

Human Biology

Advanced Subsidiary GCE

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

Mark Scheme for January 2011

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Question			Expected Answers	Marks	Additional Guidance												
1	(a)	(i)	probability / likelihood / chance (that an individual will develop, breast cancer / the disease) ; by given age / in a lifetime / AW ; <i>idea of additive risk / AW ;</i>	2 max	DO NOT CREDIT risk as it is given in the stem												
		(ii)	as age increases the (cumulative) risk increases ; two ages (in years) and two percentages ;	2	e.g. from 0% at age 30 to 65% at age 70 CREDIT other correct pairs of comparative figs % must be given <table border="1"> <thead> <tr> <th>age</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>30</td> <td>0</td> </tr> <tr> <td>40</td> <td>11</td> </tr> <tr> <td>50</td> <td>38</td> </tr> <tr> <td>60</td> <td>52</td> </tr> <tr> <td>70</td> <td>65</td> </tr> </tbody> </table> CREDIT calculations of increased risk instead of a pair of figs ACCEPT + or -1 for 11 (at age 40) and 65 (at age 70)	age	%	30	0	40	11	50	38	60	52	70	65
age	%																
30	0																
40	11																
50	38																
60	52																
70	65																
		(iii)	<i>sporadic</i> not associated with inherited <u>genes</u> / caused by <u>gene</u> mutations acquired during woman's lifetime / caused by somatic mutation / AW ; <i>familial</i> associated with inherited <u>genes</u> / caused by germ line mutation / AW ;	2	CREDIT allele for gene throughout ACCEPT DNA mutations 'familial is caused by inherited gene(s) and sporadic isn't' = 2 marks												

Question		Expected Answers	Marks	Additional Guidance
	(b) (i)	<p>selection of a, group of individuals / participants / AW, (from a larger population) ;</p> <p>each individual chosen, by chance / using random number table / using random method described ;</p> <p>each individual is, equally likely to be chosen / chosen without bias ;</p>	2 max	<p>DO NOT CREDIT sample chosen at random – rewording of stem</p> <p>e.g. numbering population, putting numbers into a computer, computer randomly selects sample / AW</p> <p>IGNORE randomly unqualified</p>
	(ii)	sample may not be representative of population / described / AW ;	1	e.g. may all be same gender / age
	(c) (i)	40 ; ;	2	<p>If answer incorrect or incorrectly rounded: ALLOW 1 mark ONLY for:</p> <p>either $\frac{42 - 25}{42}$ or $\frac{17}{42}$</p> <p>or 40.4 or (40.47691) correct answer unrounded</p> <p>or</p> <p>ecf if figures read incorrectly from graph</p>

Question		Expected Answers	Marks	Additional Guidance
(c)	(ii)	<p>greater use of screening / earlier diagnosis ;</p> <p>improvement in treatment / described / increased use of tamoxifen[®] ;</p> <p>breast cancer, has higher profile / more publicity / better education / better understanding of lifestyle risks / AW ;</p> <p>better understanding of the molecular causes of breast cancer / AW ;</p>	3 max	<p>Mark the first 3 answers IGNORE more precautions taken</p> <p>ACCEPT people are more aware of breast cancer or more campaigns for self checking</p>
(d)		<p><i>idea that</i> not all women with <i>BRCA-1</i> will acquire the second mutation ;</p> <p><i>idea that</i> some women are not exposed to (named) mutagen ;</p> <p>description of specific mutation in, p53 gene / proto-oncogene ;</p>	2 max	e.g. alcohol / tar / smoking / X-rays / carcinogens
(e)	(i)	<p>cell death ;</p> <p>that is, controlled / programmed / triggered by signals ;</p>	2	<p>ACCEPT 'cell suicide'</p> <p>ACCEPT correct description of apoptosis</p> <p>'programmed cell death' = 2 marks</p>

Question		Expected Answers		Marks	Additional Guidance
	(ii)	<p>T1 radiotherapy ; D1 uses, gamma rays / ionising radiation to destroy cancer cells ;</p> <p>T2 lumpectomy / surgery ; D2 removing tumour and surrounding tissue ;</p> <p>T3 mastectomy / surgery ; D3 removing whole breast ;</p> <p>T4 hormone treatment / tamoxifen[®] ; D4 blocking <u>oestrogen</u> receptors ;</p> <p>T5 immunotherapy / herceptin ; D5 antibody that blocks receptors for growth factors ;</p> <p>T7 complementary therapy ; D7 named therapy described ;</p>			<p>Mark first two treatments and descriptions given CREDIT phonetic spelling of treatments</p> <p>DO NOT CREDIT radiation on its own / radio waves</p> <p>e.g. aromatherapy / homeopathy / hypnotherapy / using herbalistic remedies / acupuncture</p>
			Total	4 max 22	

Question			Expected Answers	Marks	Additional Guidance										
2	(a)	(i)	macrophage(s) ; endocytosis ; antigens ; cell, surface / plasma, membrane ; complementary ; T helper ;	6	ACCEPT phonetic spelling throughout ACCEPT antigen(s)										
		(ii)	<table border="1"> <thead> <tr> <th>cell or molecule</th> <th>role in specific immune response</th> </tr> </thead> <tbody> <tr> <td>B cell</td> <td>binds to a specific antigen or divides by mitosis / clones / clonal expansion or <u>differentiates</u> into, plasma cells / memory cells</td> </tr> <tr> <td>cytokine</td> <td>stimulates, B / T, cells to divide or involved in cell signalling</td> </tr> <tr> <td>plasma cell</td> <td>produces antibodies</td> </tr> <tr> <td>memory cell</td> <td>remains in circulation or recognises antigen if it enters body a second time / AW or develops immediately into plasma cells during secondary response / AW</td> </tr> </tbody> </table>	cell or molecule	role in specific immune response	B cell	binds to a specific antigen or divides by mitosis / clones / clonal expansion or <u>differentiates</u> into, plasma cells / memory cells	cytokine	stimulates, B / T, cells to divide or involved in cell signalling	plasma cell	produces antibodies	memory cell	remains in circulation or recognises antigen if it enters body a second time / AW or develops immediately into plasma cells during secondary response / AW	4	Award 1 mark per row ACCEPT for humoral immunity
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Question		Expected Answers	Marks	Additional Guidance	
	(b)	(i)	acquired / artificial ; passive ;	2	
		(ii)	no, immune response / memory cells made / antibodies made, in body ; (injected) antibodies broken down by liver ;	2	
	(c)		36 ; ;	2	ACCEPT 36.4 for 2 marks If answer incorrect, ALLOW 1 mark for correct working $\frac{7}{100} \times 520$ or 0.07×520
	(d)		blood products screened (for viruses) ;	1	CREDIT in context of HIV / hepatitis

Question	Expected Answers	Marks	Additional Guidance
(e)	rubella / German measles, is caused by a virus ; <i>Rubella</i> (virus) can cross placenta / AW ; can cause problems during development of the, baby / AW ; named defect ; can cause, miscarriage / still birth / AW ;	3	needs to be clear that problems occur during development in uterus e.g. brain damage, deafness, heart defects and eye defects DO NOT CREDIT mental illness / learning difficulties as these develop after birth 'the rubella virus crosses the placenta' = 2 marks (MP 1 and MP 2)
	Total	20	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	the number of <u>new</u> cases ;	1	
		(ii)	<p><i>trends</i></p> <p>1 higher incidence rate in Africa (than in Europe) ; 2 incidence rate in Europe, is stable / shows slight decrease ; 3 incidence rate in Africa rises then falls ; 4 pairs of comparative figs to support one statement ;</p> <p><i>reasons for differences in Africa</i></p> <p>5 higher prevalence of HIV / AW ; 6 higher prevalence of malnutrition / AW ; 7 weakened immune system ;</p> <p>8 more homelessness / overcrowded living conditions / poor living conditions / AW ;</p> <p>9 lack of education about how TB spreads ;</p> <p>10 lack of access to good healthcare qualified ;</p> <p>11 lack of availability of vaccine ; 12 lack of availability of antibiotics ; 13 more resistant strains ;</p> <p style="text-align: right;"><i>max 5 for reasons</i></p>	8 max	<p>ACCEPT 'peaks at 2004' 2 years and 2 rates per 100 000 rates per 100 000, for Africa or Europe / Africa and Europe in the same year CREDIT processed data IGNORE reasons for the fact that both African and Europe show a decrease between 2004 and 2008 <i>ora for Europe</i></p> <p>ACCEPT descriptions of how poor hygiene leading to infection</p> <p>e.g. fewer doctors / poor transport to reach clinics</p>

Question		Expected Answers	Marks	Additional Guidance
(b)	(i)	to check if the, drug / vaccine, is effective / AW ; to find out if there are any harmful side effects ; to find out the correct dose ;	2 max	ACCEPT find out if drug works
	(ii)	<i>idea of</i> a sudden increase in the number of new cases / spread / outbreak, of the disease ; in a specified area / region / country ;	2 max	IGNORE population
	(iii)	enough people are vaccinated / immune, to prevent the spread of the disease / AW ; the risk of an infected person passing on the pathogen to a susceptible person is small / AW ;	2	
Total			15	

Question			Expected Answers	Marks	Additional Guidance
4	(a)	(i)	slow onset / AW ; lasts a long time / no cure ; progressive / AW ;	2 max	
		(ii)	<u>chronic</u> bronchitis ; emphysema ;	2	DO NOT CREDIT asthma (as given in the question) ACCEPT phonetic spelling of both
		(iii)	lung function tests / spirometry / peak flow meter measurements / lung volume measurements ;	1	CREDIT named test values such as FVC, FEV ₁ or PEFR
	(b)		COPD reduces surface area for gas exchange / AW ; (extra oxygen needed) to increase rate of diffusion of oxygen into blood / AW ; for (aerobic) respiration ; <i>idea of</i> to reduce fatigue / provide sufficient energy for person to be active / AW ;	2 max	

Question		Expected Answers		Marks	Additional Guidance
	(c)	1	causes <u>inflammation</u> ;		
		2	scar tissue formed ;		
		B3	goblet cells, produce / secrete, more mucus ;		
		B4	cilia become, paralysed / damaged / prevented from working / AW ;		
		B5	mucus, not removed (by cilia) ;		
		B6	(mucus) becomes infected ;		
		B7	airways become narrowed / blocked ;		
		A8	large numbers of, macrophage / neutrophils, in alveoli ;		ACCEPT phagocytes
		A9	produce elastase ;		
		A10	alpha-1-antitrypsin / inhibitor of elastase, is inactivated by chemicals in smoke ;		
		A11	elastin / elastic fibres / protein, in walls of alveoli broken down ;		
		A12	alveoli become, enlarged / damaged / burst / prevented from stretching and recoiling / AW ;		
		A13	less surface area for gas exchange ;	7 max	
		Q	QWC – for a balanced account ;	1	
Total				15	

Question		Expected Answers	Marks	Additional Guidance
5	(a)	non infectious ;	1	ACCEPT non-contagious
	(b) (i)	<p>1 down atheroma ;</p> <p>2 down endothelium ;</p> <p>3 down coronary artery ;</p>	3	<p>Mark answers on crossword grid</p> <p>ACCEPT phonetic spelling for all</p>
	(ii)	<p>6 across – <i>myocardial infarction</i> a heart attack / described ;</p> <p>4 down – <i>angina pectoris</i> pain (in, chest / arm / jaw) caused by, CHD / description / AW ;</p> <p>5 down – <i>thrombus</i> a blood clot / described ;</p>	3	<p>Must refer to pain and reference to CHD</p> <p>DO NOT CREDIT causes blood to clot as it shows a confusion with thrombin</p>

Question		Expected Answers	Marks	Additional Guidance
	(c)	<p>1 atheroma / plaque, grows bigger / narrows lumen of artery ;</p> <p>2 (plaque) ruptures endothelium / creates rough surface ;</p> <p>3 red blood cells stick to surface forming a blood clot / AW ;</p> <p>4 atheroma / plaque / blood clot, breaks off / is transported in the blood ;</p> <p>5 blocks <u>coronary</u> artery ;</p> <p>6 cardiac, muscle / cells / tissue does not receive, blood / oxygen / glucose / fatty acids ;</p> <p>7 cardiac, muscle / cells / tissue, dies ;</p> <p>Q QWC – correct order of events ;</p>	<p>5 max</p> <p>1</p>	<p>ACCEPT heart muscle / cells / tissue</p> <p>ACCEPT heart muscle / cells / tissue</p> <p>1 MP from 1 – 3 and</p> <p>1 MP from 4 – 5 and</p> <p>1 MP from 6 – 7</p>
	(d) (i)	a machine that restarts the heart / AW ; by giving an electric shock / AW ;	2	ACCEPT electric current / impulse / charge / apply electric voltage
	(ii)	<p><i>idea that</i> defibrillator can be used immediately / AW ;</p> <p><i>idea that</i> the longer the delay the less chance of survival / AW ;</p> <p><i>idea that</i> stress of exercise / over-exertion, more likely to result in cardiac arrest ;</p> <p><i>idea that</i> defibrillators accessible to large number of people ;</p>	2	
Total			17	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	<p>local anaesthetic applied to skin ; (long hollow) needle inserted ; through wall of, abdomen / uterus / womb ;</p> <p>ultrasound scan used to guide needle ; into <u>amniotic</u> sac ; (amniotic), fluid / cells withdrawn ;</p>	4 max	<p>DO NOT CREDIT stomach ACCEPT via vagina / via cervix</p> <p>DO NOT CREDIT placental tissue</p>
	(b) (i)	<p>older mother (over 35) ; genetic disease in the family ; increased risk of, chromosomal, abnormality / named chromosomal abnormality ; has had several, miscarriages / still births / perinatal deaths / AW ; has received result from a scan that suggests there may be a problem / AW ;</p>	2 max	e.g. cystic fibrosis e.g. Down's / Klinefelter's / Turners
	(ii)	<p>chorionic villus sampling / CVS ; can be done earlier than amniocentesis / AW ; results of test available in shorter time ;</p>	2 max	ACCEPT phonetic spelling IGNORE disadvantages of CVS
	(c) (i)	<p>Down's syndrome ; spina bifida ; congenital heart, abnormalities / defects ; cleft palate ; fetal hydrops / fetal alcohol syndrome ;</p>	1 max	DO NOT CREDIT heart disease ACCEPT other correct named conditions

Question			Expected Answers	Marks	Additional Guidance
		(ii)	Down's syndrome ; Turner's syndrome ; Klinefelter's syndrome ;	2 max	ACCEPT other named chromosomal mutations such as Fragile X / Edward's syndrome
			Total	11	

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