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GCSE

Further Additional Science B

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

General Certificate of Secondary Education

Mark Scheme for June 2015

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

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

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

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Annotations used in scoris

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 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 = alternative wording
ora = or reverse argument

Question	Answer	Marks	Guidance
1 a i	protease (1)	1	**allow** pepsin (1) **allow** protase (1)
a ii	amino acids (1)	1	**allow** polypeptides / peptides (1)
b	idea of pH too high **or** pH not low (enough) (1) idea that (stomach) enzymes only work well in acid conditions **or** at low pH (1)	2	**allow** pH goes up (1) **ignore** makes it less acid **allow** optimum pH for enzyme activity not achieved / enzymes are denatured (1) **ignore** takes longer for enzymes to digest food (1) **allow** acid lowers the pH to provide optimum conditions for enzymes to work (2)
c	**any two from:** **villi** to increase surface area / **villi** provide large surface area (1) (very) **long** so more time for absorption / **long** so everything gets absorbed (by the end) (1) **thin** (lining) or **permeable** or **semi-permeable** lining so food molecules can pass through (quickly) or be absorbed (quickly) (1) **many capillaries** or **capillary network** to take digested food away or to maintain a concentration gradient (1)	2	answer must include adaptation **and** explanation e.g. is very long = 0 **allow** microvilli**?** **allow** a value around 7m **allow** long so more digested food absorbed (1) **allow** thin walls or walls one cell thick so food molecules can pass through (quickly) (1) **ignore** thin membrane **allow** blood vessels for capillaries **ignore** veins or arteries **ignore** moist surface / flexible / references to lymphatic system
	Total	**6**	

Question	Answer	Marks	Guidance

2 a i	**A**+ (1)
	
	if A is correct then
	
	any one from:
	
	agglutination or reacted or clumping with anti(body) **A** (1)
	
	no agglutination with Anti-B (1)
	
	if + is correct then
	
	agglutination or reacted or clumping with anti-Rhesus (1)
		3	**allow A** positive / **A** Rhesus positive (1)
			ignore just A or just +
			not anti-A+ or anti-A positive
			
			allow clotting with anti(body) A (1)
			
			allow no clotting with Anti-B (1)
			
			allow clotting with anti-Rhesus (1)

a ii	agglutination or reaction or clumping occurs **because** of the B antibodies reacting with the B antigens in the donor blood (1)	1	process **and** reason required for 1 mark **allow** clotting **ignore** reject(ion) or not reject(ion)
b i	irregular heartbeat = C fast heartbeat = A slow heartbeat = B (1)	1	all correct for 1 mark
b ii	impulses or current being sent from SAN or sino-atrial node or pacemaker cells (1)	1	**allow** atrial contraction / ventricles relaxing / blood is beginning to flow from atria to ventricles (1) **ignore** just heart contracting / blood entering the atria **not** aorta contracting
	Total	**6**	

Question	Answer	Marks	Guidance
3	**[Level 3]** **Makes at least three comparisons that include information about** **other artificial hearts,** **transplants,** **rejection and immune-suppressive drugs.** Quality of written communication does not impede communication of the science at this level. (5–6 marks) **[Level 2]** **Makes two comparisons that include information about rejection or need to match tissues.** Quality of written communication partly impedes communication of the science at this level. (3–4 marks) **Level 1** **Makes two comparisons.** 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*** **Indicative scientific points about immune-suppressive drugs** • may need to take **less** for immune-suppressive drugs as not all plastic • may need **more** immune-suppressive drugs because animal tissue will not be as close a match of human tissue **Indicative scientific points ideas for comparison with other artificial hearts may include:** • smaller so can fit inside the body • contains animal tissue (others don't) • person could be more mobile as not attached to machine or in hospital • not temporary / limits the number of times surgery required • less likely to be rejected because it has plastic and tissue **allow** more chance of rejection as placed inside the body **allow** both need a power supply **allow** battery on outside so easy to change **Indicative scientific points for comparison with transplant may include:** • no need to wait for a donor or someone to die • does not have to be suitable match • made of animals tissue not human tissue • idea could be made the right size / need donor to be similar age or size • no need for batteries with donor heart • donor heart lasts longer **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
4 a i	0.80 (1)	1	accept any number in the range 0.75 to 0.85 to 2 decimal places **allow** 0.8 (1)
a ii	**any one from**: idea the foetus grows at different rates / the foetus has growth spurts (for head size) (1) idea that the growth between one day and the next is so small that problems could not be detected (1) measurement for one day does not allow you to make a comparison for that foetus (1) one particular day could be an anomaly (1) measurements could be taken from scans which could be inaccurate (1) the position of the baby in the womb could affect the measurement taken (1)	1	

Question	Answer	Marks	Guidance
b i	**any three from:**	3	
	amniocentesis (1)		**allow** ultrasound to look at the features of the foetus (1) **ignore** just blood tests / just sampling / ultra scan
	description of amniocentesis (1)		descriptions include: sample the amniotic fluid / insert needle into amniotic sac or amniotic fluid / take cells from (around) foetus (1) **ignore** insert needle into foetus / insert needle into placenta
	chromosomal analysis (1)		**allow** counting chromosomes / looking for damaged chromosomes (1) **ignore** looking at cells
	idea that the chromosome number will be different (1)		**ignore** genes will be different if idea of looking for **extra** chromosomes or that there are **47** chromosomes (2) **as an extra marking points** **allow** CVS / chorionic villus sampling (1) **allow** triple test / combined test (1) **allow** description of the combined test (1)

Question	Answer	Marks	Guidance
b ii	**for** identify problems with foetus (1) **but** identify problems with foetus and can decide about abortion (2) idea of putting their mind at rest (1) idea that parents are prepared for a child with (genetic) disorder (1) **but** idea that parents are prepared for a child with (genetic) disorder and can decide about abortion (2) **against** may lead to decision about abortion (1) could be used to identify sex of foetus (1) may harm the foetus / may lead to miscarriage (1) idea that testing is not 100% accurate (1)	2	**allow** parents deserve to know what their child will be like (1) **allow** so they know their child will have Downs syndrome (1) **allow** ethical reasons e.g. 'against God' / 'against human nature' / foetus has the 'right to live' / religious reasons e.g. baby will be how God wants it to be / foetus has no say (1)
	Total	**7**	

Question	Answer	Marks	Guidance
5 a	calcium carbonate runs out (1) **but** calcium carbonate is the limiting reactant (2)	2	**allow** calcium carbonate runs out first (2) **allow** calcium carbonate is not in excess (2) **ignore** the hydrochloric acid is in excess
b	0.36 (g) (1)	1	**allow** ± 0.01
c	0.005 or 5 x 10^{-3} (2) **if answer incorrect then** 120 (1) 24000	2	
	Total	**5**	

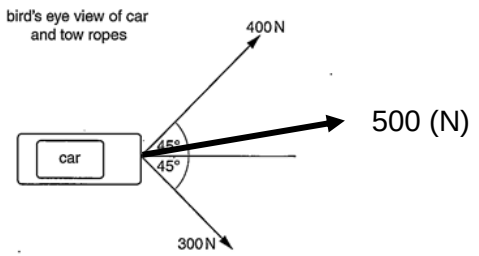
Question	Answer	Marks	Guidance
6 a	$CuSO_4.5H_2O \rightarrow CuSO_4 + 5H_2O$ formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae **but** **allow** one mark for balanced equation with minor errors of subscripts, superscripts, etc. e.g. $CuSo_4.5H_2O \rightarrow CUSO^4 + 5H_2O$ **allow** $CuSO_4.5H_2O$ + heat $\rightarrow CuSO_4 + 5H_2O$ (1) **not** and or & for + **allow** = instead of $\rightarrow$ **allow** correct multiples e.g. $2CuSO_4.5H_2O \rightarrow 2CuSO_4 + 10H_2O$
b	mass of anhydrous copper sulfate = 0.96(g) (1) mass of water = 0.54(g) (1)	2	If no other mark **allow** 96 **and** 54 / 9.6 **and** 5.4 (1)
c	yes / no (no mark) evidence from copper sulphate table supporting the prediction e.g. when you go from 1g to 2g the mass goes from 0.36g to 0.72g (which doubles) (1) evidence from sodium carbonate table not supporting the prediction e.g. when you go from 1g to 2g the mass goes from 0.63g to 1.00g (which does not double) (1)	2	**allow** ecf from (b)
	Total	**6**	

Question	Answer	Marks	Guidance
7 a	CH (1)	1	**allow** HC (1)
b i	CH_3O (2) if formula incorrect then any two from $\frac{38.7}{12}$ $\frac{9.7}{1}$ $\frac{51.6}{16}$ or 3.225: 9.7: 3.225 (1)	2	**allow** any order
ii	$C_2H_6O_2$ (1)	1	**allow** any order
	Total	**4**	

Question	Answer	Marks	Guidance
8 a	atmospheric pressure (1)	1	**allow** low pressure / pressure of 1 to 3 atmospheres (1) **ignore** just 'pressure' **ignore** standard or normal pressure
b	**any two from:** idea that high temperature reduces yield of sulfur trioxide / ora (1) idea that increasing temperature increases rate of reaction / ora (1) so 450^{o}C is a compromise or optimum temperature (1)	2	**ignore** cost **allow** idea that high temperature moves equilibrium to the left / ora (1) **allow** from 350°C to 450 °C the rate increases (1) **allow** higher level answers referring to collision frequency **ignore** enzymes
c	rate of reaction increases percentage yield unchanged (1)	1	**both required**
	Total	**4**	

Question	Answer	Marks	Guidance
9	**Level 3** **Candidate mixes barium chloride and sodium sulfate solution, filters the mixture <u>and</u> washes and dries the precipitate** **AND** **writes a correct ionic equation.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2** **Candidate mixes barium chloride and sodium sulfate solution, filters the mixture <u>and</u> washes or dries the precipitate** **OR** **writes a correct ionic equation.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1** **Candidate mixes barium chloride and sodium sulfate solutions <u>and</u> filters the mixture** 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. (0marks)	6	**This question is targeted at grades up to A/A*.** **Indicative scientific points at levels 2 and 3 may include:** • mixing of solutions • filtration • washes precipitate / residue • dries precipitate • drying in an oven or on window sill • $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$ **any two correct points about the procedure AND a correct ionic equation scores 5** **Indicative scientific points at level 1 include:** • mixing or reacting of solutions • filtration • correct word or **symbol** equation or description of reactants and products **marks can be scored from labelled diagrams** **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
		6	

Question	Answer	Marks	Guidance
10 a	constructive interference description or diagram (1) destructive interference description or diagram (1)	2	peak + peak or in phase or in sync (1) trough + trough or in phase (1)  (1) **ignore** just waves add together peak + trough or out of phase (1)  (1) **ignore** just waves cancel each other out if no other mark awarded **allow** mention of constructive **and** destructive (interference) (1)
b	published works / talks to others / lectures / letters / conferences / AW (1) **and any one from** to check results or findings (1) to be credited with the discovery (1) so other can build on the idea or evidence (1) to try to repeat experiments (1)	2	**allow marks from anywhere in the answer** **ignore** modern communications **allow** demonstration / met up or wrote down their findings (1) **allow** peer review (1) **allow** to maximise the validity of results (1) **allow** to compare idea or results or evidence (1) **allow** so scientists can learn from their ideas (1)
	Total	**4**	

Question	Answer	Marks	Guidance
11 a	500 (N) (2) in a direction between horizontal and 400N line (1)	3	award marks for answers given on a vector diagram e.g.  (3) if 500(N) not seen allow $400^2 + 300^2$ or 250 000 (1)
b	**any one from:** velocity has (magnitude and) direction (1) speed has magnitude **only** / speed has no direction (1)	1	**allow** velocity is speed with direction (1) **not** acceleration
c	14 (m/s) (2) **but if incorrect** 6 + (0.5x16) **or** 6 + 8 (1)	2	
	Total	**6**	

Question	Answer	Marks	Guidance
12 a	**advantages** **Meteostat** - (high altitude so) large area covered or see most of the Earth or see most of the weather (1) **Meteostat –** (geostationary so) provides constant monitoring (of one area) (1) **POES** – (low orbit so) better (quality) pictures or see the weather clearly (1) **POES** – (more orbits so) more information (1) **disadvantages** **Meteostat** - (orbits around equator so) can't view the poles (1) **POES** – (many orbits so) idea of intermittent photography (1) **POES** – (low orbit so) limited area of Earth covered (1)	3	to score three marks answer must refer to both orbits **allow** idea of longer term forecast (1) **allow** higher definition (1) **allow** more coverage (1) **allow** more frequent weather updates (1) **allow** idea of lower definition (1) **allow** short time spent studying one area (1)
b	gravity (1)	1	**allow** gravitational force or gravitational pull (1) **ignore** forward force / driving force **not** gravitational potential energy / GPE
c	idea of greater (gravitational) **force** (1)	1	**allow** more gravity or stronger gravity (1) **allow** gravitational attraction is greater (1) **allow** greater or stronger centripetal **force** (1)

Question	Answer	Marks	Guidance
d	**any two from:** same height (above Earth) (1) same (accelerating) force (1) same speed (1) satellite stays above same area of Earth (1)	2	**allow** reverse arguments if about elliptical orbits **ignore** stops it flying off **allow** not affected by other forces / same force of gravity / same gravitational attraction (1) **allow** constant position (above the Earth) or stays in the same place (above Earth) (1)
e	(microwaves / signal) sent or transmitted to satellite or (microwaves / signals) sent from satellite to satellite (1) (microwaves / signals) sent or (re)transmitted back to Earth (1)	2	assume the 'sent from' is 'sent from Earth' **not** reflected / bounced / pinged / rebound **allow** back to TV receiver (on Earth) (1) **not** reflected / bounced / pinged / rebound
	Total	**9**	

Question	Answer	Marks	Guidance
13	**[Level 3]** **Quantitative comparison of acceleration** **AND** **time calculated for both cyclists.** Quality of written communication does not impede communication of the science at this level. (5–6 marks) **[Level 2]** **Quantitative comparison of acceleration** **OR** **time calculated for both cyclists.** Quality of written communication partly impedes communication of the science at this level. (3–4 marks) **[Level 1]** **Answers are limited to a simple statement about average speeds** **OR** **acceleration** **OR** **time.** 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*** **Indicative scientific points at levels 2 and 3 may include:** • accelerations are 0.2 m/s^2 **and** 0.4 m/s^2 • the difference in acceleration is 0.2 m/s^2 • times are **both** 10 s **and** relates calculations to statements **Indicative scientific points at level 1 may include:** • average speeds are the same • average speed is 3 m/s • Jared's acceleration is twice Sam's acceleration / Jared's acceleration is greater than Sam's acceleration / ora • one correct acceleration e.g. 0.2 m/s^2 **or** 0.4 m/s^2 • time is the same (even if incorrect time) • time is 10s (but **not** clear this is for Sam **and** Jared) **allow** ecf for comparison statements **for 1 mark** **allow** acceleration is 0.2 **or** 0.4 (no unit given) or **allow** time = $\frac{\text{distance}}{\text{average speed}}$ **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

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