

Applied Science

Advanced Subsidiary GCE (Double Award) **A2 H375**

Advanced Subsidiary GCE **AS H175**

Combined Mark Schemes And Report on the Units

January 2006

H175/H375/MS/R/06J

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Advanced Subsidiary GCE Applied Science (H175)

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Mark Scheme G622
January 2006

GENERAL ADVICE TO ASSISTANT EXAMINERS ON THE PROCEDURES TO BE USED

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2. Please ensure that you use the **final** version of the Mark Scheme which will be available at the end of the Examiner's Standardisation meeting. You are advised to destroy all draft versions.
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6. Strike through all blank spaces and / or pages in order to give a clear indication that the whole of the script has been considered.
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9. Some questions may have a 'Level of Response' mark scheme. Details of these are given in Appendices attached to this Mark Scheme.
10. If an answer has been crossed out and no alternative answer has been written then mark the answer crossed out.
11. **Abbreviations, annotations and conventions** used in the detailed Mark Scheme

/	= alternative and acceptable answers for the same marking point
;	= separates marking points
NOT	= answers which are not worthy of credit
()	= words which are not essential to gain credit
-	= (underlining) key words which must be used to gain credit
ecf	= error carried forward
AW or owtte	= alternative wording
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12. Abbreviations to be used when marking

^	= omission mark
bod	= benefit of the doubt
nbod	= benefit of the doubt not given
ecf	= error carried forward
W	= working towards credit, but not awarded the mark
Con	= contradiction (Cases where candidates contradict themselves in the same response)

Question		Gd	Expected Answers	Mk	Additional Guidance	
1	a	E/U	trachea; bronchus; bronchiole;	3		
	b	i	E	alveolus;	1	NOT air sac
		ii	E	diffusion;	1	
		iii 1	E	arrow clearly indicating from air to blood;	1	
		iii 2	C D	two from: (very) thin; walls one cell thick; flattened epithelial cells; permeable / fine holes;	2	NOT large surface area NOT moist surface
	c	C D E E/U	rib cage; diaphragm; increases; decreases; lung;	5		
Total				13		

Question		Gd	Expected Answers	Mk	Additional Guidance
2	a	A	five from:	5	IGNORE: ref to particles. Mark rest according to mark scheme.
		B	x-ray through body to film;		
		C	radiation produces an image on film;		
		D	bones / denser material absorb more radiation; soft tissue absorbs less; different tissues absorb different amounts of the x-rays; idea of image dark where most gets through / shadow image / bones white or light grey; x-ray film as a record / x-ray film will show break;		
			QWC clear, ordered answer;	2	clear, logical answer = 2 marks any doubt = 1 mark disorder = 0 marks
	b	A	risks three from:	3	
		B			
		C	potentially harmful / ionising radiation; electricity dangers / high voltage supplies; poor soft tissue resolution / potential for misdiagnosis; dose accumulative / OWTTE;		
			benefits three from:	3	
			good bone resolution / ideal for accident investigation; quick result; easy (to obtain) / portable units available ; cheap / relatively low cost ;		
Total				13	

Question			Gd	Expected Answers	Mk	Additional Guidance
3	a	i	D	two from:	2	If no stated ref. to B or A assume 1 st ref is to B.
			E/U	extra 'P' waves; heart rate higher; irregular heart rate; amplitude / OWTTE;		
		ii	D	(sinus) arrhythmia;		
		iii 1	D	ventricular fibrillation;	1	NOT VF
		iii 2	D	two from:	2	
			E	life-threatening situation / AW; to alert team / to get them there as fast as possible;		
	b	i	C	SAN + label line to oval area in right atrium close to root of vena cava;	2	ALLOW: AVN label position anywhere between apex of Bundle of His and 2mm above it within septum
D			AVN + label line;			
		ii	A	six from:	6	
			B	1. the muscle cells of the SAN are myogenic / have an inbuilt rhythm of contraction / pacemaker;		
			C	2. each time they contract they set up a wave of excitation / wave of depolarisation / impulses;		
				3. this wave spreads out rapidly over the atrial walls;		
				4. both atria contract;		
				5. at the same rhythm as the SAN;		
				6. a band of fibres between the atria and ventricles prevent the wave of excitation from initiating ventricular contraction at the same time as atrial contraction;		
				7. the only way the wave can spread into the ventricles is through a patch of conducting fibres called the AVN;		
				8. after a delay of about 0.1 second; 9. it passes to a bunch of conducting fibres called Purkyne fibres / Bundle of His;		

Question			Gd	Expected Answers	Mk	Additional Guidance
				10. which run down the septum between the ventricles; 11. (the excitation wave / impulse travels very rapidly) to the base / apex of the ventricles; 12. it spreads upwards / outwards through the (ventricle) walls; 13. as it passes it causes the muscle cells to contract (from the apex up); QWC spelling = 1 mark (allow 1 error) punctuation and grammar = 1 mark (allow 1 error)	2	NB 10 – 13 must include at least one ref to 'ventricles' to be credited
Total					16	

Question			Gd	Expected Answers	Mk	Additional Guidance
4	a	i	C	increases it;	1	
		ii	E/U	decreased;	1	
	b		B C	result: runner 2, pre, 12 km / hr, 3.1 difference: less than at 11 km / hr; 3.5 at 11 km / hr;	3	ALLOW: runner 2, pre, 11 km / hr, 3.5 ALLOW: '3.5' (does not need qualifying because it's the only one in the table) ALLOW: reverse argument
	c		B D E E/U	material / procedure: two from: taking blood sample; use of hypodermic / needle ; transfer of blood to sample bottle; disposal of hypodermic / sharps;	2	
				hazard: reference to blood / hypodermic / sharps / risk of infection;	1	NB 'hazard' not 'mistake'
				what could go wrong: two from: stuck by hypodermic; get contaminated / microbes / HIV / hep A or hep B / spill blood; incorrect use / bruising;	2	
				safety precautions: three from: wear protective clothing / named example e.g. gloves ref. to sterilisation / open or use new kit each time; ref. to following protocols;	3	ALLOW: seal blood sample immediately; safe disposal of sharps; if not already awarded in procedure
				in case of accident: two from: stay calm / don't panic; wash / sterilise; inform someone; record incident;	2	

Question			Gd	Expected Answers	Mk	Additional Guidance
				<p>risk explained: risk needs to be stated or indicated for explanation to be rewarded</p> <p>low / medium provided explanation correct linked to context</p>	1	e.g. low risk because technician qualified; OR low risk because two runners not likely to lash out; NOT high risk
				Total	16	

5	a		C5	8	ALLOW: BP values ± 2																				
			E1																						
			<table border="1"> <thead> <tr> <th>feature</th> <th>artery</th> <th>capillary</th> <th>vein</th> </tr> </thead> <tbody> <tr> <td>range of bp</td> <td>120 - 80</td> <td>21 - 13</td> <td>13 - 3</td> </tr> <tr> <td>blood flow</td> <td>pulsing/ uneven/ fast</td> <td>smooth flow</td> <td>smooth/ slow</td> </tr> <tr> <td>structure</td> <td>thick/more muscular/more elastic/more contractile tissue</td> <td>single celled wall/<u>very</u> thin/ thinnest</td> <td>thin/little muscle/ little elastic tissue</td> </tr> <tr> <td>valves present</td> <td>not present</td> <td>not present</td> <td>present</td> </tr> </tbody> </table>	feature	artery	capillary	vein	range of bp	120 - 80	21 - 13	13 - 3	blood flow	pulsing/ uneven/ fast	smooth flow	smooth/ slow	structure	thick/more muscular/more elastic/more contractile tissue	single celled wall/<u>very</u> thin/ thinnest	thin/little muscle/ little elastic tissue	valves present	not present	not present	present		<p>Independent marking points in table therefore can accept 'mixed' answers e.g. (a) fast = 1 mark and (v) smooth = 1 mark</p> <p>both points need to be correct for the 'valve' mark</p>
feature	artery	capillary	vein																						
range of bp	120 - 80	21 - 13	13 - 3																						
blood flow	pulsing/ uneven/ fast	smooth flow	smooth/ slow																						
structure	thick/more muscular/more elastic/more contractile tissue	single celled wall/<u>very</u> thin/ thinnest	thin/little muscle/ little elastic tissue																						
valves present	not present	not present	present																						
	b	i	E6	sphygmomanometer;	1																				
				Total	9																				

Question			Gd	Expected Answers	Mk	Additional Guidance
6	a	i	A	three from:	3	AVP e.g. movement / chewing / peristalsis / breathing / circulation
		ii	C			
		iii		muscle contraction / AVP; nerve impulse transmission; reabsorption; active transport;		
	b	i	A	the substrates for aerobic respiration are glucose and oxygen whereas the substrate for anaerobic respiration is glucose only / occurs in the absence of oxygen;	1	(b)(i) – (iii) must include correct reference to both processes / or be comparative
		ii	A	aerobic respiration produces carbon dioxide and water whereas anaerobic respiration produces lactic acid;	1	
		iii	A	aerobic respiration releases more energy (from one molecule of glucose) than anaerobic / 38 ATP in aerobic v 2 ATP in anaerobic;	1	ACCEPT: 'aerobic more' ACCEPT: aerobic ATP count within range 34 – 38
	c		C	the amount of oxygen needed to oxidise the lactic acid; produced during anaerobic respiration;	2	
Total					8	

Question		Gd	Expected Answers	Mk	Additional Guidance
7	a	E/U	917 divided by 6; 152.83/152.8/153;	2	
	b	i	E E/U trend: e.g. heart rate increases for sprints 1 – 4; supporting data: 132 – 163;	2	if trend incorrect ecf supporting data
		ii	E E/U trend: e.g. heart rate decreases / increase gets less for sprints 4 – 6; supporting data: 163 – 156;	2	if trend incorrect ecf supporting data
	c	i	2E after sprint 1: male 20 faster than female; after sprint 6: female 2 faster than male;	2	answers must include gender, number and comparative
		ii	B resting / starting heart rate	1	
	d	i	E/U MHR = 220 – 18; 202;	2	
		ii	D E 70% of 202 OR 202 divided by 100 x 70; 141;	2	ecf (i) value
		iii 1	C 'you are training efficiently'	1	
		iii 2	C 'your training could be unhealthy / dangerous';	1	
Total				15	

Total for paper = 100

**Mark Scheme G623
January 2006**

GENERAL ADVICE TO ASSISTANT EXAMINERS ON THE PROCEDURES TO BE USED

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Question		Expected Answers		Mk	Additional Guidance
1	a	four from: serial dilution / described; place cover slip over drop; explain how; attempt to exclude air bubbles; use an appropriate stain / named;		4	ACCEPT second slide used instead of cover slip
	b	light microscope: two from: nucleus; cytoplasm; cell wall; vacuole; chloroplast; electron microscope: two from: ribosomes; SER / RER; mitochondria; membrane / plasmalemma / surface membrane / tonoplast; Golgi (apparatus);		4	
	c	three from:		3	<ul style="list-style-type: none"> • first check that the structures are on the list • then check for correct function • then award marks max 3 NOT 'brain of cell' for nucleus
		cytoplasm	site of many reactions / e.g. glycolysis;		
		Golgi	produces vesicles to transport material out of cell / processes molecules;		
		mitochondria	aerobic respiration / Krebs cycle / oxidative phosphorylation / ET Chain / ATP synthesis;		
		nucleus	control centre of the cell / ref to DNA / chromosomes / genes;		
		plasmalemma	selects / controls movement in and out of cell / across membrane;		
		RER	involved in protein synthesis / exportation / holds ribosomes;		
		ribosomes	makes proteins;		
		SER	involved in lipid synthesis / transport;		
Total				11	

Question		Expected Answers	Mk	Additional Guidance	
2	a	A is a concave disc / thinner (in central area) / lacks a nucleus;	1		
	b	phagocytic white blood cell / neutrophil;	2	WBC = 1 mark only leucocyte = 1 mark only	
	c	correct measurements A = 10 mm / 1 cm and B = 30 mm / 3 cm; link to 7.2 μm ; calculation max dimension 21 / 22;	3	ACCEPT: if B taken as 29 mm: max = 20.88 / 20.9 / 21 μm if B taken as 30 mm: max = 21.6 / 22 μm (no ref. to sig figs in paper) ecf for measurement errors	
	d	three from: used for: counting cells; in set volume; features of haemocytometer: grid / sets of lines; defined area / volume; marked surface of slide exactly 0.1 mm deep / volume 0.00025 mm ³ ;	3	max 2 for features	
	e	i	patient X anaemia;	1	
			patient Y bacterial infection / inflammation / carcinoma / lymphoma / melanoma / surgery / burns / leukaemia / gout / diabetic / ketoacidosis;	1	
		ii	phagocytic cells 'feed on' / ingest bacterial cells or dead tissues; large numbers of bacterial cells and or dead cells present during or after infection (or another of the conditions listed in i);	2	could be approached down 'immune system' route – still valid response
Total			13		

Question		Expected Answers	Mk	Additional Guidance
3	a	<p>A glycolipid; B protein; C phospholipid; D cholesterol;</p>	4	NOT phosphate for A or C Name of group not included in list.
	b	<p>four from: a hypotonic saline would have a <u>higher</u> / <u>greater</u> water potential than the RBC cytoplasm / OWTTE; RBC plasmalemma / cell surface membrane is <u>selectively</u> / <u>differentially</u> permeable / OWTTE; water potential gradient into RBC / <u>more</u> water moves into RBC than leaves it; by osmosis; RBC swells; RBC bursts / haemolysis;</p>	4	NOT diffusion for osmosis mark
Total			8	

**Mark Scheme G623
Planning Exercise
January 2006**

G623 January 2006 - Planning Exercise

EFFECT OF TEMPERATURE ON POPULATION GROWTH OF TWO SPECIES OF YEAST

Marking of the plan:

1. Read the material presented.
2. Then award 1 mark if *scientific terminology* has been used appropriately.
3. Then re-read, this time, point marking up to 24, by placing letters A to X in the margin where you see evidence of the marking criteria.

Marking Point	Marking Criteria	Mark	Additional notes
A	easily recognised safety procedures highlighted;	1	Evidence of something that is going to make doing the investigation safer – an active document, a working document.
B	prediction made;	1	Prediction related to comparison in task.
C	with justification;	1	Statement related to temperature range for the two species.
D	description of preliminary work;	1	E.g. dilution of yeast / sugar concentration to use / appropriate incubation time.
E	clear and in detail;	1	Explain how to do it.
F	reason (for doing it) explained;	1	Explain why it's necessary for completion of the whole investigation.
G	clear and in detail;	1	Extra information.
H	at least two secondary sources of information identified;	1	State at least 2 references.
I	relevance explained;	1	Brief explanation as to how references helped in the planning.
J	basic practical skills and accuracy;	1	Simple method / list of instructions. Would it work?
K	sound practical skills and accuracy;	1	Could someone follow the instructions unaided? Are quantities shown? Is it repeatable to appropriate degree of accuracy? Temperature values must be stated here.

Marking Point	Marking Criteria	Mark	Additional notes
L	range of appropriate equipment listed;	1	List of names of main items of equipment and materials needed for the investigation. Generic terms: beakers, flasks etc are OK here.
M	full range of appropriate equipment listed;	1	Qualifications noted. Indication of number of each, specific sizes, e.g. 250 cm ³ beaker, 1dm ³ flask. If any major item missing do not award.
N	appropriate number of measurements stated;	1	Each time population counted, repeat at least twice.
O	need for range of measurements stated;	1	At least 5 temperatures required.
P	appropriate range stated;	1	7 – 25 °C, (values should relate to the prediction see B above).
Q	relevant variables are identified;	1	At least 3 from: sugar concentration, mass of yeast, time of incubation, volume of culture, temperature.
R	how variables to be controlled explained;	1	How <u>and</u> why, for at least 2 of the variables.
S	one suitable method to display data;	1	One display of results <u>including units</u> . e.g. table.
T	additional method to display data;	1	Any <u>different</u> display <u>including units</u> . e.g. graph.
U	simple data handling;	1	Means / dilution calculations / standard error / stats.
V	possible conclusions;	1	Statements of expectations or observations to confirm or reject prediction made in B . 'What would your results need to show to confirm or reject your prediction?'
W	recognises sources of error;	1	At least two examples: equipment and / or specific human error.
X	suggests methods for improving accuracy and or validity;	1	Accuracy: relate to ' W ' or use of alternative technique(s). AND / OR Validity: state aspect of collected data to be compared with secondary sources.
Marks	Maximum for plan = 25	24 + 1	(<i>scientific terminology</i>)

Report on the Units January 2006

GCE (AS) Applied Science – Principal Moderator’s Report

Entries for only one unit (G620 – Science at work) were made this session.

G620 – Science at work

This was the first time that this specification was assessed. Generally Centres were generous in their assessment at the higher mark bands. In most cases work seen by moderators showed some good research skills mixed with suitable practical activities. Many Centres used suitable practical activities taken from those recommended in the teacher’s guide; these included vinegar analysis, vitamin c investigation, ‘mummion’, flu gas, aspirin preparation and analysis. It needs to be noted that MB3, AO3, can only be accessed if one of the practicals offers opportunities for accurate measurements. Care also needs to be taken to ensure that the practical is at AS level.

It would be helpful to the moderator if candidates could include a suitable index and number the pages. This would help locate particular evidence. This would also be particularly useful in locating the health and safety at work, AO1c, as possible evidence for this can be included throughout the portfolio.

AO1a

It was pleasing to see work which included evidence of visits, questionnaires and outcomes from talks, especially those linked to local organisations. The variety of organisations studied by centres was reflected by interesting and relevant work from candidates which showed enthusiasm into the subject matter. Examples of organisations studied included health & fitness centres, landfill sites, football clubs, hairdressers, surfaces manufacturers, environmental health centres, chemical companies, breweries, vets, dentists, zoos, the NHS and pharmacies.

It should be noted however that if MB3 is to be achieved, evidence of a range of sources should be indicated. This could include details of web addresses, book titles with authors, and where appropriate, information on visits and talks. The text of the survey should use candidates’ own words. Information cut and pasted from internet sites is insufficient, however original print outs from the internet showing material selected for use is a useful indicator of the research.

If fewer than five surveys are included in the portfolio, then credit is still given for those organisations that were surveyed. However the mark allocated needs to be averaged out of 5.

AO1b

Generally the in-depth studies did reflect coverage of all the bullet points given in the specifications and Centres used one of the five organisations surveyed for AO1a. In future it would be helpful to the moderators if an indication of which organisation is used for the in-depth study. Again assessment tended to be generous at the higher levels and comments on the validity of the sources used must be included if MB3 is to be reached. There was minimum evidence of evaluation and justification of the research material.

AO1c

Work on health and safety was variable. Some candidates’ work clearly demonstrated knowledge of health and safety laws and regulations and linked these appropriately to the organisations studied. Work on these regulations is needed for all mark bands. Contributions to this strand can come from both a discussion on health and safety laws and from the application of these laws and regulations in devising a risk assessment for the practical work in AO3.

AO2a

This was usually included as part of the in-depth study. It would however be useful if an indication was given of where this could be found within the portfolio. Again candidates' own words are needed to show understanding of the bullet points given in the specification.

AO2b

Processing of results should show the methods of calculation so that the moderator can assess whether straightforward or complex calculations have been used and so decide which mark band is appropriate for AO2b. The distinction between these two types of calculations is in the specification.

AO3

It needs to be noted that only two practical activities should be submitted for this part of the assessment. The practical tasks set must be of a standard suitable for AS and not GCSE otherwise assessment is limited. Many Centres used the suggestions given in the teacher's guide and extended them to link to a vocational context which was good to see. It may be useful in the future to include a brief statement from the assessors that the practical work had been safely completed. Risk assessments should be included with evidence that they have been used during the practical work. It was also good to see research work showing how the practical work linked to vocational contexts. This was particularly interesting in the work completed with exercise, preservation and food analyses (vinegar).

AO3b

It should be noted that AO3b is assessed for recording only. In qualitative analysis, observations should include what is seen at the end of the experimental test whether there has been a change or not, as it is often as important to identify what is **not** present as well as what is. The recording of titration results should be at least one decimal place if MB3 is to be achieved and set out in a suitable format.

AO3c

Work for this strand should show suitable processing with interpretation even for MB1. It is also important to clearly show the method of processing of the results for higher mark bands and in addition evaluation of the accuracy of apparatus and method is needed if MB3 is to be accessed.

GCE (AS) Applied Science Unit 3 (G622) – Monitoring the activity of the human body

General Comments

All questions were attempted by the majority of the candidates. Time does not appear to have been an issue in terms of completing the paper.

Comments on Individual Questions

- 1**
- (a)** The diagram was labelled well by many candidates. Errors occurred when candidates failed to draw label lines which touched the named structure. Weaker candidates often labelled the collection of alveoli as 'bronchiole'.
 - (b)** Many candidates correctly answered sections (i) and (ii). In section (iii) many candidates failed to gain the mark for showing the movement of gas from the alveolus into the capillary. Many were not rewarded for using a large surface area as a structural feature of the sac, and capillary wall that allows gas exchange to take place.
 - (c)** Answered well by the majority of candidates.
- 2**
- (a)** Some candidates misinterpreted the question and wrote about the advantages and disadvantages of X-ray radiography and the preparation of patients for such a test. Due to a range of language skills, many candidates failed to use accurate scientific terminology to explain the basic principles. Some candidates wrote about electrons being accelerated, X-rays being reflected etc.. Not many candidates made the simple statement that X-rays penetrate the human body and impact with the film. Few appreciate the idea that the image is dark where most rays get through, that shadows are grey and bones are white or light grey images.
 - (b)** Risks: Whilst most candidates made reference to the fact that X-rays are potentially harmful, e.g. cause cancer, and scored one mark, very few identified the 'electricity dangers', dose accumulation or poor resolution leading to misdiagnosis.
Benefits: Most candidates scored full marks here.
- 3**
- (a)**
 - (i)** Most candidates scored at least one mark in this section for describing a difference, in a variety of ways, in the two traces. Some, weaker candidates, misread the question and compared trace C with trace A.
 - (ii)** Few candidates identified trace B correctly.
 - (iii)** Most candidates identified trace C correctly and used a wide range in spelling to do so.
 - (b)** This section was done badly.
 - (i)** Very few candidates could label the diagram correctly with sufficient accuracy.
 - (ii)** Many candidates described control of the cardiac cycle in terms of blood flow through the heart and consequently failed to score marks. Much of what was written was incorrect and muddled.

Report on the Units taken in January 2006

- 4** (a) Generally answered well.
- (b) Some candidates failed to gain the 'result' mark by not identifying the anomalous result fully. Many of those that did score the mark, then only scored 1 mark for 'how it is different' by saying it was less without qualifying it further.
- (c) Many candidates completed this section well. However, some candidates identified 'mistakes' in the procedure of taking blood samples as 'hazards' and consequently could not be credited. Some candidates failed to gain the 'risk' mark by not stating, ringing or underlining the risk level and then providing a suitable explanation.
- 5** (a) This was done badly by too many candidates considering the level of information being asked for. Many candidates could complete the first two rows but there were many errors and inaccuracies regarding the comparative structure of blood vessel walls and the presence or absence of valves. Reference to specific valves associated with arteries was accepted.
- (b) About half the cohort gave the expected answer. The other half offered either 'spirometers' or 'blood pressure monitors'. Those who knew of sphygmomanometers had trouble with the spelling but phonetic variations close to the actual word were awarded the mark.
- 6** (a) This was the lowest scoring question on the paper. Many candidates gained a mark for responding with an answer qualifying movement. Some wrote active transport but nerve impulse and reabsorption were rare.
- (b) Not all candidates attempted this section. Candidates failed to gain marks either because of incorrect knowledge about aerobic and anaerobic respiration or as a result of failing to make their responses to each section comparative.
- (c) Few candidates gained both of the marks available. A few linked lactic acid production anaerobic respiration but very few appreciated the need for oxygen in lactic acid breakdown.
- 7** (a) Answered correctly by many but some candidates failed to gain full marks because they could not divide 917 by 6. The written attempts to complete 'long division manually' might suggest they lacked a calculator.
- (b) Answers to this section varied widely. The more able candidates were able to identify at least one trend with supporting data. Some answers combined the two mark scheme trends into one. Very often candidates gave the misleading statement that 'heart rate increases as the sprint number increases'.
- (c) Many candidates failed to gain marks here by failing to write a comparative statement referring to gender and number. Quite often calculations were presented without further qualification.
- (d) (i) & Generally well answered and most candidates scored full marks.
(ii)
(iii) Many of the weaker candidates referred to a level of fitness and not conclusions about efficiency or health and safety aspects of the training programmes.

GCE (AS) Applied Science Unit 4 (G623) – Cells and molecules

General Comments

Planning Exercise

Most candidates designed plans which involved investigating population growth in one of two ways. These were either counting cells using haemocytometry or measuring rate of carbon dioxide production using gas syringes, U-tubes or inverted fermentation tubes. Those employing the second approach usually failed to link gas production to population size ending up with an investigation into the effect of temperature on respiration. Some candidates suggested employing turbidity measurements but often only in their preliminary investigations. The statements below summarise the major comments regarding some of the assessment / marking criteria within the Planning Exercise.

Question Paper

All questions on the question paper were attempted by the majority of the candidates. Time does not appear to have been an issue in terms of completing the written paper. In general, the presentation of plans was good. However, Centres are asked to remind candidates to comply with statement 7 on page 4 of the notes for guidance. The note refers to tying pages loosely together (or use a treasury tag) so that the pages turn over freely.

Comments on Individual Questions

Planning Exercise

- A** Generic risk assessments were not rewarded. The risk assessment needs to be a working document. It needs to show specific reference to the actual experimental work that would be involved. They should include reference to hazards, risks and how to minimise these. In this case glassware, methylene blue or other stains, water and electricity associated with water baths, disposal of cultures / spillages and biohazards.
- B** Prediction should have been comparative and related to population growth and not (e.g.) just gas production (see above).
- C** Very few candidates gave adequate justification for their prediction when using gas production as an indicator of population growth. Little obvious knowledge of enzymes and / or respiration was presented.
- D/E/F/G** Some candidates did no preliminary work. Some did define and describe preliminary work, but then did not go on to do any 'main investigation' work. Some candidates briefly described observations from previous GCSE investigations using marble chips, acid and gas syringes but made no attempt to relate it to their AS investigation. Candidates were expected to explain (clearly and in detail) why the preliminary work would be done and what benefit would be gained from doing so.
- H/I** Whilst many candidates noted 2 or more sources and were awarded **H**, their relevance, **I**, was often not stated.
- J/K** Many candidates achieved **J**. However lack of detail in the method or confusion of techniques within a single method meant that many candidates did not achieve **K**. Some failed to appreciate that their method needed to be comparative.
- L/M** Generic terms were accepted for **L** but candidates need to be more specific for **M** with qualified names and stated quantities.

Report on the Units taken in January 2006

- N** Candidates need to demonstrate awareness of the importance of repeats and the need for experimental data to be comparative.
- O/P** Whilst the majority of candidates stated a minimum of 5 temperature values, the range stated did not relate to the information in the 'insert' and / or their prediction. For example many chose 5 values within the range 0–50°C and were therefore awarded **O** but not **P**.
- Q/R** Many candidates identified appropriate variables and stated the required minimum of three, quoting dependent, independent and controlled but very few explained how and why these variables **needed** to be controlled.
- S** Many candidates planned to tabulate their data in a suitable format. However many need to be reminded that units of measurement should always be stated in the headers. They must not assume 'the obvious' to be so.
- T** Candidates usually planned to display their results graphically and some went on to offer 'calculated' values for carbon dioxide production per minute and plotted these values against temperature.
- U** Means and rates of reaction were the most common calculations seen but many plans employed simple statistics in addition.
- V** Very few candidates made an attempt to meet this requirement. Whilst there are no actual results to consider candidates were expected to make some statement. They needed to make statements of expectation or observation that would confirm or reject the prediction made in **B**. In effect candidates needed to answer the following question: 'What would my results need to show to confirm or reject my prediction?'
- W** Some candidates were able to recognise one possible source of error in their equipment. Two were required for this marking point to be awarded.
- X** The majority of candidates were able to suggest at least one possible method to improve the accuracy or validity of their data.

Question Paper

- 1** (a) Most candidates gained two of the four marks available. The majority scored these by referring to staining and the use of a cover slip. A few candidates referred to the need to avoid creating air bubbles in the preparation. Few explained how to achieve this. None suggested that the culture might need to be diluted before taking the sample to the slide.
- (b) This section was answered well.
- (c) This section was answered well. Very few candidates quoted plant structures.
- 2** (a) Few could account for the pale central area. Many answers referred to the presence of haemoglobin and its related role in oxygen carriage. Few referred either to concavity or lack of nucleus.
- (b) Most candidates stated that cell B was a white blood cell and went no further. Few could recall neutrophil or phagocyte.
- (c) Few candidates scored maximum marks. Many failed to state the correct measurements for A and B. Those that did had difficulty in linking those measurements to 7.2µm.
- (d) Most candidates knew that a haemocytometer is used to count cells but failed to refer to 'in a fixed volume' for the second marking point. They were aware of the 'grid' etched on the slide but not of the specific depth nor the concept of set volume on the slide itself.
- (e) Whilst many candidates could identify correct conditions for X and Y in (i) few could give a detailed answer for increased white cell count in (ii).
- 3** (a) Most candidates scored maximum marks in this section although there was some confusion over which was glycolipid and which phospholipid.
- (b) This section was not answered well. Candidates demonstrated limited understanding of the terms 'hypotonic' and 'water potential'. Some candidates realised that osmosis was involved but many answers were vague in their descriptions of 'movement from a high concentration to a low concentration'. The reader was never certain as to what was actually moving - solutions, solvent or solutes. Direction of movement was frequently incorrectly interpreted.
- 4** (a) Weaker candidates had difficulty in stating symptoms of HC. Many copied directly from the text box.
- (b) Not answered well. Many candidates failed to recognise the significance of the 36 CAG repetitions. Some answers mentioned 'chromosome 4' without the marker gene.
- (c) Few candidates could state the nitrogenous bases associated with CAG.
- (d) Very few candidates scored 2 marks in this section. Some were credited with 1 mark for appreciating the 50% risk, without further correct explanation of that risk. Correctly argued alternative genetic scenarios involving a dominant were accepted.
- (e) A variety of approaches here with the commonest based around different religious views and the 'rights' and 'wrongs' of abortion.

**Advanced GCE Applied Science AS (H175, H375)
January 2006 Assessment Session**

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
G620	Raw	50	40	35	30	25	20	0
	UMS	100	80	70	60	50	40	0
G622	Raw	90	72	63	54	45	37	0
	UMS	100	80	70	60	50	40	0
G623	Raw	90	71	62	53	45	37	0
	UMS	100	80	70	60	50	40	0

No entries for G621, G624, G625 or G626 this session.

Specification Aggregation Results

First aggregation available for AS (H175 Single Award and H375 Double Award) in June 2006.

Statistics are correct at the time of publication.

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