

GCE

Human Biology

Unit **F224**: Energy, Reproduction and Populations

Advanced GCE

Mark Scheme for June 2016

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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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Question		Answer	Mark	Guidance
1	(a)	molecule, broken down / hydrolysed (during respiration) ; energy released / ATP produced ;	2	IGNORE substance CREDIT compound / named molecule (e.g. glucose, lipids proteins) DO NOT CREDIT energy / ATP energy, produced
	(b) (i)	oxygen ;	1	CREDIT correct formula (O ₂)
	(ii)	inner mitochondrial membrane ;	1	CREDIT cristae
	(iii)	ATP synthase ;	1	CREDIT ATP synthetase ALLOW phonetic spelling
	(c) (i)	<u>ethanol</u> ;	1	IGNORE alcohol
	(ii)	X (and Y) / ethanol (and carbon dioxide), product of <u>anaerobic</u> respiration ; Y and Z / carbon dioxide and water, products of <u>aerobic</u> respiration ; no C - H bonds present in, Y and Z / carbon dioxide and water OR	Max 3	CREDIT correct formulae throughout IGNORE ref. to lactic acid

Question			Answer	Mark	Guidance
			C – H bonds present in X / ethanol ; (so) more C - H bonds broken during aerobic respiration ; more ATP produced / energy released, in aerobic respiration ;		ORA for anaerobic respiration ORA for anaerobic respiration DO NOT CREDIT energy produced
			Total	9	

Question		Answer	Mark	Guidance
2	(a)	line drawn from point A to point within (either) fallopian tube ;	1	CREDIT lines going down both fallopian tubes if arrows are drawn, they must be in the correct direction
	(b)	<i>idea of end / terminal part of ;</i> <i>tail / flagellum ;</i>	2	CREDIT flagella
	(c)	gametes are genetically different ; <i>idea that</i> which gametes fuse is random ; <i>idea of</i> potentially large number of combinations ;	Max 2	ALLOW sperm / eggs for 'gametes' throughout IGNORE ref. to meiosis (as question is about fertilisation) IGNORE random, mating / fertilisation e.g. one egg can be fertilised by any one of a large number of sperm
	(d)	(i) blastocyst ;	1	CREDIT morula IGNORE zygote / embryo
		(ii) <u>endometrium</u> ; uterus ;	2	IGNORE 'lining'
		(iii) <i>idea that</i> blood loss will lead to a fall in blood pressure (BP) ; <i>idea that</i> heart / pulse, rate rises to maintain blood pressure ; AVP ;	Max 2	e.g. adrenaline release due to (hypovolemic) shock raises heart / pulse rate
		Total	10	

Question		Answer	Mark	Guidance
3	(a)	attachment of carbohydrate (to protein) in Golgi ; (mucin packaged) into vesicle(s) ; vesicle, moves toward and fuses with, <u>cell surface / plasma membrane</u> ; (mucin) released by exocytosis ;	Max 4 1	CREDIT sugar IGNORE binding QWC awarded for correct use of three emboldened terms Golgi vesicle(s) cell surface / plasma, membrane exocytosis
	(b)	(i) facilitated diffusion OR active transport ; correct detail of mechanism ;	Max 2	e.g. (facilitated diffusion) through channel proteins / down concentration gradient (active transport) through carrier proteins / against concentration gradient
		(ii) (high concentration of ions) reduces water potential ; water moves out of cells, by osmosis / down water potential gradient ;	2	CREDIT ORA for inside cells CREDIT ORA for mucus
		(iii) <i>idea of easier</i> for sperm to swim so increased chance of fertilisation ;	1	e.g. allows an easier passage for sperm to reach the fallopian tube for fertilisation

Question		Answer	Mark	Guidance
	(c)	<p>more FSH ;</p> <p>(release of FSH) not inhibited by oestrogen ;</p> <p>more follicles, ripen / mature ;</p> <p>increased, number of (secondary) oocytes released / ovulation ;</p> <p><i>idea of</i> more chances of fertilisation ;</p>	<p>Max 3</p>	<p>IGNORE ref. to LH throughout</p> <p>DO NOT CREDIT (clomiphene) stimulates release of FSH</p> <p>CREDIT eggs / ova</p> <p>e.g. more oocytes available to be fertilised</p>
		Total	13	

Question		Answer	Mark	Guidance
4	(a)	(anabolic) steroids are, lipid soluble / non-polar ; (steroids) <u>diffuse</u> through <u>phospholipid bilayer</u> ; cell surface / plasma, membrane and nuclear membrane ; AVP ;	Max 2	IGNORE lipid based DO NOT CREDIT facilitated diffusion IGNORE envelope ref. to intracellular transport of steroids
	(b) (i)	13 / 14 ; ;	2	Max 1 if answer given to more than 2 significant figures CREDIT $19.6 - 17.0 = 2.6$ / $19.7 - 17.0 = 2.7$, for 1 mark OR $2.6 \div 19.6 \times 100$ / $2.7 \div 19.7 \times 100$, for 1 mark
	(ii)	increased training time ; decreased recovery time ; AVP ;	Max 2	CREDIT can train longer / increased endurance time CREDIT ref. to named activity (e.g. can run longer) IGNORE can train harder / aerobically respire for longer CREDIT can recover faster e.g. increased erythrocyte production / increase haemoglobin in blood

Question		Answer	Mark	Guidance
	(c)	<p>YES performances declined after ban ;</p> <p>NO performances did not drop back to 1960s level ;</p>	Max 2	<p>IGNORE ref. to distance figures quoted from the graph</p> <p>CREDIT ORA CREDIT performances declined, after testing introduced / late 1980s / 1985 onwards</p> <p>DO NOT CREDIT performances declined after 1980-1984</p> <p>DO NOT CREDIT performance continued to improve after late1980s</p> <p>IGNORE performance continued to improve after 1980 (as testing was not introduced until the late 1980s)</p>
		Total	8	

Question		Answer	Mark	Guidance
5	(a)	<i>idea that</i> (water vapour) does not accumulate / increase over time ;	Max 1	IGNORE ref. to other greenhouse gases
	(b) (i)	<i>idea that</i> it allows comparison between different gases ;	1	CREDIT CO ₂ sets a baseline for comparing other gases
	(ii)	149 ; ;	2	Max 1 for 298 / 2 OR 298 x 0.5
	(c)	(hydrofluorocarbons) have very high GWP ; <i>idea that</i> small quantity of hydrofluorocarbons affect global warming to same degree as large quantity of other greenhouse gases ; data quoted correctly in support ;	Max 2	IGNORE high / -er / -est / large / -er / -est CREDIT idea that a small quantity of HFC can offset a large reduction in CO ₂ production / emissions must be a comparison between GWP values
	(d) (i)	carbon fixation / carbon dioxide combines with, ribulose bisphosphate / RuBP ; formation of, glycerophosphate / glycerate-3-phosphate / GP, from six carbon intermediate ; formation of, triose phosphate / TP, from, glycerophosphate / GP, using ATP and reduced NADP ; organic molecules formed from, triose phosphate / TP ;	Max 3 1	ACCEPT NADPH ACCEPT named organic molecules (carbohydrates, lipids, aminoacids) QWC awarded for correct use of three emboldened terms carbon fixation ribulose bisphosphate glycerophosphate / glycerate 3- phosphate triose phosphate

Question			Answer	Mark	Guidance
		(ii)	(eCO ₂) produced using, sugar beet / plants ; renewable ; fossil fuels not renewable ;	Max 2	IGNORE recyclable / biodegradable
			Total	12	

Question			Answer	Mark	Guidance
6	(a)	(i)	nitrogen-fixing bacteria / Rhizobium (in root nodules) ; nitrogen required for (synthesis of) nitrogen compounds ; <i>idea of soil is not depleted of,</i> nitrogen containing compounds / named ; <i>idea of reduced need for fertiliser ;</i>	Max 3	IGNORE Azotobacter CREDIT named nitrogen compound, e.g. amino acids / proteins / RNA / DNA CREDIT increase nitrogen compounds in the soil / maintain a nitrogen rich soil IGNORE provide nitrates to soil CREDIT (legumes) naturally fertilise the soil
		(ii)	fungi / bacteria ; extracellular enzymes ; break down of organic material ; deamination / ammonification ; AVP ;	Max 3	DO NOT CREDIT nitrogen fixing / nitrifying, bacteria CREDIT proteins / amino acids / nucleic acids ref. to nitrification
	(b)		<i>idea that</i> (stubble) provides a food source; <i>idea that</i> (stubble) provides, nesting sites / <u>habitat</u> ;	Max 2	IGNORE provides shelter
Total				8	

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