power/current or power = voltage x current or $5\,000\,000 = V \times 250$ (1)	3	correct answer on its own with no working scores 3 20k(V) scores (3)
		Total	6	

8	a	idea of gas/clouds/particles/heat /radiation/energy ejected/AW (from Sun) (1)	1	allow cosmic rays NOT just gas/clouds/particles/heat/radiation on its own – answer must include idea of ejected/thrown out/pushed out - not protrusion/given out/released
	b	distorts (signals)/AW	1	allow – stops signals ignore damage to satellite/satellite systems allow higher level answers eg charged particles/magnetic field distorted/AW ignore scrambled
		Total	2	

Question			Expected Answers	Marks	Rationale
9	a	i	between Mars and Jupiter (1)	1	if no answer on the line, look at list
		ii	any one from craters/idea of unusual elements in rocks/sudden changes in fossil numbers between (adjacent) layers of rock/AW (1)	1	ignore holes in the earth/crust
	b	i	ice (1)	1	ignore dust/rock – if any other content and ice – no mark allow 'frozen water' but NOT 'solid water'
		ii	elliptical/oval (1)	1	allow drawing of an ellipse/oval (1) allow egg shape ignore idea of flattened circle
		iii	speed change/AW (1) speed increases as it approaches the Sun (2) OR speed decreases as it moves away from the Sun (2)	2	allow because of greater gravity closer to the Sun speed increases (2) ORA close to Sun it is fast/AW and far away it is slow (2) close to Sun it is faster ORA (2)
			Total	6	

Question			Expected Answers	Marks	Rationale
10	a	i	poor road surface/slippery road/bald or wrongly inflated tyres/faulty brakes/increased speed/heavier load/heavier car (1)	1	allow poor suspension (1) NOT just 'road surface' allow correct weather condition eg ice/rain/snow/leaves, but NOT 'the weather', or 'poor/bad weather'
		ii	drugs/alcohol/tiredness/illness/distraction AW/increased speed (1)	1	allow increasing age/AW (1) allow driver not concentrating/not alert
	b		any two from idea that seat belts - stretch/ change shape (1) - absorb energy (1) - increase stopping time AW (1) - reduce acceleration/deceleration (1) - reduce force on body (1) - prevents/reduces impact (with windscreen/ steering wheel/dash board) (1)	2	ignore idea of seat belts locking/keeps you in your seat/stops you being thrown forward
	c		advantage - no pollution at point of use/quieter/conserves fossil fuels (1) disadvantage - needs to be charged/short range/pollution produced at power station (AW) (1)	2	allow 'cleaner' allow does not add to global warming allow 'slower' ignore 'cost' for either answer
Total				6	

11			4250 (J) scores (3) but (W =) 85 x 50 (2) (W =) force x distance (1)	3	correct answer on its own (3) correct conversion to kJ (3) incorrect conversion to kJ from correct answer will score 2 for correct substitution allow 85 x 5000 for 1 mark (formula mark)
Total				3	

Question			Expected Answers	Marks	Rationale
12	a	i	A (1)	1	multiple answers score (0) If no answer on line, mark any letter chosen from the list. If neither of these are answered then look at diagram – must show labels (i) or (ii)
		ii	C (1)	1	multiple answers score (0) If no answer on line, mark any letter chosen from the list. If neither of these are answered then look at diagram – must show labels (i) or (ii)
	b		ideas of energy transferred/lost in a collision/AW (1) doubling speed more than doubles energy (1) (KE =) $\frac{1}{2}mv^2$ (1) BUT doubling speed increases energy 4 fold (2)	2	KE is proportional to v^2 (2)
			Total	4	
13			any three from condition of road surface (1) different speeds (1) idea of different terrain (1) short/long journey (1) ORA one car has more/load/mass/weight/passengers (1) different driving styles (1) Colin uses brakes more/stops and starts a lot (1) ORA different accelerations (1) Colin accelerates harder (1) ORA Colin brakes harder/uses more braking force ORA (1) different drag/air resistance (1)	3	ignore reference to larger/smaller cars ignore reference to weather (except wind) eg Cathy drives on flat roads/Colin drives over hills. allow 'more load', 'mass', 'weight' (1) ignore reference to car conditions ignore electrical equipment in use in one car (eg air conditioning) (eg open windows/roof rack/towing caravan/wind)
			Total	3	

Question			Expected Answers	Marks	Rationale
14	a	i	gravity/weight > drag/(air) resistance OR drag/(air) resistance increasing (1)	1	allow friction for drag ignore 'forces are unbalanced'
		ii	(at terminal speed) (air) resistance/drag = gravity/weight (1)	1	allow friction for drag allow forces are balanced or equal
	b		any two from greater surface area (1) greater (air) resistance (1) lower terminal /steady/final/speed (1)	2	ignore reference to weight
			Total	4	

**General Certificate of Secondary Education
Gateway Science Suite
June 2007 Assessment Series**

Unit Threshold Marks

	<i>Unit</i>	Maximum Mark	a*	a	b	c	d	e	f	g	u
B621/01	Raw	60				34	28	22	17	12	0
	UMS	69				60	50	40	30	20	0
B621/02	Raw	60	44	35	26	17	10	6			0
	UMS	100	90	80	70	60	50	40			0
B622/01	Raw	60				39	32	25	19	13	0
	UMS	69				60	50	40	30	20	0
B622/02	Raw	60	45	37	29	22	14	10			0
	UMS	100	90	80	70	60	50	40			0
B625	Raw	60	55	50	45	40	35	30	25	20	0
	UMS	100	90	80	70	60	50	40	30	20	0
B623/01	Raw	60				35	29	23	18	13	0
	UMS	69				60	50	40	30	20	0
B623/02	Raw	60	46	38	30	23	16	12			0
	UMS	100	90	80	70	60	50	40			0
B631/01	Raw	60				41	34	27	21	15	0
	UMS	69				60	50	40	30	20	0
B631/02	Raw	60	39	32	25	19	14	11			0
	UMS	100	90	80	70	60	50	40			0
B641/01	Raw	60				34	28	22	17	12	0
	UMS	69				60	50	40	30	20	0
B641/02	Raw	60	46	38	30	22	17	14			0
	UMS	100	90	80	70	60	50	40			0
B651/01	Raw	60				34	27	21	15	9	0
	UMS	69				60	50	40	30	20	0
B651/02	Raw	60	46	39	32	26	20	17			0
	UMS	100	90	80	70	60	50	40			0

B625 - The grade thresholds have been decided on the basis of the work that was presented for award in June 2007. It should be noted that this was the first cohort of candidates to take these new assessments. Thus, the threshold marks will not necessarily be the same in subsequent awards. Some adjustments may be expected as experience with the mark descriptors grows, and a wider range of Centres becomes involved.

For a description of how UMS marks are calculated see;
http://www.ocr.org.uk/exam_system/understand_ums.html
 Statistics are correct at the time of publication

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