

Human Biology

Advanced GCE A2 H423

Advanced Subsidiary GCE AS H023

Mark Schemes for the Units

January 2010

HX23/MS/R/10J

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

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.

© OCR 2010

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

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

CONTENTS

Advanced GCE Human Biology (H423)

Advanced Subsidiary GCE Human Biology (H023)

MARK SCHEME FOR THE UNITS

Unit/Component	Page
F221 Molecules, Blood and Gas Exchange	1
F222 Growth, Development and Disease	10
F224 Energy, Reproduction & Populations	25
Grade Thresholds	36

F221 Molecules, Blood and Gas Exchange

Question		Expected Answers	Marks	Additional Guidance
1	(a)	has, membrane bound organelles / nucleus ;	1	CREDIT 'true organelles' or 'true nucleus' ACCEPT 'nuclear membrane / envelope' ACCEPT named example of membrane bound organelle e.g. mitochondrion, chloroplast, RER / SER, lysosome, Golgi apparatus DO NOT CREDIT ribosome
	(b) (i)	A: nucleus ; B: nucleolus ; C: (central) vacuole ;	3	ACCEPT nuclei DO NOT CREDIT nuclear envelope ACCEPT nucleoli ACCEPT 'permanent vacuole' or 'cell sap vacuole'
	(ii)	D: production of ATP / (site of aerobic) respiration ; E: supports cell ; F: production of glucose / (site of) photosynthesis ;	3	DO NOT CREDIT 'produces / creates / makes energy' ACCEPT 'release of energy' DO NOT CREDIT references to movement in or out of the cell or references to stability ACCEPT idea of 'keeps cell, rigid / turgid' DO NOT CREDIT 'produces / creates / makes energy' ACCEPT idea that this is where photosynthesis happens
	(c)	10 (μm) ; ;	2	Correct answer 2 marks If answer incorrect: ALLOW one method mark for correctly measured length of X-Y <u>with</u> appropriate units e.g. 10 cm, 100 mm divided by 10000
Total			9	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	find the position of the, radial / carotid, <u>artery</u> ; press (firmly against artery) with two fingers ; correct reference to not using, the thumb ; count, number of pulses per minute / number of pulses in 30s and multiply by 2 ;	3 max	ACCEPT <u>artery</u> , in wrist or neck ACCEPT any valid multiples (e.g. number in 20s multiplied by 3) or calculated differences DO NOT CREDIT references to repeats as this is given in the stem of the question
	(b) (i)	the longer the time Jack exercises the higher his heart rate ; 2 times and two means to support answer ;	2	DO NOT CREDIT the longer the time Jack exercises the higher his <i>pulse rate</i> (as stem of question asks for 'heart rate') e.g. 'the mean increased from 65 to 145 from 0 to 5 minutes' CREDIT correctly calculated difference in given time period
	(ii)	muscles contract <u>more</u> ; (need) an <u>increased</u> blood flow ; (need) a <u>greater</u> supply of, oxygen / glucose ; for <u>increased rate</u> of (aerobic) respiration / <u>more</u> ATP ;	3	ACCEPT muscles working harder ACCEPT <u>more</u> blood flows to muscles DO NOT CREDIT increased, speed / rate, of blood (flow) CREDIT <u>higher</u> oxygen demand / <u>more</u> oxygen needed CREDIT <u>higher</u> glucose demand / <u>more</u> glucose needed ACCEPT ' <u>more</u> energy needed'
	(c) (i)	named health related consideration ; named relevant safety precaution ; (check that) he is wearing suitable clothing ;	2 max	e.g. ensure he is not asthmatic, warming up prior to exercise DO NOT CREDIT non exercise related health concerns e.g. irrelevant genetic disease e.g. bike is in good working order, told to stop if feeling unwell

Question		Expected answer	Marks	Additional Guidance
	(ii)	to identify anomalous results ; to make sure results are <u>reliable</u> ; to make <u>mean</u> more <u>accurate</u> ;	1 max	DO NOT CREDIT references to accuracy alone, as replicates do not improve accuracy of data measured (only the accuracy of mean)
		Total	11	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	<p><i>double circulatory system</i> has two separate circuits ;</p> <p>blood travels through heart twice on one circuit of the body ;</p> <p><i>closed circulatory system</i> blood stays within blood <u>vessels</u> ;</p>	<p>1 max</p> <p>1</p>	<p>CREDIT reference to both pulmonary and systemic circuits DO NOT CREDIT 'it travels twice round the body'</p> <p>CREDIT named blood vessels</p>
		(ii)	<p>oxygenated and deoxygenated blood do not mix ; more oxygen delivered to (all respiring) cells ;</p> <p>maintains blood pressure within the system ;</p>	2 max	<p><i>As the stem of the question specifically asks for two advantages, only mark first two statements given</i></p> <p>DO NOT CREDIT reference to speed or rate of oxygen delivery</p> <p>ACCEPT maintains blood pressure within the body</p>
		(iii)	<p><i>ora</i> diffusion pathway is too long ; cells are a long distance from (exchange) surface ; would not deliver, oxygen / nutrients, fast enough to (all respiring) cells ; humans (cells) have, high metabolic rate / high requirements (of oxygen and nutrients) ;</p>	2 max	<p><i>As the stem of the question specifically asks for two reasons, only mark first two statements given</i></p> <p>ACCEPT diffusion is too slow to meet demand</p>
	(b)	(i)	vena cava ;	1	<p>DO NOT CREDIT 'vein' as the question has asked for the name of the vein IGNORE reference to superior or inferior</p>

Question	Expected Answers	Marks	Additional Guidance
	<p>(ii) Q tunica externa ; R tunica intima / tunica interna / endothelium ;</p>	2	<p>ACCEPT collagen (fibres) DO NOT CREDIT epithelium</p>
	<p>(iii)</p> <p>(only needs a) thin wall, because blood at low pressure ;</p> <p>wide lumen, so blood under less pressure / flows slowly ;</p> <p>wide lumen, so venous return matches arterial output ;</p> <p>smooth endothelium, to reduce, friction / resistance to blood flow ;</p> <p>valves, to prevent backflow ;</p> <p>collagen / outer fibrous layer, to protect from damage ;</p>	3 max	<p>CREDIT <i>feature linked to correct function for each mark</i></p> <p>CREDIT thin layer of, muscle / elastic tissue</p> <p>ACCEPT large lumen</p> <p>ACCEPT large lumen</p> <p>ACCEPT smooth, <u>inner</u> surface / lining (in place of smooth endothelium)</p>
	Total	12	

Question			Expected Answers	Marks	Additional Guidance
4	(a)	(i)	polypeptide chain / chain of amino acids ; (folded to) form a, specific / 3D, shape ; (shape) held in place by bonds between R groups ;		IGNORE reference to side chains

		<p>disulfide / ionic / hydrogen, bonds ;</p> <p>hydrophilic / polar, R groups on outside ; hydrophobic / non-polar R groups on inside ;</p> <p>QWC ;</p>	<p>3 max</p> <p>1</p>	<p>CREDIT hydrophobic / hydrophilic, interactions or Van de Waals forces</p> <p>IGNORE peptide bonds</p> <p>two emboldened terms used and spelt correctly</p>
	(ii)	<p>has an active site ; complementary / specific, to, fibrinogen / substrate ; where substrate / fibrinogen binds ;</p> <p>forms, enzyme – substrate complex / ESC ; this lowers activation energy ;</p>	<p>3 max</p>	<p>ACCEPT substrate / fibrinogen ‘fits into’ active site DO NOT CREDIT substrate / fibrinogen ‘combines with’ active site</p>
	(b)	<p>clotting time increases ;</p> <p>there is a lower number of (successful) collisions ; idea of vacant active sites ; fewer, enzyme substrate complexes / ESCs, formed ; less fibrin produced ;</p>	<p>1</p> <p>3 max</p>	<p>ACCEPT blood takes longer to clot / conversion to fibrin is slower</p>
		Total	11	

Question		Expected Answers	Marks	Additional Guidance
5	(a)	<p>1 (lung contains) large numbers / millions, of alveoli ;</p> <p>2 alveoli, are <u>lined</u> with / have <u>walls</u> of, squamous epithelial cells ; alveoli <u>walls</u> are one cell thick ; (squamous epithelial) cells are, thin / (only) 0.1- 0.5 micrometres thick ;</p> <p>3 air inhaled supplies lungs with high concentration of oxygen ; idea of oxygenated blood carried away from the, alveoli / lungs ; idea of deoxygenated blood carried towards the, alveoli / lungs ;</p> <p>4 cells secrete a watery fluid which lines the alveoli ; alveoli are deep inside the body ;</p>	5 max	<p>IGNORE air sacs</p> <p><i>candidates must use either <u>walls</u> or refer to <u>lining</u> to gain credit</i></p> <p>CREDIT equivalent marking point that correctly refer to carbon dioxide</p> <p>DO NOT CREDIT references to surfactant or mucus</p>
	(b) (i)	(walls of) trachea / bronchi / bronchioles / alveoli ;	1	DO NOT CREDIT air passages
	(ii)	<p>(elastic fibres) stretch, as air moves in / during inhalation ;</p> <p>(elastic fibres) recoil, to help force air out / during exhalation ;</p>	2	<p>ACCEPT (fibres) allow alveoli to expand during inhalation DO NOT CREDIT 'elastic fibres expand'</p> <p>DO NOT CREDIT contract DO NOT CREDIT 'to stretch and recoil'</p>
Total			11	

Question			Expected Answers	Marks	Additional Guidance
6	(a)	(i)	ester (bond) ;	1	ACCEPT covalent
		(ii)	by a condensation reaction ; between glycerol and fatty acids ; between, hydroxyl / OH, group and, carboxylic acid / COOH, group ; QWC ;	2 max 1	ACCEPT 'involves the removal of water' two emboldened terms used and spelt correctly
	(b)	(i)	<i>phospholipid has:</i> (only) two, fatty acids / ester bonds ; a phosphate, group / head ; choline ;	2 max	DO NOT CREDIT equivalent marking points that refer to triglyceride (they have been provided with the structure of a triglyceride) DO NOT CREDIT references to properties DO NOT CREDIT phosphate ion / phosphate molecule / phosphorus
		(ii)	polar (molecule) ; phosphate (head), is hydrophilic / soluble in water ; fatty acid (tails), are hydrophobic / insoluble in water ; form a bilayer ;	3 max	ACCEPT repel water
Total				9	

F222 Growth, Development and Disease

Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	one million deaths in 14 million people ; in, a given time / 16 years ; OR 36 deaths in 40 000 / 200 deaths in 40 000 ; over a fixed period of time / during the study period / AW ;	2	Figures must come from case study 1 DO NOT CREDIT number of deaths unqualified (without sample size)
		(ii)	TB / tuberculosis ;	1	IGNORE other infectious diseases
		(iii)	lung / liver / bowel, cancer ;	1	ACCEPT 'cancer' alone IGNORE other non-infectious diseases DO NOT CREDIT other types of cancer
	(b)		selecting a group of people / example from case study / AW ; monitoring the group over (a long) time ; example of time period from case study ; forward looking study / AW ;	3 max	IGNORE reference to large scale e.g. 14 million Indian participants / 40 000 doctors / 650 male patients e.g. 16 years / 50 years / 1998 - 2014 / 1948 - 1997 look for the idea that the data is being collected from now to be subsequently analysed

Question	Expected Answers	Marks	Additional Guidance
(c)	<p><i>Precaution:</i> (Hill and Doll) did not interview patients themselves ;</p> <p><i>Explanation:</i> avoid bias introduced by Hill and Doll / AW ;</p> <p><i>Precaution:</i> social workers not told suspected diagnosis ;</p> <p><i>Explanation:</i> avoid bias introduced by social workers ;</p> <p><i>Precaution:</i> other (non-cancer / cancer) patients interviewed ;</p> <p><i>Explanation:</i> avoid bias introduced by patients ;</p> <p><i>Precaution:</i> all / 650 male patients ;</p> <p><i>Explanation:</i> avoid gender difference in smoking / AW ;</p>	4 max	<p>CREDIT any reasonable precaution (up to a maximum of two marks for precautions) and linked explanation CREDIT same explanation given twice if appropriate</p> <p>DO NOT CREDIT 'avoid bias' unqualified CREDIT idea that Doll and Hill would know what they expected</p> <p>ACCEPT 'interviewers' instead of social workers look for the idea of avoiding bias by the people completing the questionnaires</p> <p>IGNORE references to large numbers DO NOT CREDIT references to further studies</p>

Question		Expected Answers	Marks	Additional Guidance
	(d) (i)	420 ;;	2	2 marks for correct answer even if no / wrong working shown If final answer is incorrect, award 1 mark for correct working, e.g. '100 – 58' x 10 OR $\frac{100 - 58}{100} \times 1000$ OR '42% X 1000 died'
	(ii)	10 ;	1	
(e)	(i)	<i>in men aged 60 – 74:</i> increase (up to 1970) then falls (after 1970) ; <i>in men aged 35 – 59:</i> decrease / little change ; figures with units in support ;	3 max	ACCEPT 'peaks at' Look for figures within an age group with two x axis values and 2 y axis values
	(ii)	lung cancer takes time to develop ; 60 – 70 year olds had been smoking for longer ;	1 max	ACCEPT have been exposed to the carcinogen for a long time

Question		Expected Answer	Marks	Additional Guidance
	(f)	cough with qualification of <i>type</i> of cough ; blood in sputum / coughing up blood / AW ; weight loss ; lethargy / AW ; difficulty in breathing ; change in voice ; pain / symptoms, from secondary tumours ;	2 max	e.g. 'persistent cough' OR 'chesty cough' DO NOT CREDIT cough unqualified
		Total	20	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	caused by a pathogen ; passed from one organism to another / communicable ;	2	ACCEPT named type of pathogen ACCEPT the idea of spreading from person to person
	(b)	as a control ; to compare to the garlic results ; to show what an antibiotic does ;	2 max	DO NOT CREDIT 'fair test' ACCEPT idea that antibiotics kill bacteria
	(c) (i)	<i>Conclusion:</i> (onion) behaves in a similar way to garlic / AW ; <i>Reason:</i> (because) same genus as / closely related to, garlic ; OR has (some of) same genes / common DNA (regions / markers) ;	2	CREDIT 1 mark for conclusion and 1 mark for reason CREDIT idea that onion also cause a zone of inhibition ACCEPT 'both are Allium' DO NOT CREDIT same species
	(ii)	less time consuming / less expensive ; no need to screen every species (on agar) / AW ; not wasting resources (on the wrong plants) ; alternative sources of same compound identified ;	2 max	

Question		Expected Answers	Marks	Additional Guidance
	(d) (i)	<i>Heart attack :</i> area of heart muscle / myocardium, deprived of, oxygen / oxygenated blood ; <i>Cardiac arrest :</i> heart stops / AW ;	2	ACCEPT myocardial infarction / coronary artery blocked ACCEPT no pulse / cannot pump blood / ventricular fibrillation DO NOT CREDIT heart / atrial fibrillation

Question	Expected Answers	Marks	Additional Guidance
(ii)	<ol style="list-style-type: none"> 1. check for absence of breathing ; 2. clear airways (lay person on their back) / tilt head / lift chin ; 3. raise person's legs ; 4. hands in centre of chest ; 5. use heel of hand / interlocking fingers / fingers off chest ; 6. press down, 4 – 5 cm ; 7. repeat 30 times ; 8. 100 compressions per minute ; 9. (follow by) two rescue breaths ; 10. pinch nose and make seal around lips / AW ; 11. breathe (slowly) into person's mouth ; 12. repeat, CPR / description (until help arrives) ; 13. monitor / AW , breathing/ pulse ; 14. (if pulse returns) place in recovery position ; <p>QWC for correct sequence of check, compressions, breaths, monitor ;</p>	<p style="text-align: center;">7 max</p> <p style="text-align: center;">1</p>	<p>IGNORE reference to pulse ACCEPT remove blockages to airway</p> <p>DO NOT CREDIT reference to stomach and abdomen</p> <p>ACCEPT a few ACCEPT 70 – 100 (or as current guidelines) ACCEPT recovery breaths</p> <p>DO NOT ACCEPT blow into person's mouth</p> <p>ACCEPT '30:2' or 'cycle' or 'procedure' instead of CPR</p> <p>look for a clear statement that they are checking</p> <p>ACCEPT initial check for pulse and / or breathing</p>
	Total	18	

Question		Expected Answers	Marks	Additional Guidance												
3	(a)	A = (inorganic) phosphate ; B = deoxyribose ;	2	DO NOT CREDIT phosphate sugar DO NOT CREDIT pentose sugar DO NOT CREDIT ribose												
	(b) (i)	<table border="1"> <tr> <td></td> <td></td> <td>30 ;</td> </tr> <tr> <td>guanine ;</td> <td>purine ;</td> <td>20 ;</td> </tr> <tr> <td>thymine ;</td> <td>pyrimidine ;</td> <td></td> </tr> <tr> <td></td> <td></td> <td>20 ;</td> </tr> </table> <p><i>If table not completely correct look for:</i></p> <p><i>first column</i> guanine ; <u>thymine</u> ;</p> <p><i>second column:</i> purine next to guanine ; pyrimidine next to thymine ;</p> <p><i>third column:</i> A same number as T ; G same number as C ; purine number equals pyrimidine number equals 100 ;</p>			30 ;	guanine ;	purine ;	20 ;	thymine ;	pyrimidine ;				20 ;	7	1 mark per box Correct spelling only required for thymine ACCEPT phonetic spelling for all other terms
		30 ;														
guanine ;	purine ;	20 ;														
thymine ;	pyrimidine ;															
		20 ;														
	(ii)	holds (DNA) strands / AW, together ; ref to high stability of DNA molecule ; (allows) complementary base pairing ; (2 hydrogen bonds) between A and T AND (3 hydrogen bonds) between C and G ;	3 max	mark is for A – T and C – G. Both required for 1 mark. DO NOT CREDIT if numbers of hydrogen bonds given is incorrect												
	(c) (i)	<i>in bacteria</i> (DNA) in cytoplasm / not in nucleus ;	1	CREDIT reverse argument for animals, plants and fungi CREDIT in plasmids												

Question		Expected Answers	Marks	Additional Guidance
	(ii)	<i>in bacteria</i> (DNA is) circular / not attached to proteins / in plasmids / has no introns ;	1	CREDIT reverse argument for animals, plants and fungi DO NOT CREDIT in plasmids if mark given in c(i)
	(d)	(virus) may, have RNA / be a retrovirus ; (virus) has single stranded DNA / AW ;	1 max	ACCEPT uracil instead of thymine (implies it is RNA) ACCEPT idea that DNA is different in structure DO NOT CREDIT different unqualified
Total			15	

Question		Expected Answers				Marks	Additional Guidance	
4	(a)	statement	mitosis	meiosis I	meiosis II	5	1 mark for each correct row	
		B	x	✓	x			;
		C	✓	x	✓			;
		D	✓	✓	✓			;
		E	x	✓	x			;
F	✓	x	✓	;				
	(b) (i)	mutation ;				1		
	(ii)	carcinogen / named carcinogen ; UV radiation ; X – rays ; other forms of radiation ;				2 max	CREDIT two named carcinogens e.g. benzpyrene / alcohol / tar / virus / asbestos	
	(c) (i)	through, nuclear pore(s) / protein channels and carrier proteins;				1	ACCEPT across nuclear, envelope / membrane IGNORE references to a mechanism e.g. active transport	
	(ii)	(active p53) is not, complexed with / joined to, a (second) protein ; (so) small enough (to fit through nuclear pore) / correct shape ; complements the binding site of the carrier or channel protein ;				2 max	CREDIT reverse argument for <i>inactive</i> form	

Question		Expected Answers	Marks	Additional Guidance
(d)	(i)	enzyme ;	1	ACCEPT globular
	(ii)	change shape of <u>active site</u> ;	1	ACCEPT idea of a change resulting in the <u>active site</u> not being the right shape for the substrate
(e)		no p53 / damaged p53 made / AW ; (so) no p21 made ; (so) cyclins bind to cyclin kinases / AW ; (so) cell cycle not halted / goes beyond G1 / AW ; progresses into S phase / AW ; no response to / detection of, DNA damage / AW ;	4 max	DO NOT CREDIT damaged p53 genes ACCEPT DNA replicates
		QWC ;	1	Look for correct references to p53 AND p21 AND cyclin kinases
(f)		(cancer) cells divide out of control / mitosis continues ; apoptosis not triggered ; tumour forms ;	2 max	IGNORE cells divide rapidly
Total			20	

Question		Expected Answers	Marks	Additional Guidance	
5	(a)	(a preparation that) contains antigens ;	1	CREDIT triggers antibody production / specific immune response	
	(b)	<p><i>Answers for A and B (in either order):</i> tetanus ; pertussis / whooping cough ;</p> <p><i>Answer for C:</i> meningitis ;</p> <p><i>Answers for D and E and F (in any order):</i> measles ; mumps ; Rubella ;</p>	6	<p>If A is tetanus then B must be pertussis or whooping cough If A is pertussis or whooping cough then B must be tetanus</p> <p>ACCEPT 'German measles'</p>	
	(c)	(i)	the live virus is an, attenuated / weakened, strain / form ; IPV does not contain live viruses / contains dead viruses ;	1 max	DO NOT CREDIT 'dead'

		<p>(ii)</p> <p><i>Advantage:</i> (organisms) multiply therefore is more antigen ; (organisms multiply) therefore antigens are present for longer ; (live vaccine) more effective ;</p> <p><i>Disadvantage:</i> (live vaccine) could cause disease symptoms / AW ; can't give (live vaccine) to an immune compromised person / AW ;</p>	<p>2 max</p>	<p>Candidates must give one advantage and one disadvantage for 2 marks</p> <p>CREDIT idea of a stronger immune response e.g. more memory cells created / faster rate of antibody production / more antibodies made</p> <p>CREDIT named condition e.g. leukaemia</p>
--	--	--	---------------------	---

Question		Expected Answers	Marks	Additional Guidance
	(d) (i)	Human Papilloma Virus ;	1	ALLOW phonetic spelling of Papilloma
	(ii)	(HPV causes) cervical cancer ; (only) females have a cervix ;	2	CREDIT 'males do not have a cervix'
	(e)	HPV is sexually transmitted ; (could be seen as) encouraging sexual activity ; (girls) below age of consent / not 16 ; (could be seen as) encouraging unprotected sex ; requires parental consent and parents might refuse ; specific religious / cultural, objections ; any vaccine has risk of potential side effects ; AVP ;	3 max	idea that it will result in more sexual activity in girls under sixteen gets both marks e.g. idea that vaccine might reduce cervical screening
Total			16	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	<p>by non-disjunction ; (X) chromosomes / chromatids fail to separate ; in meiosis ; in anaphase ;</p> <p>gamete / AW, has, no X chromosome / 22, chromosomes / only autosomes ; fuses with, gamete with X chromosome / 23 chromosomes ; at fertilisation ; zygote has 45 chromosomes ; Turner's, is XO / has only one X chromosome ;</p>	5 max	<p>For all marking points, ACCEPT a labelled diagram that conveys the same information</p> <p>CREDIT 'X and Y' or 'sex chromosomes'</p> <p>CREDIT named gamete</p> <p>ACCEPT fertilised egg cell</p>
		QWC ;	1	correct reference to non disjunction in meiosis and fertilisation resulting in, 45 chromosomes / XO / missing chromosome
	(b) (i)	stimulates, cell division / mitosis ; chromosomes only visible in dividing cells ;	1 max	
	(ii)	prevents spindle formation ; stops mitosis / AW ; chromatids, still attached / not separated ;	2 max	ACCEPT stopping cell division / cell cycle
	(iii)	cells, swell / burst / lyse ; chromosomes spread out ;	1 max	ACCEPT expands
	(iv)	so (chromosomes) visible (under microscope) ; banding pattern visible ;	1 max	
Total			11	

F224 Energy, Reproduction & Populations

Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	<u>primary</u> spermatocyte / spermatogonium ;	1	DO NOT CREDIT primary and secondary spermatocyte
		(ii)	spermatid / secondary spermatocyte ;	1	DO NOT CREDIT sperm / spermatozoa
	(b)		<u>acrosome</u> ;	1	CREDIT acrosomal, cap / head
	(c)	1	secondary oocyte ;	6	DO NOT CREDIT primary oocyte or oocyte ACCEPT digestive or hydrolytic enzymes IGNORE cortical reaction DO NOT CREDIT fertilisation barrier
		2	enzymes ;		
		3	zona pellucida ;		
		4	flagellum / contractile filaments ;		
		5	fertilisation membrane ;		
		6	fuse ;		

	(d)	1	can only be used within 72 hours of intercourse ;		
		2	abdominal, pains / cramps ;		DO NOT CREDIT stomach pains
		3	sickness / vomiting / nausea ;		
		4	specific, ethical / religious , reason ;		e.g. belief that life begins at fertilisation
		5	named possible medical complications ;		e.g. long term disruption to menstrual cycle
		6	does not protect against, STIs / named sexually transmitted disease ;		
		7	AVP ;		e.g. can get it without medical advice / no medical records kept
				2 max	
			Total	11	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	D ;	1	
		(ii)	E ;	1	
	(b)		1. (Ca^{2+}) released from sarcoplasmic reticulum ; 2. binds to troponin ; 3. (troponin) changes shape ; 4. tropomyosin is, displaced / AW ; 5. (myosin) binding sites exposed ; 6. myosin head now, binds / attaches / joins, to actin ; 7. QWC ;	4 max 1	DO NOT CREDIT Ca^+ or calcium CREDIT Ca^{++} or calcium ions DO NOT CREDIT myosin binds to actin all three emboldened terms used and spelt correctly
	(c)	(i)	25.8 (%) ;;	2	Correct answer = 2 marks CREDIT answers to a maximum of 1dp If answer incorrect, allow 1 working mark for $(8 \div 31) \times 100$ OR 26 DO NOT CREDIT 26.0

		<p>(ii)</p> <p>age (group) ;</p> <p>ethnic origin ;</p> <p>build / somatotype ;</p> <p>baseline fitness / AW ;</p> <p>no underlying illness ;</p> <p>diet ;</p> <p>same number of tablets ;</p> <p>same appearance of tablets ;</p> <p>no other, supplements / medication ;</p>	<p>2 max</p>	<p>Mark the first 2 stated answers DO NOT CREDIT gender</p> <p>e.g. mesomorph / BMI / height and weight DO NOT CREDIT height or weight alone</p> <p>e.g. people are all athletes / smokers or non- smokers DO NOT CREDIT family history of disease</p> <p>e.g. colour / size</p>

Question	Expected Answers	Marks	Additional Guidance
	<p>(iii) either protein / amino acid ; for growth of muscle, fibres / cells ; or carbohydrate / sugar ; for energy for, exercise / storage ; or steroid / named steroid ; stimulate protein synthesis ; or creatine phosphate ; rapid regeneration of ATP ;</p>	2	CREDIT one appropriate ingredient with a valid use
	Total	13	

Question			Expected Answers	Marks	Additional Guidance								
3	(a)	(i)	X – <u>adenine</u> ;	1	DO NOT CREDIT adenosine								
		(ii)	Y – <u>ribose</u> ;	1	IGNORE pentose								
	(b)		<table border="1"> <thead> <tr> <th>stage</th> <th>products</th> </tr> </thead> <tbody> <tr> <td>glycolysis</td> <td>pyruvate reduced NAD</td> </tr> <tr> <td>Krebs cycle</td> <td>reduced NAD reduced FAD CO₂</td> </tr> <tr> <td>oxidative phosphorylation</td> <td>water NAD / FAD</td> </tr> </tbody> </table>	stage	products	glycolysis	pyruvate reduced NAD	Krebs cycle	reduced NAD reduced FAD CO ₂	oxidative phosphorylation	water NAD / FAD	3	<p>All 6 correct products in the correct place in the table = 3 marks</p> <p>4 or 5 correct products in the correct place in the table = 2 marks</p> <p>2 or 3 correct products in the correct place in the table = 1 mark</p> <p>0 or 1 correct product in the correct place in the table = 0 mark</p> <p>CREDIT NADH / NADH₂ / NADH + H⁺/ FADH etc</p>
stage	products												
glycolysis	pyruvate reduced NAD												
Krebs cycle	reduced NAD reduced FAD CO ₂												
oxidative phosphorylation	water NAD / FAD												

Question		Expected Answers	Marks	Additional Guidance	
	(c)	<p><i>lipids</i></p> <p>1 more C-H bonds or more reduced or more hydrogen ;</p> <p>2 produces more reduced NAD ;</p> <p>3 produces more ATP per gram ;</p> <p>4 more aerobic respiration or more electron transport chain / ETC / oxidative phosphorylation / chemiosmosis or fats only broken down aerobically ;</p>	2 max	<p>CREDIT reverse argument for carbohydrates Statements should be comparative DO NOT CREDIT H₂ / hydrogen ions</p> <p>CREDIT reduced NAD / NADH₂ / NADH + H⁺</p>	
	(d)	(i)	<p>CO₂ produced divided by O₂ consumed ;</p> <p><u>volume</u> of CO₂ divided by <u>volume</u> of O₂ ;</p> <p>in the same time / per unit time ;</p>	2 max	<p>CREDIT $\frac{\text{volume of CO}_2 \text{ produced}}{\text{volume of O}_2 \text{ consumed}}$ gets both marks DO NOT CREDIT amount</p> <p>CREDIT \div (a specified) time or (a specified) time⁻¹</p>
		(ii)	<p><i>carbohydrate</i> = 1.0 ;</p> <p><i>lipid</i> = 0.6 – 0.8 ;</p>	2	CREDIT a single figure in the range or a range
		(iii)	goes up ;	1	CREDIT a figure greater than 1 or figures that show an increase
Total			12		

Question		Expected Answers	Marks	Additional Guidance
4	(a)	<p>1 implantation less likely (in uterus of older woman) ;</p> <p>2 miscarriage rate increases (with age) ;</p> <p>3 (as) fewer hormones / unbalanced hormones (in older woman) / menopause ;</p> <p>4 (as) genetic defects increase in oocyte (with age) ;</p> <p>5 placental function less efficient ;</p>	3 max	<p>IGNORE description of the trend</p> <p>CREDIT reverse argument for younger mothers but do not credit the same mark point twice</p>
	(b)	<p>(GIFT) sperm and oocytes placed directly in, oviduct / fallopian tube ;</p> <p>natural fertilisation ;</p> <p>sperm / oocytes, often donated ;</p> <p>(ICSI) sperm injected directly into oocyte ;</p> <p>embryo inserted into uterus ;</p>	<p>(2 max)</p> <p>3 max</p>	<p>CREDIT male and female gametes throughout</p> <p>DO NOT CREDIT 'egg'</p> <p>2 max overall if :</p> <ul style="list-style-type: none"> • treatments not identified • GIFT and ICSI swapped round
Total			6	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	rubisco / ribulose bisphosphate carboxylase / RuBP carboxylase;	1	DO NOT CREDIT RuBP / RuBPase
		(ii)	ATP ; reduced NADP ;	2	ACCEPT NADPH / NADPH ₂ / NADPH + H ⁺ DO NOT CREDIT reduced NAD / NADH ₂ / NADH + H
		(iii)	lipids / fatty acids / triglycerides / glycerol ; amino acids / protein ; AVP ;	2 max	e.g. nucleic acids / nucleotides / DNA / RNA
	(b)	(i)	as mass of algae increases dissolved oxygen concentration decreases ; paired comparative figs with units ;	2	both mass and concentration on 2 separate days e.g. algae 15 – 115 oxygen 8.5 – 0.5 figures can be manipulated assume days 0 - 20 unless otherwise stated

Question	Expected Answers	Marks	Additional Guidance
	<p>(ii) mineral ions enter lake, from effluent ;</p> <p>named ion ;</p> <p>algae use / AW, ions, to grow ;</p> <p><u>eutrophication</u> ;</p> <p>ref. higher temperature / longer day length / higher light intensity, in summer ;</p>	<p>2 max</p>	<p>e.g. nitrate / ammonium / phosphate IGNORE potassium (because effluent, not fertiliser)</p> <p>ACCEPT 'more light in summer'</p>
	<p>(iii)</p> <ol style="list-style-type: none"> 1. plants / algae, die (from lack of light) ; 2. (plants / algae) decomposed / decayed, by bacteria ; 3. increasing population of bacteria / AW ; 4. more oxygen used (by bacteria) ; 5. (bacteria carry out) <u>aerobic respiration</u> ; 	<p>3 max</p>	<p>IGNORE oxygen used or produced by algae</p> <p>must stress the idea of more bacteria</p> <p>must stress the idea of more oxygen</p>
	Total	12	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	<p>1 (interacting) community of organisms ;</p> <p>2 within, a specific habitat ;</p> <p>3 biotic / living, component ;</p> <p>4 abiotic / physical, component ;</p> <p>5 shows biodiversity / variety of species ;</p> <p>6 QWC ;</p>	<p>2 max</p> <p>1</p>	<p>DO NOT CREDIT 'rainforest' alone</p> <p>ACCEPT named plants from Fig. 6.1</p> <p>three of the emboldened terms used and spelt correctly</p>
	(b)	<p>1 medical use ;</p> <p>2 named resource material ;</p> <p>3 food / agriculture ;</p> <p>4 ecotourism / aesthetic benefits ;</p> <p>5 prevention of natural disasters ;</p> <p>6 home to indigenous human populations ;</p> <p>7 remove CO₂ from atmosphere, so reduce climate change ;</p>	<p>3 max</p>	<p>mark the first three stated answers</p> <p>e.g. wood for building / fibres for clothes / genetic resource</p> <p>e.g. prevents soil erosion / prevents flash floods / specific impact on climate</p>
Total			6	

Grade Thresholds

Advanced GCE Human Biology (H423)
 Advanced Subsidiary GCE Human Biology (H023)
 January 2010 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
F221	Raw	60	39	33	28	23	18	0
	UMS	90	72	63	54	45	36	0
F222	Raw	100	65	58	51	44	37	0
	UMS	150	120	105	90	75	60	0
F224	Raw	60	43	37	31	26	21	0
	UMS	90	72	63	54	45	36	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
H023	300	240	210	180	150	120	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
H023	2.2	17.8	42.2	71.9	95.6	100.0	136

136 candidates aggregated this series.

For a description of how UMS marks are calculated see:

<http://www.ocr.org.uk/learners/ums/index.html>

Statistics are correct at the time of publication.

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

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

© OCR 2010

