OCR
RECOGNISING ACHIEVEMENT

GCE

Applied Science

Advanced GCE **A2 H575/H775**

Advanced Subsidiary GCE **AS H175/H375**

Mark Schemes for the Units

January 2008

H175/H375/MS/R/08J

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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.

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MARK SCHEMES FOR THE UNITS

G622 Monitoring the activity of the human body

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Mk</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>
<table>
<tr><td>(glucose)</td><td>glucose ;
oxygen ;
see additional</td></tr>
<tr><td>lactic acid / lactate ;
see additional</td><td>carbon dioxide ;
water ;
see additional</td></tr>
<tr><td>2 ;</td><td>32 / 38 ;</td></tr>
</table>
</td><td>7</td><td>If extra answers are given each incorrect answer deduct 1 mark.
accept correct formulae / symbols
accept any single number on or between limits for ATP</td></tr>
<tr><td></td><td>(b)</td><td></td><td>supplies (all cells with) energy ;
example of use ;</td><td>2</td><td>reject makes or produces energy.
accept obtain / release energy.

e.g. nerve transmission,
muscle contraction,
active uptake,
AVP.</td></tr>
<tr><td></td><td>(c)</td><td></td><td>four from:

cell requires oxygen ;
cell requires respiratory substrate / e.g. glucose;
cell produces wastes / e.g. carbon dioxide / lactic acid / water ;
respiratory system provides supply oxygen ;
respiratory system disposes of carbon dioxide / water vapour ;
blood circulatory system services cell / AW ;
AVP ;</td><td>4</td><td>accept breathing / lung in place or respiratory system.

e.g. AVP heart activity / action</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>13</td><td></td></tr>
</table>

Question			Expected Answers	Mk	Additional Guidance
2	(a)	(i)	**A**. vena cava **;** **B**. aorta **;**	1 1	
		(ii)	**C**. left atrium; collects / stores blood from pulmonary veins / lungs / pumps blood to ventricle **;** **D**. atrio-ventricular / tricuspid valve **;** ensures unidirectional flow of blood / S.A.W / prevents backflow of blood **;**	2 2	reject 'valve flap' reject 'AV valve' look for 'direction' in function mark
	(b)	(i)	4 **;**	1	+/- 0.5 mm
		(ii)	more muscle / the ventricle / Y has to generate higher pressure / pump blood further / S.A.W **;**	1	
	(c)		nervous –*two from:* cardiac / cardiovascular centre / medulla oblongata **;** accelerator nerve / sympathetic **;** speeds up HR **;** vagus nerve / parasympathetic ; slows down HR **;** SAN / pacemaker / AVNode **;** AVP **;** hormonal - *two from:* adrenaline; accelerates SAN / pacemaker / HRate **;** increases strength of contraction **;**	2 2	AVP example: ref to Purkyne involvement
			Total	**12**	

Question			Expected Answers	Mk	Additional Guidance
3	(a)	(i)	15 – 18; (0.45 – 0.5) (6.00) 4.25; 400 – 600;	3	
		(ii) 1	9.38 ; 6.00 1.56 or 1.563 or 1.6 ;	2	
		2	(200 X 9.38 =) 1876 ;	1	to 3 sig figs 1880
		3	200 X 9.38 X 21 **OR** 1876 x 21 ; 100 100 393.96 / 394 ;	2	ecf from (ii2) [2] for answer on its own
		(iii)	alveoli ; diffusion ; thin ; permeable ; mucous / water / moisture ; solution ; red blood cells / haemoglobin ; concentration gradient / diffusion gradient / difference ;	8	Read it. If word or words are not on the Mark Scheme, but are biologically correct and fit in with the syntax, award the mark.
	(b)		A before H ; H before C ; C before D ; D before F ; F before G ; G before E ;	6	
			Total	**22**	

Question			Expected Answers	Mk	Additional Guidance
4	(a)	(i)	*two from:* indicate fever / infection **;** indicate hypothermia / hyperthermia **;** general health indicator **;** fertility signal during oestrous **;** AVP **;**	2	
		(ii)	*two from:* easier to read / use **;** faster **;** safer / AW **;** disposable earpiece **;** cheaper **;** data capture easier **;**	2	
		(iii)	*two from:* monitors ear drum temp **;** ear drum shares blood supply with temp. control centre / hypothalamus / brain **;** temp. control will be monitoring blood temperature from internal organs / closer to core temperature / less affected by environmental temperature **;**	2	
	(b)	(i)	sphygmomanometer **;**	1	
		(ii)	*three from:* patient sits, relaxed **;** position of arm described **;** cuff placed around wrist or upper arm **;** air blown into balloon / cuff **;** systolic pressure measured **;** diastolic measured **;** AVP **;**	3	 e.g. arm on table OR arm kept at same height as heart e.g. AVP description of how to read digital or manual meter
		(iii)	**D** aortic **;** **E** (L) ventricular **;** **G** (L) atrial **;** 2 **C ;** 4 **F ;** 6 **J ;** 7 **I ;**	7	
			Total	**17**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Mk</th><th>Additional Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td>(i)</td><td>four from:

show soft tissue / size / position of lump ;
does not use ionising radiation / X-rays ;
non-invasive ;
real time imaging / film /video / CDROM ;
visualises movement and function / eg blood flow ;
readily available / cheap(er) ;
Immediacy / quick(er) diagnosis / assessment ;
no harmful direct effects / side effects / described ;</td><td>4</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>five from:

sound waves beyond range of human hearing used / typical value / very high frequency ;
delivered by sensor / transducer / ‘loudspeaker’ / piezo-crystal / probe as transmitter ;
gel used ;
waves reflected off internal organs / barriers / layers of tissue / interfaces ;
(echo pattern of the) returning waves picked up by transducer / ‘microphone’ / piezo-electric crystal / probe as receiver ;
viewed as (real-time) picture on monitor / AW ;
recordings possible ;
AVP ;

QWC;</td><td>5

2</td><td>AVP e.g. gel excludes air / enables transmission to skin

QWC marks:

1 mark for appropriate use of three of the following scientific terms: sensor, transducer , loudspeaker , piezo-crystal, interface, microphone, frequency, waves, reflection, probe

1 mark for clear and ordered answer</td></tr>
<tr><td></td><td>(b)</td><td></td><td>two from :

<table><tr><th>Hazard</th><th>Risk</th><th>Safety</th></tr><tr><td>external metal objects ;
internal metal objects ;
(loud) noise ;
claustrophobia ;
body size ;</td><td>related ;</td><td>related ;</td></tr></table></td><td>6</td><td>two from five different hazards for 2 marks
NB ‘risk’ marks ;
and
‘safety’ marks ;
must relate to hazard.
Look for 2 of the 5 hazards listed. Award 1 mark for each. Look for <u>related</u> risks. Award 1 mark for each. Look for <u>related</u> safety. Award 1 mark for each.
accept magnetic field as hazard ;</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>17</td><td></td></tr>
</table>

Question			Expected Answers	Mk	Additional Guidance
6	(a)		*three from:* ensures that Dr. *tells* patient / patient is *informed* of procedure / risks **;** check patient *understands* procedure risks **;** to *confirm agreement* between Dr and patient **;** *protect doctor* from later complaints **;** AVP **;**	3	
	(b)		*four from:* ref. to patient's rights **;** ref. to how bad news may affect patient **;** ref. to informing family or not **;** what is success rate / likelihood of improved quality of life **;** cost effectiveness **;** will the patient be able to understand in the first place **;** 'ageist' point **;** no right or wrong answer / complexity of decision / each case on merit **;** QWC ;	4 2	QWC 1 mark for appropriate use of English 1 mark for correct spelling, punctuation and grammar
			Total	**9**	

Total for Paper = 90 marks

G623/01 Cells and Molecules - Plan

Planning Exercise

Marking of the Plan.

1 Read the material presented

2 Then *award 1 mark if scientific terminology* has been used appropriately. Record using the letter Y.

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.

4 The same piece of evidence can be used to award one criterion only.

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 related to the plan: • cutting • broken glassware • blender electrical issues/risk of shock • regular testing of equipment • juice irritant/allergy • leaf spines • disposal of silver waste
B	prediction made	1	Prediction related to task
C	with justification	1	Statement: use evidence
D *Preliminary work starts here*	description of preliminary work	1	At least one from: • extraction technique • maceration • filtering • how must original tissue • volumes • age or source of tissue • controlled variables • pH • temp • volume of extract • time for end point
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. Full website address needed. Full description of named text.
I	relevance explained	1	Brief explanation as to how references helped in the planning

J *Main investigation starts here*	basic practical skills and accuracy	1	Simple method/list of instructions. Basic. 'Is it a feasible approach?
K	sound practical skills and accuracy	1	Could someone follow the instructions unaided? Are quantities shown? Is it repeatable to appropriate degree of accuracy?
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 eg 250cm^3 beaker, 1dm^3 flask. If any major item missing do not award.
N	appropriate number of measurements stated	1	Mentions replicated/repeats. At least one repeat
O	need for range of measurements stated	1	Statement eg 'To enable comparison to be made.'
P	appropriate range stated	1	Related to prediction made: the 3 tissues
Q	relevant variables are identified (stated)	1	At least two from: • pH • temp • volume of extract • type of film • surface area of film • time for end point
R	how variables to be controlled explained	1	How for at least 2 of the variables
S	one suitable method to display data	1	One display of results eg Table
T	additional method to display data	1	Any <u>different</u> display eg graph
U	simple data handling	1	mean/colour comparison/use of graph data
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/ materials/specific human error: *Human* error: • end point recognition • extraction • measuring *Precision* error: • equipment *Sampling* error: • where was tissue taken from?

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. *Accuracy:* eg precision of water bath *Validity:* eg comparison with secondary source
Marks	**Maximum for plan = 25**	**24 + *1 (scientific terminology)***	

G623/02 Cells and Molecules

Question			Expected Answers	Mk	Additional Guidance
1			<table><tr><th>part of function</th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th></tr><tr><td>mitochondrion</td><td></td><td></td><td></td><td>✓</td><td></td></tr><tr><td>Golgi</td><td></td><td>✓</td><td></td><td></td><td></td></tr><tr><td>controls activities of the cell</td><td>✓</td><td></td><td></td><td></td><td></td></tr><tr><td>contains digestive enzymes</td><td></td><td></td><td></td><td></td><td>✓</td></tr><tr><td>carries out aerobic respiration</td><td></td><td></td><td></td><td>✓</td><td></td></tr><tr><td>rough endoplasmic reticulum</td><td></td><td></td><td>✓</td><td></td><td></td></tr><tr><td>visible using a light microscope</td><td>✓</td><td>✓</td><td></td><td>✓</td><td></td></tr></table>	7	<u>All three correct</u> for last row mark
			Total	7	

Question			Expected Answers	Mk	Additional Guidance
2	(a)		<table><tr><th>food chemical</th><th>reagent(s) used</th><th>result if food chemical is PRESENT</th></tr><tr><td>(starch)</td><td>iodine/iodine KI, solution</td><td>(black colour)</td></tr><tr><td>(non reducing sugar)</td><td>dil. HCl, Na bicarbonate/alkali, Benedict's (reagent)</td><td>Orange colour/ precipitate/red</td></tr><tr><td>(protein)</td><td>Biuret (reagent) /sodium hydroxide (solution), dilute copper sulphate (solution)</td><td>purple/lilac</td></tr><tr><td>lipid/fat</td><td>ethanol and water/paper</td><td>emulsion</td></tr></table>	7	1 mark for each correct box, test reagent (s) must be complete for the mark Accept green for sugar accept Sudan III; red colour in fat accept translucent stain test for lipid
	(b)	(i)	glucose **;**	1	accept galactose and mannose
		(ii)	-O- **;**	1	
		(iii)	maltose **;**	1	
		(iv)	water **;**	1	accept correct formula
		(v)	condensation **;** glycoside / glycosidic **;**	2	
	(c)		*inserts in order:* hydrolyse/digest **;** glycerol **;** three **;** fatty **;** carbon/hydrogen **;** hydrogen/carbon **;** saturated **;** <u>poly</u>-unsaturated **;**	8	accept breakdown/split as alternative for hydrolyse
			Total	**21**	

Question			Expected Answers	Mk	Additional Guidance
3	(a)	(i)	4 **;**	1	
		(ii)	larger cell, lower right of centre **;**	1	
		(iii) 1	7.0 **;**	1	
		2	7.0 x 1000 **;** 2500 2.8 **;**	2	ecf from iii1 first MPt for substitution (divide by 2500) second MPt for conversion mm to μm (multiply by 1000)
	(b)		*four from:* • dilution of sample • stain • cover/ref. to Newton Rings • load haemocytometer slide • use (Pasteur) pipette • excess sample removed • place on stage under appropriate magnification • count WBC within set square/grid/ref to 'central square forms'/'four by four' • ref to TL, TR, C, BL, BR • border rule • leave (for 5 minutes)/to settle • calculation QWC	4 2	Border rule = cells touching middle of three lines T and L border of square are counted in Those touching B, R are out. QWC 1 mark for order 1 mark for spag - allow one error
			Total	**11**	

Question			Expected Answers	Mk	Additional Guidance
4	(a)		*four from:* • no pancreatic juice released • pancreatic juice contains digestive enzymes, therefore digestion is impaired • dietary deficiency • dietary additives required • sometimes exhibit diabetic symptoms • AVP	4	examples of AVP could be: named enzymes such as lipase or protease
	(b)		*two from:* • possibility of error arising during testing • human rights issues including employment, insurance, mortgage facilities • whether or not to pursue abortion • how serious a defect has to be before abortion might be considered • cost-effectiveness of screening • AVP	2	AVP could include: who wants to know? who needs to now? religio-cultural issues
			Total	**6**	

Total for Paper = 45 marks

G628 Sampling, testing and processing

Question			Expected Answers	Mk
1	(a)		the samples from the spoil heap vary in composition ;	1
	(b)	(i)	the soil results are the most valid ; they have the most samples taken ;	1 1
		(ii)	sketch shows 'downstream' being lower ; % of As becomes less the further away from the mine ;	1 1
	(c)	(i)	by drilling/ digging / removing a core ; relating core length to depth ;	1 1
		(ii)	the concentration of arsenic may vary with depth ;	1
	(d)	(i)	*two from:* date of taking sample ; location sample taken from ; hazard warning symbol ;	2
		(ii)	are they affected by storage time ; are they affected by light/ oxygen ;	1 1
		(iii)	to avoid contamination ;	1
	(e)	(i)	suitable straight line ; through origin ;	1 1
		(ii)	230 mg ;	1
		(iii)	1150 mg kg^{-1} (allow ecf) ;	1
	(f)	(i)	*two from:* mass of sample on left, mass of mercury on right ; numerically increasing ; make all the units common ;	2
		(ii)	*two from:* the mass of the samples are not the same ; the masses of the samples should be made per gram; ; suggests a third column showing e.g. $\frac{\text{mass of Hg}}{\text{mass of sample}}$;	2
	(g)		*three from:* it can analyse many elements at the same time ; no interference from other elements ; uses (very) small samples ; (very) accurate ; speed of determination ;	3
	(h)	(i)	so that all arsenic can be brought (easily) into solution / dissolves faster ;	1
		(ii)	risk assessment ;	1
		(iii)	wash the insoluble residue with water ;	1
		(iv)	the mass of the empty crucible needs to be known ;	1
		(v)	use a different / less porous crucible/ other suitable method / refilter ;	
		(vi)	on a window sill / dessicator / in an oven set to a low temp ;	1
		(vii)	0.900 % ; Answer given to three significant figures ;	1 1
		(viii)	percentage errors due to weighing will be greater / difficulty in weighing small masses accurately ;	1
			Total	**33**

Question			Expected Answers	Mk
2	(a)		to test its quality / compare with other samples of jute ;	1
	(b)	(i)	to ensure 'uniformity' of product ;	1
		(ii)	Different bales / batches ;	1
	(c)		in a dry area ; away from animals / insects ;	1 1
	(d)	(i)	*six from:* means of supporting the fibre ; varying masses attached to the fibre ; suitable method of measuring extension ; measures width ; using an appropriate scale ; constant length of fibre ; uses more than one fibre ; QWC organise relevant information clearly and coherently; ; ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear ;	6 2
		(ii)	mass used to produce this extension ; starting length of fibre ; width of fibre ;	3
		(iii)	repeat it / ignore it (if qualified) / report it ;	1
	(e)		synthetic – man made / not natural ; biodegradable – broken down by natural / biological means ; matrix – a 'substance' in which other things are embedded ;	3
	(f)		'15 tonnes of carbon dioxide … 11 tonnes of oxygen' ;	1
	(g)		*three from:* the percentage / proportion / number of caterpillars killed ; how often to spray ; the concentration of insecticide necessary ; toxicity to the user ; weather / time of the day ;	3
	(h)	(i)	sodium arsenate is very poisonous ;	1
		(ii)	I 50 x 0.080 = 4.0 g ; II $\frac{4.0 \times 1000}{25}$ = 160 g (accept ecf) ; III 6.0 x 160 = 960 g (accept ecf) ;	3
		(iii)	suitable heating equipment ; suitable equipment for adding sodium hydrogen carbonate e.g. hopper / chute / conveyor ; pot shows method for allowing carbon dioxide to escape ;	3
			Total	**31**

Question			Expected Answers	Mk
3	(a)	(i)	to ensure better / complete reaction / faster reaction ;	1
		(ii)	leave for longer / heat the mixture / use more sulphuric acid ;	1
		(iii)	use of fume cupboard / respirator ; No flames ;	2
		(iv)	suitable apparatus e.g. flask or beaker ; suitable method e.g. pour solution onto a flat surface ; safe method of propanone evaporation ;	3
		(v)	wash with propanone ; dry ;	2
		(vi)	method of moving polymer automatically ; polymer entering and leaving / moisture leaving ; heated room / draught ;	3
		(vii)	renewable source / readily available ;	1
	b	(i)	beaker or flask greater than 1 dm^3 ; measuring cylinder 50 cm^3 or greater ;	2
		(ii)	e.g. use of cloth / sintered glass vessel / through glass wool / fine sieve ;	1
		(iii)	not dirty / cracked OR check to see if it is clean ;	1
		(iv)	leave (for longer) ; reaction rate is slower at room temperature ;	2
		(v)	*three from:* using the same amount of glue for each ; press between two pieces of cardboard (or other suitable material) ; leave for the same period of time and try to separate the two pieces of cardboard ; same amount of force used to separate the two pieces of glued cardboard ; measure the force ;	3
		(vi)	the quantities of borax / casein are not stated ; it does not say how long to leave the mixture ;	2
		(vii)	I To condense the solvent / butanone ; II To control the heating rate / prevent fire / for safety ;	2
			Total	**26**

Total for Paper = 90 marks

G635 Working waves

Question			Expected Answers	Mk
1	(a)		*two from:* full and empty parts of the tank at different temperatures / liquid at a different temperature to surroundings **;** different temperatures emit different intensity / frequency / wavelength {of Infrared/electromagnetic radiation) **;** shows as different colours/shades of grey on photograph **;** [not enough just to say giving off IR/camera detects IR must show difference]	2
	(b)		any valid application e.g. motor / freezer / fuses / pulley system **;** appropriate explanation eg hot spots / leaking freezer / overheating fuse / overheating belt **;** indication of how thermal imaging helps e.g. show as bright / coloured / dark region / indicates problems invisible in normal light **;**	3
	(c)	(i)	wavelength = 650 $\pm$ 100 (nm) read from graph, stated or implied **;** correct conversion to m. i.e. 650 x 10^{-9} m/6.5 x 10^{-7}m **;**	2
		(ii)	v= fλ or f = v/λ; seen or implied **;** f = 3.0 x 10^{8} / 650 x 10^{-9} or whatever their value of λ **;** = 4.6 x 10^{14} **;** Hz **;** 2sf **;**	5
		(iii)	1. (almost) same [accept very slightly more] **;** 2. (almost) same **;** [accept restatement of value]	2
		(iv)	1 ultra violet (or UV)/ X-ray(s)/Gamma ray(s) **;** 2. infra-red(or IR)/ microwaves/radio **;**	2
	(d)	(i)	curve drawn entirely lower than photoflood and labelled bulb **;** peak to the right of peak for special photographic bulb **;**	2
		(ii)	curve drawn entirely higher than special photographic light bulb and labelled sun **;** peak to the left of peak for special photographic bulb **;**	2
			Total	**20**

Question			Expected Answers	Mk
2	(a)		*three from from text or diagram:* unpolarised light oscillates in all directions **;** at right angles to wave direction **;** light emerging only oscillates in one direction/plane **;** emerging light has less energy/intensity **;** emerging light has less (approximately/slightly less than) half the energy/intensity of the incident light **;**	3
	(b)		(direction of polarisation transmitted by) Polaroid in sunglasses is at right angles to (direction of polarisation of) light reflected (off a horizontal surface) **;**	1
	(c)	(i)	Fig 2.2 **;**	1
		(ii)	minimal / less / no reflections / glare / Polaroid has removed reflected glare **;**	1
		(iii)	*two from:* Polaroid turned **;** through 90^{o} **;** Polaroid in Fig 2.2 stops reflected light **;** other picture with Polaroid indistinguishable / difficult to distinguish from picture with no Polaroid **;** because it does not stop reflected light **;** direction in which Polaroid polarises is different **;**	2
	(d)	(i)	no **;** longitudinal **;** only one direction of movement/longitudinal waves cannot be polarised / only transverse waves can be polarised **;**	3
		(ii)	yes **;** electromagnetic waves / transverse waves **;**	2
			Total	**13**

Question			Expected Answers	Mk
3	(a)		glass ; plastic (accept any specified plastic eg Perspex) ;	2
	(b)		*three from:* total internal reflection ; refractive index of fibre > surrounding (air) ; light meets inside surface of fibre at > than critical angle ; sin C = 1/n ; C typically around 40 – 50^{o} QWC, spelling punctuation and grammar	3 1
	(c)	(i)	arrangement of fibres changes along the length of the bundle / random arrangement of fibres or wtte ;	1
		(ii)	cheaper ; light down each fibre same / arrangement unimportant / adequate for purpose or wtte ;	1 1
	(d)	(i)	any appropriate application e.g. endoscope / communications ;	1
		(ii)	need to keep order of pixels / segments of image in same order / send signals to right receiver / avoid randomised image or owtte ;	1
	(e)	(i)	coated / covering / [jacket] ; with material of lower refractive index / diagram showing 3 layers ;	1 1
		(ii)	less leakage of light ; eg due to scratches / moisture ; OR less dispersion ; path closer to axis ;	1 1
	(f)	(i)	*marks may be awarded for any appropriate method:* e.g. tracing a ray passing through the block using pins or a ray box and measuring angles of incidence and refraction or real and apparent depth accept method finding n via critical angle including condone using semicircular rather than rectangular block. 7 appropriate points e.g. diagram:- correct components – block & pins/block & ray box/laser ; correctly arranged ; in words or diagram:- draw normal ; i measured (or equivalent distances) ; r measured (or equivalent distances) ; method described:- drawing ray paths / no parallax method ; draw round block ; measuring instrument specified ; equation/calculation ; repeats (and averages) ; dark room ; alternative detail ; QWC clear ordered answer	7 1

		(ii)	*any appropriate answer e.g.:* fine ray **;** large angle **;** sharp pencil **;** dark room (if not credited in (i)) **;** repeats (if not credited in (i)) **;**	2
			Total	**25**

Question			**Expected Answers**	**Mk**
4	**(a)**	**(i)**	works with (either of) two types of transmission technology/TDMA & FDMA/TDMA & CDMA/ FDMA & CDMA **;**	1
		(ii)	can switch frequencies/wavelengths **;** [accept digital & analogue supported]	1
	(b)	**(i)**	Global System for Mobile (Communications) **;**	1
		(ii)	Time Division Multiple Access /TDMA **;**	1
		(iii)	Frequency Division Multiple Access (FDMA)/Code Division Multiple Access (CDMA) **;** [allow TDMA if not given as answer for b(ii)]	1
		(iv)	*two of TDMA, FDMA, CDMA as stated in answers to ii and iii:* FDMA the available spectrum is split up into (uniform) chunks of bandwidth **;** each call is on a separate frequency **;** TDMA a (narrow frequency band) is spilt into time slots **;** each call is given a certain portion of time (at the designated frequency) **;** CDMA each signal is coded **;** each signal is spread over the entire bandwidth **;** at the receiver the code is used to recover the signal **;** [accept as an alternative: both are systems for sharing the available radio band between many users]	4
	(c)		*any two appropriate answers e.g.:* obstruction (between phone and aerial) **;** distance (between phone and aerial) **;** height (of phone and aerial) **;** NOT interference/damaged aerial	2
	(d)		4 characters correctly encoded **;** all characters correctly encoded **;** (0 1 0 1 0 0 0 P 1 0 1 0 0 0 0 C 1 0 0 0 0 1 1 M 1 0 0 1 1 0 1) 0 1 0 1 0 0 1	1 1
			Total	**13**

Question			Expected Answers	Mk
5	(a)		bone absorbs X-rays (more than fat / other tissues) ; bone higher atomic No. / density ; so bones cast a shadow or wtte ;	3
	(b)	(i)	*any two sensible suggestions e.g.:* lead apron / shield ; appropriate location ; take fewer images ;	2
		(ii)	*any two sensible suggestions e.g.:* leave room / stand behind screen ; wear (film) badge / dosemeter ; wear lead apron ;	2
	(c)		ionises ; *plus any four further points e.g.:* the ions interact (with water molecules resulting in a number of new products) ; reaction products interact with molecules of the cell ; causing early death of a cell ; prevention or delay of cell division ; permanent modification which is passed on to daughter cells ; NOT diseases, must focus on cells	1 4
	(d)		*any four appropriate points e.g.:* CAT scanner uses X-Rays ; conventional X-ray pictures show information from all depths in the body superimposed on each other ; CAT scanner images one slice of the body at a time ; sharp image is obtained by changing the direction of the X-Rays and using multiple positions of the detector ; the information from these scans is processed by a computer to obtain the final image ; rotate ; 3D ; provides more information ; images soft tissue ;	4
	(e)		*three from:* therapy ; to remove tumours ; kill harmful/cancer cells ; need to ensure that dose to healthy cells is minimised ; further detail ;	3
			Total	**19**

Total for Paper = 90 marks

Grade Thresholds

Advanced GCE Applied Science AS (H175, H375) and
GCE Applied Science A2 (H575, H775)
January 2008 Assessment Session

Portfolio Unit Threshold Marks (AS)

Unit		Maximum Mark	a	b	c	d	e	u	Total nos of cands
G620	Raw	50	41	36	31	26	22	0	499
	UMS	100	80	70	60	50	40	0	
G621	Raw	50	42	37	32	27	22	0	327
	UMS	100	80	70	60	50	40	0	
G624	Raw	50	40	35	30	25	21	0	106
	UMS	100	80	70	60	50	40	0	
G625	Raw	50	40	35	30	25	21	0	81
	UMS	100	80	70	60	50	40	0	
G626	Raw	50	40	35	30	25	21	0	103
	UMS	100	80	70	60	50	40	0	

Examined Unit Threshold Marks (AS)

Unit		Maximum Mark	a	b	c	d	e	u	Total nos of cands
G622	Raw	90	70	61	52	44	36	0	985
	UMS	100	80	70	60	50	40	0	
G623	Raw	90	73	64	55	47	39	0	155
	UMS	100	80	70	60	50	40	0	

Portfolio Unit Threshold Marks (A2)

Unit		Maximum Mark	a	b	c	d	e	u	Total nos of cands
G627	Raw	50	40	35	30	25	20	0	87
	UMS	100	80	70	60	50	40	0	
G629	Raw	50	41	36	31	26	22	0	38
	UMS	100	80	70	60	50	40	0	
G630	Raw	50	40	35	30	25	21	0	13
	UMS	100	80	70	60	50	40	0	
G632	Raw	50	40	35	30	25	20	0	19
	UMS	100	80	70	60	50	40	0	
G633	Raw	50	40	35	30	26	22	0	52
	UMS	100	80	70	60	50	40	0	
G634	Raw	50	40	35	30	25	20	0	12
	UMS	100	80	70	60	50	40	0	

Examined Unit Threshold Marks (A2)

Unit		Maximum Mark	a	b	c	d	e	u	Total nos of cands
G628	Raw	90	58	52	46	40	34	0	308
	UMS	100	80	70	60	50	40	0	
G635	Raw	90	65	57	50	43	36	0	221
	UMS	100	80	70	60	50	40	0	

Specification Aggregation Results

Uniform marks correspond to overall grades as follows.
Advanced Subsidiary GCE (H175):

Overall Grade	A	B	C	D	E
UMS (max 300)	240	210	180	150	120

Advanced Subsidiary GCE (Double Award) (H375):

Overall Grade	AA	AB	BB	BC	CC	CD	DD	DE	EE
UMS (max 600)	480	450	420	390	360	330	300	270	240

Advanced GCE (Single Award) (H575)

Overall Grade	A	B	C	D	E
UMS (max 600)	480	420	360	300	240

Advanced GCE (Double Award) (H775)

Overall Grade	AA	AB	BB	BC	CC	CD	DD	DE	EE
UMS (max 1200)	960	900	840	780	720	660	600	540	480

Cumulative Percentage in Grade

Advanced Subsidiary GCE (Single Award) (H175):

A	B	C	D	E	U
0.0	3.7	40.7	81.5	92.6	100.0
There were 28 candidates aggregating in January 2008.					

Advanced Subsidiary GCE (Double Award) (H375):

AA	AB	BB	BC	CC	CD	DD	DE	EE	U
0.0	4.4	4.4	13.3	24.4	40.0	57.8	75.6	95.6	100.0
There were 46 candidates aggregating in January 2008.									

Advanced GCE (Single Award) (H575):

A	B	C	D	E	U
0.0	0.0	0.0	0.0	0.0	100.0
There were 0 candidates aggregating in January 2008.					

Advanced GCE (Double Award) (H775):

AA	AB	BB	BC	CC	CD	DD	DE	EE	U
0.0	0.0	0.0	0.0	0.0	33.3	33.3	66.7	100.0	100.0
There were 3 candidates aggregating in January 2008.									

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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