OCR
RECOGNISING ACHIEVEMENT

GCE

Human Biology

Advanced Subsidiary GCE

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

Mark Scheme for June 2012

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates 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.

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

Annotations

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded
	Verbal Construction

**Quality of Written Communication*

Question			Answer	Marks	Guidance
1	(a)	(i)	testing a population / people who are at risk / AW **;** before symptoms occur / in early stages / before it has time to spread **;**	2	**ACCEPT** an example of a high risk group such as testing women over 50 for breast cancer
		(ii)	*sensitive - idea that* able to pick up the cancers at **,** early stage / low level / AW **;** *specific - idea that* it doesn't diagnose cancer when it is not present / give false positives / AW **;**	2	**ACCEPT** doesn't miss the disease / AW **ACCEPT** distinguishes between, malignant / cancer and, benign / other tissue
	(b)	(i)	COPD is often found in smokers **;** smoking is, also a risk factor for, lung cancer / increasing mutations (leading to cancer) **;**	2	must be linked to smoking
		(ii)	patient, lies down in / is moved through, a tunnel / a (CT) machine / AW **;** X-rays / X-ray pictures are taken from different angles **;** (computer used) to create a 3D image **;**	3 max	**ACCEPT** lies on a platform and CT scanner moves along **ACCEPT** tube
		(iii)	 more people can be screened in a given time / AW **;** less likely to, cause cancer / mutations leading to cancer / AW **;** less stressful for patient / AW **;**	2 max	**Mark the first 2 answers** **IGNORE** ref. to quicker diagnosis **ACCEPT** shorter time in machine so less expensive on staff time **ACCEPT** ora eg shorter time in machine less uncomfortable for patient

Question			Answer	Marks	Guidance
	(c)		*cancer cells have* irregular shaped / larger nucleus **;** irregular shaped / larger, cells **;** cells may have more than one nucleus **;** more than one nucleolus **;**	3 max	**Mark the first answer on each prompt line** ora for normal cells **ACCEPT** abnormal for irregular **DO NOT CREDIT** different shape **ACCEPT** abnormal for irregular **DO NOT CREDIT** different shape **DO NOT CREDIT** irregular shaped cytoplasm
	(d)	(i)	protein **;** glycoprotein **;** glycolipid **;**	2 max	**Mark the first 2 answers** **If further incorrect answers are given subtract 1 mark for each incorrect answer up to 2 subtracted marks** **ACCEPT** enzyme / antibody **ACCEPT** antigen
		(ii)	easy to get sample / no surgical technique involved / AW **;** blood / urine **,** samples are **,** taken / tested **,** routinely **;** metabolic products likely to be found in body fluids **;**	1 max	**ACCEPT** idea that molecules linked to cancer may be found in, blood / urine
	(e)	(i)	39 **; ;**	2	**Correct answer = 2 marks** If answer incorrect **ALLOW** 1 mark for correct working 78 – 39 =39
		(ii)	*lung cancer* no symptoms in early stages **;** usually detected at an advanced stage **;** secondary cancers already formed / metastasised / AW **;** cannot be successfully treated at an advanced stage / lung cancer more difficult to treat / AW **;** no screening for lung cancer **;**	2 max	ora for breast cancer **ACCEPT** ora eg symptoms occur later **ACCEPT** ora eg harder to detect at early stages **ACCEPT** lung cancer not so easily removed by surgery / ora
			Total	**21**	

Question			Answer	Marks	Guidance
2	(a)	(i)	more , carbohydrates / (named) foods containing carbohydrate ; more , protein / (named) foods containing protein ; more (named foods containing) , vitamin A / vitamin C / folic acid / iron ; avoid, alcohol / soft cheese / blue cheese / shark / shellfish / raw eggs / raw meat / liver / liver products ;	2 max	**Mark first two answers** **DO NOT CREDIT** ref. to supplements eg taking folic acid
		(ii)	for (growth of) healthy bones ; regulation of, calcium / phosphate, uptake from gut into blood ; vitamin D may be lacking due to lack of exposure to sun light / AW ;	1 max	applies to mother or fetus **ACCEPT** teeth for mother **IGNORE** teeth for fetus **ACCEPT** helps to absorb calcium
		(iii)	*if haemoglobin is low* insufficient oxygen transported (in blood) to tissues ; lower rate of respiration (in, tissues / cells) ; less of energy ; *idea of:* fatigue in mother / AW ; stunted / slower, growth of fetus / AW ;	2 max	 **ACCEPT** to, fetus / body / mother / baby **ACCEPT** less respiration **DO NOT CREDIT** birth defects / miscarriage / developmental problems
	(b)		virus (that causes rubella) may cross placenta ; cause problems to the developing baby / example of problem / AW ; if positive / woman, has antibodies against rubella, she is immune to rubella / AW ; baby not at risk / AW ; if negative / woman has no antibodies against rubella she is not immune to rubella / AW ; baby at risk / AW ; (if at risk) need to avoid contact with people who might have the disease / AW ;	3 max	 eg brain damage / heart defects / birth defects **ACCEPT** causes miscarriage **DO NOT ACCEPT** problems after birth **IGNORE** baby immune

Question			Answer	Marks	Guidance
	(c)	(i)	an inability to control blood glucose levels / insufficient insulin produced / less sensitive to insulin / AW **;** it develops during pregnancy / only lasts for length of pregnancy / AW**;**	2	
		(ii)	fasting blood glucose / glucose tolerance **,** (test) **;**	1	**Mark the first answer**. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks
		(iii)	family history (of diabetes / gestational diabetes) **;** have had gestational diabetes before / AW **;** overweight / obese / high BMI **;** having previously had a large baby (over 4.5kg) **;** have polycystic ovary syndrome **;** Asian (women) **;** high sugar diet **;** older / over 40 **;**	2 max	**Mark the first 2 answers.** **ACCEPT** genetic link / hereditary
	(d)	(i)	to give a clear picture / AW **;**	1	**ACCEPT** easier to see
		(ii)	*idea that* exit of baby is blocked / AW **;** risk of, haemorrhage / severe bleeding (at birth) / AW **;** might require Caesarean (section) **;** placenta born first so baby deprived of oxygen **;**	1 max	
	(e)		high blood pressure could indicate pre-eclampsia **;** protein in urine could indicate kidney, infection / disease / damage **;** means woman needs to **,** go into hospital / be closely, monitored / checked **,** until the baby is born / AW **;**	2 max	
			Total	**17**	

Question			Answer	Marks	Guidance
3	(a)	(i)	(inactive chemical) acts a placebo **;** as a control **;** to show that the, vaccine / drug, has an effect **;**	2 max	**ACCEPT** has made a difference
		(ii)	0.009 **;**	2	**Correct answer = 2 marks** if answer incorrect **ALLOW** 1 mark for correct working 74 ÷ 8 198 **ACCEPT** more than three decimal places if figure starts with 0.009
		(iii)	virus keeps mutating **;** different strains of virus **;** (different strains of the virus) have antigens with different shapes / AW **;** antibodies cannot bind to these antigens / AW **;**	2 max	
	(b)	(i)	blood, test / sample **;** HIV antibodies (in blood) bind to HIV antigens in test / ora **;** detail of test **;** detecting viral **,** DNA / RNA / genome **;** detail of genome test **;**	3 max	eg use of monoclonal antibodies use of enzymes colour change **only award 1mp for detail** eg using PCR
		(ii)	*idea that:* time needed **,** to produce antibodies / for primary immune response **;** time needed for virus to, replicate / be present in sufficient numbers to detect **;**	1 max	**DO NOT CREDIT** remains dormant need implication of time

Question			Answer	Marks	Guidance
	(c)		*similarities* **1** clonal selection / described, for B cells and T killer cells **;** **2** clonal expansion / described, for B cells and T killer cells **;** **3** (stimulated by) (named) cytokines**,** for B cells and T killer cells **;** **4** (cytokines) produced by T helper cells **;** **5** B cells and T killer cell, differentiate into / become memory cells **;** *differences* *B lymphocytes* **6** humoral (immunity) **;** **7** protect body against bacteria / extracellular pathogens / toxins **;** **8** differentiate into / become, plasma cells **;** **9** (plasma cells) produce antibodies **;** *T killer cells* **10** cell-mediated (immunity) **;** **11** bind to cells infected by viruses / cancer cells / AW **;** **12** destroy cell / described **;**		**ACCEPT T lymphocytes for MP 1,2 and 5** **similarities between B cells and T killer cells may be given in different parts of the answer** **1** cell, (with receptors), complementary to antigen / that binds to antigen **2** stimulated to **,** divide by mitosis / clone **3** eg interleukins / interferon **4** needs only to be referred to once for mark **9** **DO NOT CREDIT** secrete or release **DO NOT CREDIT** without reference to plasma cells **11** **ACCEPT** targets cells infected by viruses **12** reference to perforins / hydrogen peroxide, / toxic chemical, being injected into cell **12** **DO NOT CREDIT** engulf
			QWC - *candidates should refer to both similarities and differences between the roles of B lymphocytes and T killer cells*	1	**Award QWC mark if** 1 marks awarded from mps 1 – 5 **AND** 1 mark awarded from mps 6 – 9 **AND** 1 mark awarded from mps 10 – 12
			Total	**18**	

Question			Answer	Marks	Guidance
4	(a)	(i)	*alcohol:* decreases the number of cells in mitosis **;** from 100 per μm^2 to 58 per μm^2 / by 42 per μm^2 **;** increases the number of cells in apoptosis **;** from 10 per μm^2 to 30 per μm^2 / by 20 per μm^2 **;**	3 max	**DO NOT CREDIT** rate of mitosis units must be stated **ACCEPT** figs to + / - 1 **DO NOT CREDIT** rate of mitosis units must be stated **ACCEPT** figs to + / - 1
		(ii)	*mitosis* produces genetically identical (retina) cells **;** *apoptosis* (retinal) cells die as part of normal development / description of an example **;**	2	**ACCEPT** to remove cells that have, a mutation / damaged DNA
		(iii)	the retina may be thinner than normal / AW **;** *idea that* cell death has increased **and** cell production decreased **;**	2	**ACCEPT** very thin / smaller **DO NOT CREDIT** thin unqualified **ACCEPT** mitosis instead of cell production apoptosis instead cell death but must be linked to less / more cells

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4</td><td>(b)</td><td></td><td>
<table>
<tr><th>stage</th><th>description of two changes that take place in the cell</th></tr>
<tr><td>(prophase)</td><td>chromosomes become visible / AW ;
nucleolus disappears ;
nuclear , envelope / membrane , breaks down ;
movement of centrioles to poles of cell / AW ;
spindle (fibres) forms ;
2 max</td></tr>
<tr><td>(metaphase)</td><td>chromosomes / centromeres , attach to ,
spindle fibres / microtubules ;

chromosomes line up at , equator / middle / centre ;
2</td></tr>
<tr><td>(anaphase)</td><td>centromeres , divide / split ;
spindle (fibres) shorten ;
chromatids , separate / are pulled to opposite poles ;
2 max</td></tr>
<tr><td>(telophase)</td><td>chromatids / daughter chromosomes ,
become less visible ;
spindle (fibres) break down ;
nuclear , envelope / membrane , (re)forms ;

cell membrane invaginates / cell membrane pinched inwards / AW ;
2 max</td></tr>
</table>
</td><td>8</td><td>2 max for each stage
Candidates do not need to name the stages
IGNORE incorrect names of stages

ACCEPT chromosomes condense

ACCEPT breaks

ACCEPT decondense / uncoil

ACCEPT cytokinesis, cell / cytoplasm, pinches in</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>15</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td></td><td>morbidity
number of people living with / prevalence of, (CHD) ;

mortality
number of people who have died from (CHD) ;</td><td>2</td><td>DO NOT CREDIT amount (ecf if used twice)
DO NOT CREDIT incidence / number of new cases
DO NOT CREDIT reference to, other / a disease

DO NOT CREDIT amount (ecf is used twice)
DO NOT CREDIT reference to, other / a disease (ecf if use twice)</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>independent variable
body mass index (BMI) / waist circumference (WC) ;

controlled variable
women’s age (55-69) / gender / all women ;</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>a waist circumference of less than 80cm / 80<>88cm, having a BMI of over 30 increases risk (of fatal CHD) ;

pairs of comparative figures ;</td><td>2</td><td>
<table>
<tr><th rowspan="2">BMI</th><th colspan="3">relative risk fatal CHD</th></tr>
<tr><th>WC less then 80cm</th><th>WC between 80cm and 88cm</th><th>WC greater then 88cm</th></tr>
<tr><td>less than 25</td><td>1.0</td><td>1.0</td><td>3.1</td></tr>
<tr><td>between 25 and 30</td><td>0.5</td><td>1.3</td><td>3.3</td></tr>
<tr><td>more than 30</td><td>1.8</td><td>1.5</td><td>2.8</td></tr>
</table>
for example:
with a waist circumference of less than 80cm risk at 25 BMI is 1.0 and risk at 30 BMI is 1.8

with a waist circumference of between 80cm and 88cm risk at 25 BMI is 1.0 and risk at 30 BMI is 1.5</td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td></td><td>(iii)</td><td>(at all BMI) having a waist circumference of over 88cm greatly increases risk (from fatal CHD) ;

pairs of comparative figures ;</td><td>2</td><td>
<table>
<tr><th rowspan="2">BMI</th><th colspan="3">relative risk fatal CHD</th></tr>
<tr><th>WC less then 80cm</th><th>WC between 80cm and 88cm</th><th>WC greater then 88cm</th></tr>
<tr><td>less than 25</td><td>1.0</td><td>1.0</td><td>3.1</td></tr>
<tr><td>between 25 and 30</td><td>0.5</td><td>1.3</td><td>3.3</td></tr>
<tr><td>more than 30</td><td>1.8</td><td>1.5</td><td>2.8</td></tr>
</table>

for example:
at BMI between less than 25 the risk of fatal CHD is 1.0 at WC less than 80cm and 3.1 at WC greater than 88cm

at BMI between 25-30 the risk of fatal CHD is 0.5 at WC less than 80cm and 3.3 at WC greater than 88cm

at BMI more than 30 the risk of fatal CHD is 1.8 at WC less than 80cm and 2.8 at WC greater than 88cm</td></tr>
</table>

Question			Answer	Marks	Guidance
5	(c)			6 max	statement must be qualified e.g. more exercise not just exercise
			advice on life style modification **1** reduce intake of saturated fats **;** **2** increase intake of soluble fibre **;** **3** increase intake of polyunsaturated **,** fats / oils **;** **4** reduce / maintain suitable **,** weight **;** **5** increase physical activity **;**		**5** **ACCEPT** an example of physical activity **ACCEPT** advised to, take up a physical activity / exercise more regularly
			6 stop smoking **;** **7** reduce salt intake **;** **8** reduce intake of sugar **;** **9** reduce stress **;**		
			drug therapy **10** (named) drugs to, reduce LDL / increase HDL / reduce cholesterol, levels **;** **11** (named) drugs to lower blood pressure **;**		**10** eg statins **11** eg beta blockers 'water tablets' / diuretics
			12 (named) drugs to treat Type 2 diabetes **;** **13** (named) drug **,** to, prevent blood clots / lower blood viscosity **;** **14** take aspirin **;**		**12** eg metformin **13** eg wafarin
			QWC - candidates need to refer to the two different strategies **;**	1	**Award QWC mark if** 2 marks awarded from mps 1 – 9 **AND** 1 marks awarded from mps 10 – 14
	(d)		make sure health professionals benefit from latest research / AW **;** make sure best practice used to treat all patients / AW **;** make sure treatment is cost effective / AW **;**	1 max	e.g. approval of drugs showcased to treat CHD
			Total	**16**	

Question			Answer	Marks	Guidance
6	(a)		**1** bacteria cannot penetrate (unbroken) skin **;** **2** blood clots to, seal wound / prevent bacteria entering **;** **3** in, stomach / vagina, kills bacteria / AW **;** **4** acid conditions denature, proteins / enzymes **;** **5** goblet cells produce mucus that traps bacteria **;** **6** cilia / ciliated cells, remove mucus (and trapped bacteria) **;** **7** lysozyme / enzymes, in tears **;** **8** breaks down, bacteria / bacterial cell walls **;**	5 max	**ACCEPT** pathogen throughout **3** **ACCEPT** destroyed / digested **6** **ACCEPT** cilia waft mucus up to throat **7** **DO NOT CREDIT** lysosomes / lysin **8** **ACCEPT** kills / digests
	(b)		histamine **;** blood **;** permeable / leaky / porous **;** tissue fluid **;** enzymes **;**	5	**Mark the first answer on each prompt line.** If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks **ACCEPT** digestive enzymes

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>faster growth / increases, from 0 – 9 and then, slower growth / decreases

OR
peaks at 9 years / AW ;

slower decrease from, 14 / 15 – 20 years ;

2 pairs of comparative figures ;</td><td>2 max</td><td>DO NOT CREDIT development

<table><tr><th>age (years)</th><th>% of total post natal growth</th></tr><tr><td>0</td><td>0</td></tr><tr><td>9</td><td>196</td></tr><tr><td>14</td><td>120</td></tr><tr><td>15</td><td>112</td></tr><tr><td>20</td><td>100</td></tr></table>
for example
from 0 percent of total post natal growth at 0 years to 196 percent of total post natal growth at 9 years</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>idea that child, is exposed / responds, to many different pathogens during first 9–10 years / AW ;</td><td>1</td><td>ACCEPT at a younger age / early childhood</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>13</td><td></td></tr>
</table>

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

OCR Customer Contact Centre

Education and Learning
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