GCE

Human Biology

Advanced Subsidiary GCE

Unit **F222:** Growth, Development and Disease

Mark Scheme for June 2011

Any enquiries about publications should be addressed to:

Question			Expected Answers	Marks	Additional Guidance
1	**a**		eat less, (red / processed) meat **;** exercise regularly / AW **;** eat more, fruit / vegetables / high fibre food **;** drink less alcohol **;** stop smoking **;** maintain a healthy weight / AW **;**	**2 max**	Mark first two answers given **IGNORE** general comments about diet e.g. 'healthier or balanced diet'

Questions			Expected answers	Marks	Additional guidance

	b		*incidence*
			incidence in both males and females increases **;**
			incidence is higher in males than females / described **;**
			greater increase in incidence in males than females / incidence rate
			                rises steadily in males but fluctuates in females / AW **;**
			
			pairs of comparative figures for incidence
			                with units for rate to support **;**
			
			                                                     max 3
					comparisons do not need to be in same sentence
					
					<table><tr><td rowspan="2">year</td><td colspan="2">incidence
					rate per 100 000</td></tr><tr><td>male</td><td>female</td></tr><tr><td>1970</td><td>43</td><td>33</td></tr><tr><td>1975</td><td>46</td><td>35</td></tr><tr><td>1980</td><td>48</td><td>35</td></tr><tr><td>1985</td><td>50</td><td>37</td></tr><tr><td>1990</td><td>52</td><td>38</td></tr><tr><td>1995</td><td>54</td><td>38</td></tr><tr><td>2000</td><td>56</td><td>36</td></tr><tr><td>2005</td><td>57</td><td>38</td></tr></table>2 years and 2 rates (or calculated)

			mortality mortality (rate) is higher in males than females **;** the mortality (rate) in males and females has decreased **;** pairs of comparative figures for mortality with units for rate to support **;** ***max 3***		*mortality* <table><tr><td rowspan="2">year</td><td colspan="2">mortality rate per 100 000</td></tr><tr><td>male</td><td>female</td></tr><tr><td>1970</td><td>34</td><td>27</td></tr><tr><td>1975</td><td>34</td><td>27</td></tr><tr><td>1980</td><td>32</td><td>24</td></tr><tr><td>1985</td><td>30</td><td>22</td></tr><tr><td>1990</td><td>30</td><td>20</td></tr><tr><td>1995</td><td>28</td><td>18</td></tr><tr><td>2000</td><td>26</td><td>16</td></tr><tr><td>2005</td><td>23</td><td>14</td></tr></table>2 years and 2 rates (or calculated)
				4 max	

Questions			Expected Answers	Marks	Additional Guidance
	c		to reduce the number of deaths from (bowel) cancer **;** to detect (bowel) cancer at an early stage / AW **;** (early stages) can be treated more successfully / less likely to have spread / AW **;** the 60-75 age group is more at risk **;** **2 max**		Mark first two suggestions **ACCEPT** higher chance of survival **DO NOT CREDIT** treated unqualified **ACCEPT** idea of older age group
	d		**D** first **;** **C** last **;** **B** before **E** (anywhere in the sequence) **;** **E** before **A** (anywhere in the sequence) **;** **4**		Correct order: **D**, **B**, **E**, **A**, **C** = 4 marks
	e		age **;** weight **;** race / ethnicity **;** if they, are suffering from / have suffered from, a (named) disease **;** if they, have had chemotherapy / are on medication / AW **;** if they have a family history of bowel cancer **;** **2 max**		**IGNORE** ref to gender **DO NOT CREDIT** references to lifestyle **IGNORE** culture **ACCEPT** 'if they are ill'
	f		similar, <u>shape</u> / <u>structure</u>, molecule to oestrogen **;** isoflavone is <u>complementary</u> to (oestrogen) receptor **;** binds to the oestrogen receptors / competes with oestrogen for receptor AW **;** prevents oestrogen binding **;** **2 max**		

Question			Expected Answers	Marks	Additional Guidance

	g		*essential amino acids*
			needed to make, new proteins / named protein /
			                (named) non-essential amino acids **;**
			(these amino acids) cannot be synthesised (by the body) **;**
			
			polyunsaturated fatty acids
			needed to make, phospholipids / glycolipids / triglycerides / steroids /
			                lipids **;**
			
			needed for production of myelin sheath / cell membrane / AW **;**
				3 max	

	h		*Study 1* *idea of* (soy food) may not have the same effect on men who are not having already having problems with fertility / AW **;** *Study 2* humans may respond differently to monkeys / AW **;** **or** study only carried out on females (and males can have breast cancer) **;**	**2**	**IGNORE** ref to small sample size **ACCEPT** monkeys might be affected differently 'difference' needs to be qualified in some way (e.g. a different species, different genetic makeup)
			Total	**21**	

Question			Expected Answers	Marks	Additional Guidance
2	a		*optimal growth* the, best / ideal / healthiest, growth (for a baby) **;** *average growth* mean / median / mode / described, growth of a sample (of babies) **;**	**2**	**DO NOT ACCEPT** 'optimum' since this is given in the stem **ACCEPT** most common growth rate as this is a description of the mode **ACCEPT** growth at the 50th centile
	b	(i)	scales used that are specially designed for babies / AW **;** baby's clothes removed **;** weight recorded in kg **;** for three separate recordings **;** mean taken of two readings that are closest together **;** if one reading very different a further reading is taken **;**	**4 max**	**ACCEPT** specific scales **DO NOT ACCEPT** scale unqualified **IGNORE** weighing mother + child methods as not accurate **ACCEPT** 'average' instead of 'mean'
		(ii)	length / height **;** head circumference **;**	**2**	**DO NOT CREDIT** crown –rump length, or biparietal diameter as these are fetal measurements **DO NOT CREDIT** mass
	c	(i)	8 (%) **;;**	**2**	If answer incorrect **CREDIT** 1 mark for correct working $\dfrac{4.29 - 3.95}{4.29}$ **or** $\dfrac{0.34}{4.29}$ If answer not given to whole number **CREDIT** 1 mark for 8.0, 7.9, 7.93

Question			Expected Answers	Marks	Additional Guidance
		(ii)	75th (centile) ;	1	**ACCEPT** 50th
		(iii)	5.0 <u>kg</u> ;	1	**ACCEPT** 5 <u>kg</u> Units must be given. **ALLOW** 4.7kg if 50th centile given **ACCEPT** + or minus 0.2 for figs **ACCEPT** error carried forward for incorrect centile
		(iv)	not feeding properly / AW ; have had an infection ; have a, named / described, condition which affects growth / AW ;	2 max	**ACCEPT** the baby has been ill Condition could be inherited or congenital
	d	(i)	growth rate falls rapidly, initially / to begin with / up to 3 / 4 years ; growth rate, decreases more slowly / levels off ; then a, rapid increase / growth spurt (between 12 and 14 years) / peak at 14 years ; then decreases rapidly ; pairs of comparative figures to support ;	4 max	2 years and two rates (or calculated) | age	relative growth rate (cm year⁻¹)
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1	18.0
2	12.8
3	8.8
4	7.2
5	6.2
6	5.8
7	5.4
8	5.2
9	5.0
10	5.0
11	5.0
12	5.2
13	6.8
14	9.8
15	6.0
16	2.6
17	1.0
18	0.1	 **ACCEPT** + or – 0.4 for figs

Question			Expected Answers	Marks	Additional Guidance
		(ii)	*line drawn* same as boys between 0 and, 9 / 10, years **;** growth spurt peak before **and** lower than that of boys **;** growth curve reaches x axis after 16 but before 18 **;** **2 max**		**DO NOT CREDIT** if line 2 or more small squares lower or higher than boys peak between 10 and 14
		(iii)	 *relative growth curve* takes account of the starting, mass / weight / height / AW **;** *idea of* truer representation of growth **;** *idea of* relative growth curve more straightforward to use / AW **;** **2 max**		**ORA** referring to absolute growth curve **ACCEPT** 'more accurate or efficient'
			Total	**22**	

Question			Expected Answers	Marks	Additional Guidance
3	**a**		*Mycobacterium tuberculosis* **or** *Mycobacterium bovis* **;**	**1**	Name must be given in full **IGNORE** *M. tuberculosis* / *M. bovis* **ALLOW** upper / lower cases incorrectly applied **DO NOT CREDIT** microbacterium or myobacterium
	b	**(i)**	tuberculin / protein, acts as an <u>antigen</u> (from TB bacteria) **;** *if person has been in contact with TB bacteria* they will have, memory cells / antibodies, already present **;** <u>specific</u> to tuberculin / TB bacteria **;** memory cells / antibodies, move to the site of injection / AW **;** reaction with tuberculin causing the, swelling / lump / AW **;** (swelling) caused by inflammation / action of leucocytes / phagocytes **;** correct reference to (the role) of histamine **;**	**3 max**	
		(ii)	they may have been immunised against TB **;**	**1**	

		(iii)	they may have, a weakened immune system / HIV **;**
			  idea of infected recently and antibodies memory cells not yet
			                                    developed **;**
				1 max	

	c	**(i)**	TB bacteria are resistant to more than one <u>antibiotic</u> / AW **;**	**1**	Ignore 'drugs' **ALLOW** resistant to **antibiotics** (plural) **DO NOT CREDIT** immune to antibiotics

Question			Expected Answers	Marks	Additional Guidance
		(ii)			**DO NOT CREDIT** 'bacteria are immune' throughout
		1	(populations of) TB bacteria / *M. tuberculosis* / bacteria, show genetic variation **;**		
		2	(as a result of) gene mutations / changes in DNA **;**		
		3	which may cause the bacteria to be resistant (to an antibiotic) **;**		
		4	a description of how bacteria may be resistant (to an antibiotic) **;**		*4* e.g. are able to make an enzyme that breaks down the drug
		5	antibiotic acts as a, selection pressure / selective agent **;**		
		6	resistant bacteria survive **;**		ORA for MPs *6*, *7*, *8*
		7	(resistant bacteria) reproduce / multiply / produce offspring **;**		
		8	(resistant bacteria) pass on the, genes / alleles, that give resistance **;**		
		9	when a new antibiotic is used the process is repeated / AW **;**		
		10	idea of horizontal transmission gene (on plasmid) / AW **;** *max 7*		
		Q	QWC for the correct sequence of events **;**		One MP from 1 – 4 before One MP from 5 – 8
				8	

Question			Expected Answers	Marks	Additional Guidance
	d	(i)	rare plants / plants that may become extinct, are stored / AW ; (plants) may be screened for a source of new chemicals that have medicinal properties / AW ; easier to store seeds rather than whole plants / seeds are more compact ; seeds can be stored for long time ;	2 max	**DO NOT CREDIT** conserve as it is in the stem of the question
		(ii)	keeping / maintaining, organisms / named example ; outside their natural habitat / AW ;	2	organisms may be whole or part of an organism
			Total	19	

Question			Expected Answers	Marks	Additional Guidance
4	**a**	**(i)**	interphase ;	1	
		(ii)	*G1* growth **or** synthesis of RNA **or** synthesis of proteins **or** replication of organelles / named organelle **or** respiration ; *S* replication / synthesis, of DNA ;	2	
	b		concern about the source of embryos ; embryo denied human rights of consent / AW ; (could be considered as) the same as destroying a human life ; contrary to / against, religious belief ; it could lead to cloning humans / designer babies ; may give people false hope (as research in very early stages) / AW ;	2 max	e.g. aborted / unused for IVF / harvested for the purpose e.g. idea that potentially life begins at conception **IGNORE** 'playing God' or vague religious reference **CREDIT** 2 correct MPs where ever they occur

Question				Expected Answers	Marks	Additional Guidance
c	**(i)**			*both*		
		1		stem cells divide by <u>mitosis</u> **;**		
		2		genes, switched on / switched off / activated / deactivated **;**		
		3		new proteins made **;**		
		4		cells, develop specialised features / become specialised **;**		**4 IGNORE** 'differentiate' (as given in Q)
				erythrocyte		
		5		becomes smaller / is small **;**		**5 IGNORE** shrinks
		6		loses its nucleus / has no nucleus **;**		
		7		loses / has no / has few, mitochondria / named organelle **;**		
		8		becomes / is, a bi-concave shape **;**		
		9		produces / contains, haemoglobin **;**		
				neutrophil		
		10		nucleus, becomes / is, lobed **;**		
		11		cell, grows / is, larger **;**		
		12		cytoplasm, granular **;**		
		13		has many lysosomes **;**		
		14		(lysosomes) contain, hydrolytic / digestive, enzymes / lysozyme **;**		
				7 max		
		Q		QWC refers to both erythrocyte and neutrophil **;**		**One** MP from **5** – **9** **and** **One** MP from **10** – **14**
					8 max	

Question			Expected Answers	Marks	Additional Guidance

		(ii)	no nucleus so
			    no, (control of) protein synthesis / new proteins made
			    or
			    no, mitosis / cell division ;
			no lysosomes so
			    no removal of damaged cell contents / AW ;
			no mitochondria so
			    little, (aerobic) respiration / ATP production / supply of energy ;
			no RER so
			    no protein synthesis / new proteins made ;
					ACCEPT can't replicate

				1 max	
			Total	14	

Question			Expected Answers	Marks	Additional Guidance
5	**a**	**(i)**	as age increases the number of deaths increases ; (at all ages) more men die than women ; pairs of comparative figures for increase with age ; pairs of comparative figures to show more men die than women ; **3 max**		figures may be given for either males or females (see table below)

figures may be given for either males or females

age (years)	number of deaths	
	male	female
under 35	129	27
35-44	783	183
45-54	2 679	578
55-64	6 687	1 779
65-74	11 335	4 987

Question			Expected Answers	Marks	Additional Guidance
		(ii)	*age - older people are more likely to:* be, overweight / obese ; be inactive ; have, atherosclerosis / atheroma / AW ; have high blood pressure ; have high cholesterol ; be diabetic ; *idea of* may have been smoking for longer / AW ; **3 max** *gender* women are protected from heart disease before the menopause ; (before the menopause / protected by) higher oestrogen levels ; men are more likely to put on fat around the abdomen / AW ; men have smoked more (in the past) ; **4 max**		

Question			Expected answer	Marks	Additional guidance
	b	**(i)**	exercise leads to increased heart rate ; heart / cardiac, muscle needs more oxygen ; coronary arteries narrowed (in people with angina) ; by atheroma / AW ; less blood to, cardiac / heart, muscle / cells / tissue ; unable to supply enough oxygen for (aerobic) respiration / AW ;	**3 max**	**ALLOW** heart, beats / pumps faster **IGNORE** ref to glucose **DO NOT CREDIT** blocked **DO NOT CREDIT** heart on its own **IGNORE** ref to glucose

Question			Expected Answers	Marks	Additional Guidance
		(ii)	catheter fed into <u>artery</u> ; stent and balloon pushed into <u>coronary</u> <u>artery</u> ; balloon inflated ; stent expanded ; opens up artery AW ; deflated balloon (and catheter) removed ; leaving stent in place ;	**4 max**	
	c		(heart) bypass ; (heart) transplant ; AVP ;	**2**	Mark first two answers e.g. ablation (removal of dead cardiac muscle)
			Total	**16**	

Question			Expected Answers	Marks	Additional Guidance
6	a		hydrogen ; complementary ; condensation ; DNA polymerase ; semi-conservative ;	5	**ACCEPT** A to T **and** C to G **ACCEPT** polymerisation **ACCEPT** polymerase
	b	(i)	karyotypes shows chromosomes ; change in nucleotide sequence too small to show up in chromosomes ;	1	
		(ii)	Turner's syndrome ; Klinefelter's syndrome ; AVP ;	2 max	**ACCEPT** phonetic spelling e.g. Down's syndrome, Edward's
			Total	8	

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