OCR
Oxford Cambridge and RSA

GCSE

Further Additional Science B

Unit **B761/02:** Modules B5, C5, P5 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2016

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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

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

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

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

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

Question	Answer	Marks	Guidance
1 a i	60 (%) (1)	1	
ii	**any four from** (percentage loss) increases / AW (1) (as) **blood** more dilute / excess water in the **blood** / **blood** concentration needs to stay the same (1) **less** ADH released (1) ADH released from **pituitary** (gland) (1) ADH reduces water loss from the kidneys (1) permeability of (kidney) tubule **decreased** (1) less water reabsorbed from the kidney / into the blood (1) idea of feedback loop to maintain concentration (1)	4	**ignore answers about drinking less water** **allow** produces **less** concentrated urine / **more** dilute urine / **more** water in the urine (1) **allow** idea that need to balance the amount of water in the **blood /** increases **blood** water concentration (1) **allow less** ADH is needed (1) **ignore no** ADH released **allow** no or more ADH released from **pituitary** (gland) (1) **allow** nephron for kidney tubule (1) **ignore** there is **no** permeability in the (kidney) tubule **allow** (ADH release is controlled by) negative feedback (mechanisms) (1)

Question	Answer	Marks	Guidance
b	**for** **any one from** idea that somebody can benefit from the death of a person (1) idea that donors want to donate so their loss of life is allowing another person to live (1) **against** **any one from** idea that the donor may (need to) die before the organ is available (1) idea that relatives may not want to donate organs from their loved ones (1) idea that it is difficult to decide who gets the organ (1)	2	 **allow** saving a life (1) **allow** donors can help another person (when they die) (1) **allow** issues involved in using live donors, such as paying people for kidneys (1) **allow** idea of needing to consider religious beliefs e.g. bodies need to be left intact after death (1) **allow** just 'playing God' / not letting natural selection happen (1)
	Total	**7**	

Question	Answer	Marks	Guidance
2 a	The demand for AB negative blood was greater than the demand for B positive blood. ☐ The demand for A positive blood was greater than A negative blood ☑ The demand for B negative blood was greater than O positive. ☐ The demand for AB blood of either type was greater than either type of O blood. ☐ (1)	1	more than one tick = 0
b	**any three from** 4.3 (days) of supply left / 2600 (dm^3) available (1) O (negative) can be used to donate blood to any blood type / anyone (1) O (negative) blood has no antigens (on the red blood cells) (1) idea that people with O (negative) blood can only be given O (negative) blood (1)	3	**assume answer is refers to O negative throughout** **allow** idea of a few days left / 4 days left / second lowest number of days left / only a low supply left / just over 2500 (dm^3) left (1) **allow** O (negative) is the universal donor / O (negative) will not cause clotting / O (negative) will not be rejected (1) **as extra marking point allow** idea that amount of blood (per session) a donor can give is limited (1)
	Total	**4**	

Question	Answer	Marks	Guidance
3 a	maltose (1) **and any one from** starch is broken down in two stages (1) there is only one enzyme / need two enzymes (1) starch has not be fully broken down (1)	2	**2nd mark dependent on first** **allow** carbohydrates are broken down in two stages / it's a two stage process (1)
b	**any two from** there would be no sugar in either tube (1) lipase will **not** breakdown starch (1) lipase breaks down/acts on fats or lipids (1) carbohydrases breakdown/act on starch (1) enzymes are specific (to one substrate) (1)	2	**ignore yes or no** **ignore** lipase will not react with starch **allow** lipase **only** breakdown or act on fats (2) **ignore** lipase breaks down fatty (acid) **allow** carbohydrases **only** breakdown/act on starch (2) **ignore** carbohydrases react with starch
	Total	**4**	

Question	Answer	Marks	Guidance
4 a	0.55 (dm^3) (1)	1	**allow** 0.5(0) - 0.6(0) (dm^3) (1)
b i	vital capacity (1)	1	

Question	Answer	Marks	Guidance
ii	**[Level 3]** **Explains in full how the changes in the thorax cause air to leave the lungs including pressure changes.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Describes the change in volume in terms of direction of air movement** **AND** **attempts to describe changes in the thorax but may not mention pressure changes.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Describes the change in volume in terms of direction of air movement** **OR** **attempts to describe changes in the thorax but may not mention action of muscle or diaphragm.** Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to B** **Indicative scientific points at Level 3 may include:** • decrease in volume of thorax • increase in pressure forces air out **Indicative scientific points about the changes in volume at Levels 1 and 2 may include:** • lung volume is decreasing • air is leaving the lungs • air is entering spirometer • breathing out / expiration **Indicative scientific points about the changes in thorax at Levels 1 and 2 may include:** • (intercostal) muscles relax • ribs move down • diaphragm goes up / diaphragm relaxes • air forced out of lungs **assume answer is about expiration** **if answer is generally about expiration and inspiration (or inspiration only) then maximum level 2** **Use the L1, L2, L3 annotations in RM Assessor.** **Do not use ticks.**

Question	Answer	Marks	Guidance
c	**any two from** provides a framework for body (1) can grow with body (1) easy to attach muscles (1) flexibility / more range of movement (1) lightweight (1)	2	 **allow** idea that it gives the body a shape / keeps the shape of the body / provides structure for the body (1) **allow** idea that there is no need to shed the skeleton to grow (1) **ignore** no need to shed skin to grow **ignore** connects ligaments to bones / connects tendons to bones / protects organs
	Total	**10**	

Question	Answer	Marks	Guidance
5 a	(pH) 2.5 (1)	1	**allow** (pH) 2.4 - 2.7 (1)
b i	30 (cm^3) (1)	1	
ii	number of moles = $\frac{25}{1000}$ x 0.20 (1)	1	**allow** 0.025 x 0.20 (1) **allow** 25 x 10^{-3} x 0.20 (1) **allow** (concentration = moles/volume) 0.005/0.025 = 0.2 (1) **not** the whole expression 25/1000 = 0.025 x 0.2 = 0.005
iii	concentration of NaOH = 0.17 (mol/dm^3) (2) **but if answer incorrect then** concentration of NaOH = $\frac{0.005 \times 1000}{30}$ (1) / $\frac{0.005}{0.030}$ (1)	2	**allow** 0.166 or 0.167 or 0.166666 (mol/dm^3) (2) **allow** 0.16 (mol/dm^3) (1) **allow** ecf from incorrect answer in part (i) for 2 marks **but if this answer is incorrect then** concentration = $\frac{0.005 \times 1000}{\text{answer to (b)(i)}}$ **or** $\frac{0.005}{\text{answer to (b)(i) in } dm^3}$ (1)
	Total	**5**	

Question	Answer	Marks	Guidance
6 a	**any one from** reactant not in excess (1) reactant that is all used up (at the end of the reaction / first) (1)	1	 **allow** reactant that controls how much product is made (1) **allow** gets used up faster (1) **allow** runs out (first) (1) **ignore** only lasts a limited time / finishes first / finite
b	 less volume (of hydrochloric acid) / lower concentration (of hydrochloric acid) (1) because (half as much) mass is lost / gradient is less / reaction is slower / reaction took longer (1)	2	**assume answer refers to experiment 2 unless experiment 1 is specified** **allow** diluted hydrochloric acid / use less limiting reactant (1) **allow** less amount of hydrochloric acid (1) **ignore** use a weaker acid / change the amount **ignore** references to calcium carbonate
c	$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$ formulae (1) balancing (conditional on correct formulae) (1)	2	**allow** any correct multiple, including fractions e.g. $2CaCO_3 + 4HCl \rightarrow 2CaCl_2 + 2CO_2 + 2H_2O$ (2) **allow** = or $\rightleftharpoons$ instead of $\rightarrow$ **not** and or & balancing mark is dependent on the correct formulae but **allow** 1 mark for a balanced equation with a minor error in subscripts or case e.g. $CaCo_3 + 2HCl \rightarrow CACl2 + CO_2 + H_2O$ (1)

Question	Answer	Marks	Guidance
d	**any two from** idea that they contribute (more) ideas / have different solutions for problems / use different methods / have a range of ideas (1) idea that it is easier to check outcomes / compare results / check for accuracy / check for mistakes / reduces the chance of an error / makes results more reliable (1) more productive / obtain results faster (1) idea that they can build on each other's work / improve the investigation (1)	2	**allow** idea that they see things from a different perspective (1) **allow** idea that they have different training backgrounds / different specialities / different abilities (1) **allow** work more efficiently (1) **ignore** just shares the load or just shares the work
	Total	**7**	

Question	Answer	Marks	Guidance
7 a	1.60(g) (2) **if answer incorrect then** (M_r of copper carbonate is) 124 **and** (M_r of copper oxide is) 80 (1)	2	**allow** 1.6(g) (2)
b	51.6 (%) (2) **but if answer incorrect then** $\frac{64 \times 100}{124}$ (1)	2	**allow** 51.61(%) (2) **allow** 52(%) (1) but look for correct answer in working first **allow** ecf from incorrect M_r values in (a) for 2 marks if percentage calculated
	Total	**4**	

Question	Answer	Marks	Guidance
8	**[Level 3]** **Answer includes an explanation about the difference in pH** **AND** **explains why the rates of reaction are different** **AND** **an equation.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Answer includes an explanation about the difference in pH** **AND** **explains why the rates of reaction are different.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Answer includes an explanation about the difference in pH** **OR** **explains why the rates of reaction are different.** Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A/A* .** **Indicative scientific points may include:** **pH** • idea that acids ionise **in water** • acids produce hydrogen ions / H^+ • idea that strong acids ionise (dissociate) completely • idea that weak acids ionise (dissociate) partially • dissociation of ethanoic acid is an equilibrium **allow** comparison of numbers of H^+ for idea of producing hydrogen ions **and** difference in ionising **Rate of reaction** • ethanoic acid reacts more slowly because it has a lower concentration of hydrogen ions • so there is a lower frequency of collisions **OR** • hydrochloric acid reacts faster because it has a higher concentration of hydrogen ions • so there is a greater frequency of collisions **Equation** • $HCl \rightarrow H^+ + Cl^-$ • $CH_3COOH \rightleftharpoons H^+ + CH_3COO^-$ **Maximum level 2 if no equation given or if only equations given** **Use the L1, L2, L3 annotations in RM Assessor.** **Do not use ticks.**
		6	

Question	Answer	Marks	Guidance
9 a	decreases (percentage yield of ethanol) (1)	1	
b	(idea that rates of forward and back reactions are) equal (1) (idea that concentration is) constant (1)	2	**allow** are the same / are balanced (1) **ignore** constant **allow** does not change / is the same (1)
	Total	**3**	

Question	Answer	Marks	Guidance
10 a	0 (m/s) (2) **but if answer incorrect** 4.8 – (0.4 x 12) (1) **or** 4.8 – 4.8 (1)	2	 **allow** 0.4 x 12 on its own (1)
b	7.2 (m) (2) **but if answer incorrect** $\frac{4.8 \times 3}{2}$ (1)	2	 **allow** 2.4 x 3 **or** $\frac{14.4}{2}$ **or** 14.4 (1)
c	20 (N) (1)	1	**answer line takes precedence**
d	velocity or vector involves direction / AW (1)	1	**allow** speed or scalar does not have direction (1)
	Total	**6**	

Question	Answer	Marks	Guidance
11 a i	diffraction / diffracts (1)	1	**ignore** light overlaps / bends / spreads out **not** refract / refraction
ii	coherent (1) **or** **any two from for one mark** constant phase difference / in phase same wavelength / monochromatic same frequency similar amplitude / same amplitude (1)	1	
iii	peaks and troughs interact / AW (1) destructive interference (1)	2	**allow** the peaks and troughs cancel out (1) **allow** waves meet (completely) out of phase (1) **allow** odd number of half wavelengths e.g. 1.5 (1) **ignore** peaks and troughs hit **not** constructive interference **if no other mark awarded** **allow** the waves cancel out (1)
b	can only be explained using waves / particles will not interfere / AW (1)	1	**allow** waves interfere / light is a wave (1) **not** if light could also be a particle
	Total	**5**	

Question	Answer	Marks	Guidance
12	**[Level 3]** **Answer recognises that greater particle speed creates more frequent collisions which cause more force as there is a greater change in momentum.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Answer recognises that there is greater particle speed or pressure linked to collisions or kinetic energy.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Answer recognises that there is greater particle speed or more pressure.** Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted up to grade A*** **Indicative scientific points may include:** **Level 3:** • faster particles have more frequent collisions • greater rate of change in momentum causes a greater force or pressure **ignore** just idea that it has momentum **Level 2:** • faster particles have more collisions • faster particles have more KE • more collisions means more pressure **Level 1:** • warmer lemonade has faster particles • warmer lemonade has more pressure. **Use the L1, L2, L3 annotations in RM Assessor.** **Do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
13 a	**any two from** equal **and** opposite forces on each truck (1) trucks have same mass (1) momentum is conserved **or** momentum before = momentum after (1)	2	 **allow** equal and opposite reaction (1) **allow** trucks have the same weight (1) **allow** moment before and after = 0 (2) **allow** momentum before collision is 0 so must move at same speed opposite to keep momentum 0 (2) **ignore** momentum is shared out / momentum is the same
b	speed = 0.3 (m/s) (3) **but if answer incorrect** momentum before = 1.2 x mass (1) momentum after = $\frac{1.2 \times \text{speed}}{4}$ (1)	3	 **if no other mark awarded allow one mark from** **allow** the idea that momentum is conserved (1) **allow** momentum before = momentum after (1)
	Total	**5**	

Question	Answer	Marks	Guidance
14 a	idea of greater gravitation attraction (1)	1	**allow** higher centripetal acceleration (1) **ignore** centripetal force **not** greater gravitational potential energy
b	height between 34000 - 38000(km) (2) **but if answer incorrect** (idea that in 24 hours there are) 1440 (minutes) (1)	2	
	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

www.ocr.org.uk

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