

Science B

General Certificate of Secondary Education

Unit **B621/02**: Unit 1 Modules B1, C1, P1 (Higher Tier)

Mark Scheme for June 2012

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

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

Subject-specific Marking Instructions

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

Question		Answer	Marks	Guidance
1	(a)	<p>correctly calculating any one average Tom =10(cm) or Peter=8(cm) or Mary=9(cm) (1)</p> <p>correctly calculating all averages : Tom =10(cm) and Peter = 8(cm) and Mary = 9(cm) (2)</p> <p>Peter (is fastest) (1)</p>	3	<p>names not needed in calculation</p> <p>names not needed in calculation</p> <p>if no mark awarded allow (1) for any attempt at calculating an average eg (Mary) $36 \div 5$ or 7.6 (1) or (Peter) $32 \div 5$ or 6.4</p>
	(b)	finger muscle(s) / hand muscle(s) (1)	1	allow muscle(s)
	(c)	<p>USE ✓'s IN THIS ANSWER</p> <p>read complete answer before awarding marks</p> <p>more transmitter substance / neurotransmitter or stimulates release of transmitter substance (1)</p> <p>diffuses more quickly (across synapse) (1)</p> <p>bind with more receptor molecules / receptors are more sensitive (1)</p>	3	<p>the idea of <u>more</u> is only needed in one part of the answer for full marks</p> <p>allow higher level answers eg more named transmitter substance (acetylcholine noradrenaline)</p> <p>as additional marking points allow narrower or thinner synapse (1) allow different transmitter substance (1) allow larger surface area of dendrite or nerve / neurone end(ing) (1) allow more vesicles move to surface / release transmitters (1) allow correct reference to drugs eg stimulants increase synaptic activity / depressants inhibit synaptic activity (1) but correct reference to drug linked to the amount of transmitter substance released (2) e.g. painkillers block the synapse (2) allow higher level answers: threshold lowered / more sensitive membrane (1)</p>
		Total	7	

Question			Answer	Marks	Guidance
2	(a)	(i)	broken down into small(er) molecules / made into small(er) molecules (1)	1	allow made soluble or so that they can be absorbed allow proteins broken down into amino acids / carbohydrates broken down into sugars / fats broken down into glycerol and fatty acids ignore break up ignore molecules break down ignore particles
		(ii)	(already) small (1)	1	allow (already) soluble allow does not need to be digested to be absorbed / AW allow it can diffuse into blood (stream) not already broken down
	(b)	(i)	passive (1)	1	allow any indication of correct answer including the word passive written beside the answer if no word circled ticked or underlined more than one answer (0)
		(ii)	antibodies not made by baby / AW (1)	1	allow passed on from mother ignore passed through milk
	(c)		idea of <u>enzymes</u> work best at an optimum temperature or best temperature for <u>enzymes</u> (1)	1	allow <u>enzymes</u> works best at body temperature / 37(°C) allow <u>enzymes</u> work most effectively or most efficiently ignore optimum temperature for digestion
	(d)		cause addiction / act as a stimulant (1)	1	allow cries more / withdrawal symptoms allow milk is addictive / baby craves for milk ignore small / premature baby
			Total	6	

Question			Answer	Marks	Guidance
3	(a)	(i)	changes the amino acid / protein / (form of) haemoglobin / <u>base</u> sequence or <u>base</u> codes (1)	1	allow different triplet / different codon allow bases or <u>base</u> codes not correctly matched ignore merely codes ignore changes DNA
		(ii)	A, T, C, G (1)	1	all four needed any order allow adenine, cytosine, thymine, guanine
	(b)	<p>parental genotypes: Hh and Hh named or indicated on diagram (1)</p> <p>all children named or shown on the diagram i.e. HH Hh Hh hh (1)</p> <p>Claire: hh named or indicated on diagram (1)</p>	3	<p>connecting lines not needed middle level not needed for maximum marks ignore incorrect lines</p>	
	(c)	<p>idea of lack of oxygen or not enough oxygen (1)</p> <p>anaerobic respiration (1)</p>	2	ignore oxygen debt not no oxygen available (for aerobic respiration) but the second mark can still be gained not less oxygen for anaerobic respiration	
Total				7	

Question			Answer	Marks	Guidance
4	(a)	(i)	hydrophobic (1)	1	allow phonetically correct spelling ignore fat-loving / water hating
		(ii)	water-loving (1)	1	allow attracted to water (molecules) / attracted to polar molecules ignore fat hating ignore reacts with water
	(b)		13 (1)	1	
	(c)	(i)	give a better taste / give a better flavour kills microbes / kills microorganisms / kills bacteria / kills a named bacteria eg salmonella / kills virus / stops food poisoning / improve the texture / description of change of texture / easier to digest / denatures the protein / denatures toxins (1)	1	allow change taste allow change flavour allow to get rid of bacteria allow to stop getting salmonella allow symptoms of food poisoning ignore it is safer / so you do not get ill or sick ignore kills germs not cooks microbes / microorganisms / bacteria allow the texture changes ignore so it can be digested on its own ignore easier to eat / to make it edible ignore denatures food ignore improves or changes appearance ignore break down protein
		(ii)	new substance formed / irreversible (1)	1	allow energy change takes place allow difficult to reverse allow colour change allow change is permanent allow difficult to or can't be changed back allow higher level answers involving changes to molecules, eg molecules change shape ignore references to particles ignore references to changes of state or denaturing
			Total	5	

Question		Answer	Marks	Guidance
5	(a)	5 (g) (1)	1	If answer line is blank allow $150 \div 30$
	(b)	(compound containing) carbon and hydrogen (atoms) only / AW (1)	1	allow H and C only ignore (compound containing) carbon and hydrogen not mixture of carbon and hydrogen only not (compound containing) carbon and hydrogen molecules only
	(c)	$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$ correct reactants and products (1) correct balancing (1)	2	allow any correct multiple, including fractions allow = / \rightleftharpoons instead of \rightarrow but not and / & instead of + allow 'energy' over the arrow but not '+ energy' on products side balancing mark is dependent on the correct formulae but allow 1 mark for a balanced equation with a minor error in subscripts / formulae eg $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

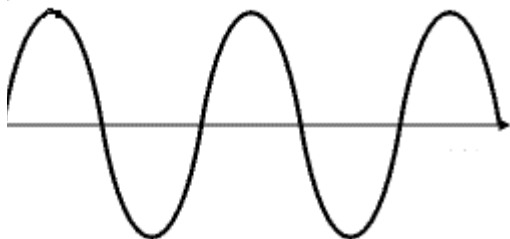
Question		Answer	Marks	Guidance
	(d)	<p>any two from:</p> <p>idea of (high) energy value (1)</p> <p>idea of availability / is it easy to get hold of / how long will it last (1)</p> <p>idea of renewable (1)</p> <p>idea of ease of use (1)</p> <p>idea of storage (1)</p> <p>toxicity of fuel (1)</p> <p>idea of cost (1)</p> <p>idea of pollution given out / does it have a clean flame / is it smelly / AW (1)</p> <p>idea of volatility (1)</p> <p>viscosity of fuel (1)</p> <p>state / is it solid, liquid or gas (1)</p>	2	<p>allow more energy transferred / released / produced ignore efficiency or fuel efficiency</p> <p>allow can it run out / is it nearby / global stocks / how much in reserves / sustainability</p> <p>allow is it non-renewable</p> <p>allow is it easy to use / is it difficult to use / is it safe to use allow idea of flammability / how well it burns / ease of burning / ease of ignition</p> <p>allow can it be stored / how much space to store it ignore transportation</p> <p>allow is it poisonous / must be non-poisonous / no harmful effects if in contact with people / will it irritate skin ignore is it safe / harmful / explosive / dangerous</p> <p>allow how much waste is produced ignore environmentally friendly / effect on the environment</p>
		Total	6	


Question		Answer	Marks	Guidance
6	(a)	✓ in second box: the bag gets hot because the reaction is exothermic (1)	1	
	(b)	holes too small / doesn't allow (liquid) water / rain to pass through (1) and but big enough / allows (water) vapour / evaporated sweat to pass through (1)	1	if holes not mentioned no mark for idea of stopping water and allowing vapour out allow big enough for evaporation to get out not just sweat
	(c)	(i) covalent (1) intermolecular (1)	2	allow Van Der Waals
		(ii) strong forces (due to covalent bonds or cross-linking bridges) between the molecules (1)	1	allow strong intermolecular bonds (prevent movement) allow cross-links / (covalent) bonds between chains / polymer molecules (prevent movement of chains past each other) (1) ignore intermolecular forces ignore merely polymer has strong bonds
		Total	5	

Question		Answer	Marks	Guidance
7	(a)	<p>any one from: petrol or 'it' is in high demand / AW (1)</p> <p>petrol or 'it' is in short supply / AW (1)</p> <p>supply of petrol or supply of 'it' is less than demand / AW (1)</p> <p>low(er) (relative) percentage in crude oil (1)</p>	1	<p>allow reverse argument, ie, fuel oil is in low demand / AW</p> <p>allow reverse argument, ie, fuel oil is plentiful / AW</p> <p>allow reverse argument, ie, supply of fuel oil is greater than demand</p> <p>allow reverse argument, ie, high(er) (relative) percentage of fuel oil in crude oil / AW</p> <p>ignore references to boiling point or number of atoms</p>
	(b)	idea of weak(er) intermolecular forces (between petrol molecules) / ora (1)	1	<p>ignore weak(er) intermolecular bonds</p> <p>ignore less energy to break intermolecular bonds</p> <p>not weaker forces between atoms</p>
	(c)	<p>changes fractions or named fraction or hydrocarbons that are in excess / less useful / low demand (1)</p> <p>into fractions or named fraction or hydrocarbons that are needed / more useful / in demand (1)</p> <p>but to match supply with demand scores (2)</p> <p>to meet the demand (2)</p> <p>changes fraction into something in high demand (2)</p>	2	<p>allow fuel for fraction</p> <p>allow to make (more) petrol / LPG / paraffin (1)</p> <p>allow to make alkenes (for polymer production) (1)</p>
Total			4	

Question		Answer	Marks	Guidance
8	(a)	(energy) breaking intermolecular bonds (1)	1	allow overcome intermolecular forces but not break intermolecular forces ignore changing liquid into gas or change of state not intramolecular bonds or intramolecular forces
	(b)	(SLH of water is) 2265861(J/kg) (2) but if answer is incorrect $\frac{750000}{0.331} = (1)$ or 2265 2266 (1)	2	allow 544267 or 716332 (1) ie penalise non-conversion of mass only once allow 2265861.027 (2) allow 544....544.3 or 716.....716.4 (1) ie penalise non-conversion of mass and kJ once only
	(c)	90.3% (2) but if answer is incorrect $\frac{6500\ 000}{7200\ 000} (x100) = (1)$	2	allow 90% / 90.2% (2) allow 0.9 / 0.903 / 0.902 (2) but with incorrect units or no units: 0.9% / 0.9J(1) 90 / 90N(1) allow 90.277777 % / 0.90277777 (2) allow any cancelled down form eg $65 \div 72 / 6500 \div 7200 (x 100) (1)$
		Total	5	

Question		Answer	Marks	Guidance
9	(a)	<p>max two marks from each radiation</p> <p>infrared infrared heats or cooks surface or strikes surface (1)</p> <p>some energy in infrared oven used to heat the oven (1)</p> <p>infrared absorbed by glass or plastic (1)</p> <p>takes longer for energy to reach the centre with infrared / more time for centre to be cooked / cooking is slower (1)</p> <p>microwaves microwaves penetrate food or cook approx 1cm (1)</p> <p>all energy in microwaves used for cooking (1)</p> <p>microwaves go through glass or plastic (1)</p> <p>takes less time for energy to reach centre / less time for centre to be cooked / cooking is quicker (1)</p>	3	<p>allow heats the outside of the food / few mm allow idea of cooks from outside in</p> <p>ignore reflection or bounce</p> <p>allow a few cm allow idea energy transferred to water or fat or sugars allow heats water</p> <p>ignore reflection or bounce</p> <p>if the longer time for IR is awarded no mark for microwaves cook more quickly</p> <p>ignore the rest of the food is cooked by conduction and / or convection idea of KE passed on from particle to particle (of food)</p>

Question	Answer	Marks	Guidance
(b)	<p>any two of the following for (1):</p> <p>put transmitters or masts close</p> <p>more transmitters or masts</p> <p>put transmitters or masts high up</p> <p>remove obstacles affecting signals</p> <p>amplify or boost signal</p>	1	<p>allow put transmitters or masts where obstacles do not block signals / in line of sight / AW</p> <p>allow share transmitters or masts with other mobile companies</p> <p>allow taller or bigger transmitters or masts</p> <p>ignore satellites</p> <p>ignore stronger signals</p> <p>ignore digital</p>
(c)	<p>ionosphere reflects signal and</p> <p>idea of satellite receives and transmits (to Earth) / satellite retransmits</p> <p>e.g satellite gets signal and sends it back</p>	1	<p>both needed</p> <p>allow bounce for reflection</p> <p>allow TIR</p> <p>allow ionosphere refracts</p> <p>allow upper atmosphere for ionosphere</p> <p>allow idea satellite uses a short wavelength (and reflection by) ionosphere requires long wavelength</p>
(d)	<p>(analogue is) a continuously variable signal (1)</p>	1	<p>allow can have a range of values / any value / a value between 0 and 1/ has values other than 0 and 1</p> <p>allow a correct diagram e.g.</p> <div data-bbox="1301 1043 1809 1283" style="text-align: center;">  </div> <p>ignore diagrams unless labelled correctly</p> <p>ignore merely continuous wave</p>
Total		6	

Question		Answer	Marks	Guidance
10	(a)	labels or description needed as well as diagram 	1	at least two waves peak matching peak and trough matching trough and labelling to correctly show one of the following : peak, trough, wavelength or description or label(s) that clearly describe 'in phase' eg diagram as shown with 'peaks and troughs in step' or 'all peaks in step' or 'all troughs in step' (1)
	(b)	(i)	pits / AW in the surface of the CD (1)	1 allow patterns or bumps or dips on the surface or holes (1) allow digitally allow like Braille ignore notches / grooves / lines
		(ii)	laser or beam or light reflected from the surface (1)	1 ignore bounce ignore scanned / pattern read
			Total	3

Question		Answer	Marks	Guidance
11	(a)	(P-waves) longitudinal / pressure (waves)..... solids and liquids (1) (S-waves) transverse / shear waves)..... solids (only) (1)	2	allow can travel through anything for idea of medium if no mark awarded allow (1) for longitudinal and transverse correctly identified or solids and liquids for P and solids (only) for S
	(b)	destroy or damage / AW ozone layer or make it thinner and allowing (more) UV (waves) through (to the Earth) or absorbing less UV (1)	1	allow cause holes in the ozone layer or makes the ozone layer weaker causing global warming in answer scores (0)
			Total	3

Question		Answer	Marks	Guidance
12	(a)	contains air which is an insulator / air is a poor conductor (1)	1	ignore hot air
	(b)	air is trapped or air cannot move (1)	1	ignore no convection currents not the idea of hot air moving then being trapped
	(c)	silver foil reflects IR / heat / radiation / waves / 'it' (back) (1)	1	ignore bounce ignore radiates
		Total	3	

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

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

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