OCR
RECOGNISING ACHIEVEMENT

GCE

Human Biology

Advanced GCE

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

Mark Scheme for June 2013

Oxford Cambridge and RSA Examinations

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, Cambridge Nationals, Cambridge Technicals, 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.

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>
<table>
<tr><th>correct order</th><th>letter of stage</th></tr>
<tr><td>1</td><td>F</td></tr>
<tr><td>2</td><td>A</td></tr>
<tr><td>3</td><td>G</td></tr>
<tr><td>4</td><td>B</td></tr>
<tr><td>5</td><td>E</td></tr>
<tr><td>6</td><td>D</td></tr>
<tr><td>7</td><td>H</td></tr>
<tr><td>8</td><td>C</td></tr>
<tr><td>9</td><td>J</td></tr>
</table>
A G B all above E ;
D H C J all below E ;
A G B in correct order <u>AND</u> D H C J in correct order ;
</td><td>3</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>• future pregnancies (for same woman) / described ;
• embryo donation ;
• research qualified ;</td><td>2</td><td>e.g. woman about to undergo chemotherapy
e.g. stem cell research</td></tr>
</table>

Question			Answer	Marks	Guidance
	(c)		*Look for the idea that it is wrong because…* • contradicts some, religious beliefs **;** • money could be spent elsewhere (in healthcare system) **;** • rights of child to identify father who may not want to be identified **;** • spare embryos created may be, destroyed / used in stem cell research (which is considered wrong) **;**	3	**IGNORE** playing God, not natural
			Total	**8**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>
<table>
<tr><th>molecule</th><th>role</th><th>location</th></tr>
<tr><td>1. ATP (synth)ase ;</td><td></td><td></td></tr>
<tr><td>2. FAD ;</td><td></td><td></td></tr>
<tr><td></td><td></td><td>3. cytoplasm / cytosol ;</td></tr>
<tr><td>4. ADP ;</td><td></td><td>5. cytoplasm ;
6. mitochondria / matrix ;</td></tr>
<tr><td></td><td></td><td>7. matrix (of mitochondria);</td></tr>
</table>
</td><td>7</td><td>MARK first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the first answer then = 0 marks

1.CREDIT ATP synthetase
1.ACCEPT stalked particles
2.ACCEPT oxygen

4.IGNORE reference to P
6.DO NOT CREDIT crista / inner membrane

7.DO NOT CREDIT crista / inner membrane</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>(oxygen is) the final acceptor for electrons (and hydrogen);</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>0.7 ; ;</td><td>2</td><td>If answer is incorrect, or not rounded to one decimal place (0.6956……) allow one mark only if correct working has been shown. (16 ÷ 23)</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>10</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
3	(a)		muscle **;**	1	**DO NOT CREDIT** 'cardiac muscle' **DO NOT CREDIT** a named muscle since this would be an organ
	(b)	(i)	96(%) **;**	1	
		(ii)	*idea that* arteries / arterioles have thick walls **;** gas exchange / AW, only occurs in capillaries **;**	1	**CREDIT** a description of walls
	(c)		(curve) plateaus at, high pO_2 / after 12 kPa **OR** curve less steep at, high pO_2 / after 8 kPa **;** *idea that* haemoglobin still (almost fully) saturated (even if pO_2 is lower) **;** reason for enough oxygen still arriving at tissues **;**	2	**LOOK FOR** idea that drop in pO_2 does not result in a big drop in saturation of haemoglobin e.g. increased numbers of red blood cells (due to epo) idea of increased vascularisation
	(d)	(i)	curve to the right of the one on Fig. 3.1 **;** curve same / similar, shape **;**	2	**DO NOT CREDIT** multiple lines **DO NOT CREDIT** if the top point of the drawn line is less than 80% and the bottom point is greater than 3 kPa
		(ii)	Bohr (shift) **;**	1	**ACCEPT** phonetic spelling
		(iii)	more oxygen, released (from oxyhaemoglobin) **;** prolongs aerobic respiration / delays onset of anaerobic respiration **;**	1	**CREDIT** oxygen is released at higher partial pressures
	(e)		oxygen store **;**	1	**IGNORE** 'source', **DO NOT CREDIT** ref transport
			Total	**10**	

Question			Answer	Marks	Guidance
4	(a)	(i)	**X** – reduced NADP **;**	1	**DO NOT CREDIT** reduced NAD / NADH **ACCEPT** NADPH / $NADPH_2$ / NADPH and H^+
		(ii)	condensation **;**	1	**ACCEPT** polymerisation **IGNORE** ref to bonds
		(iii)	some used in (plant cell) respiration **;**	1	**ACCEPT** for ATP synthesis **IGNORE** to provide energy **DO NOT CREDIT** ref. to creating / making energy
	(b)	(i)	used in sulfur containing R groups (in amino acids) **;** used to make disulfide bonds (in proteins) **;**	1	**CREDIT** reference to methionine or cysteine (as these have R groups containing sulfur)
		(ii)	chlorophyll / nucleic acids / nucleotides / DNA / RNA / ATP / NAD / FAD **;**	1	**CREDIT** any other correct named molecule e.g. ADP

Question	Answer	Marks	Guidance
(c)	*Ref to consequence of nutrient enrichment in water* • (*leads to*), **eutrophication ;** • algae, grow rapidly**;** • (*leads to*) reduction light, for **photosynthesis**, leads to plant death **;** • **decomposers/bacteria**, respire **aerobic**ally **;** • oxygen levels decline (due to bacterial activity) so, fish / animals, die / migrate **;** *Ref to consequence of nutrient enrichment on land* • ref to legumes outcompeted **;** *Refs to human impact on environment* • *(leads to)* **habitat** destruction / AW **;** • (*leads to*) loss of **biodiversity ;** • loss of **aesthetic** value / described **;** **QWC ;**	3 1	**DO NOT CREDIT** ref. to pesticides leading to eutrophication **CREDIT** reference to an **algal bloom** **CREDIT** a description of light reduction e.g. water becomes cloudy **CREDIT** ref to increased Biological Oxygen Demand (BOD) **ACCEPT** a description of stagnant / smelly ponds being unattractive **OR** weeds / nettles invade Any **three terms** with correct spelling and suitable context from: **eutrophication** **aerobically** **algal bloom** **aesthetic** **decomposers** **habitat** **bacteria** **biodiversity** **photosynthesis**
	Total	**9**	

Question			Answer	Marks	Guidance
5	(a)		• (epithelial cell divides by) **mitosis** to produce **spermatogonium;** • (spermatogonium), multiplies / AW, to produce **primary spermatocyte(s) ;** • spermatogonium / primary spermatocyte, is **diploid** / has 2 sets of chromosomes **;** • **meiosis** 1 / reduction division (occurs producing) **secondary spermatocyte(s) ;** • **meiosis** 2 occurs (to produce spermatids) **;** • secondary **spermatocyte** / spermatids, are **haploid** / have one set of chromosomes **;** **QWC;**	5 1	**CREDIT 'spermatogonia'** **DO NOT CREDIT** ref to 'stage 1 of meiosis' but penalise **once** only Look for terms **haploid OR diploid** in correct context **AND** any **two** from the following terms: **mitosis, spermatogonium(a) meiosis (1or 2) primary spermatocyte, secondary spermatocyte,**
	(b)	(i)	glycoprotein / glycolipid **;**	1	**IGNORE** antigen / receptor
		(ii)	hydrolytic **;**	1	**CREDIT** named enzyme e.g. lipase, phospholipase, protease **ACCEPT** digestive or catabolic

Question			Answer	Marks	Guidance
	(c)	(i)	*idea that* participant should be (generally) healthy **OR** not taking any other drugs **OR** no family history of disease **;** **OR** not infertile / viable sperm present **;**	1	e.g. no family history of disease risk, not undergoing any other treatment
		(ii)	*idea that* to establish 'baseline' sperm count to compare treatment to **;** to establish a mean sperm count (for each participant) **;**	1	**IGNORE** ref to reliable unqualified
		(iii)	using <u>random</u>isation **;** (idea of) blind or double blind groups **;**	1	e.g. so participants did not know if they were getting the treatment or a placebo
		(iv)	viable / AW, sperm, is reduced **;** sperm count returns to normal (at end of trial) **;** idea that side effects are minimal **;**	1	e.g. reduced motility of sperm **IGNORE** reference to monitoring pregnancies
	(d)	(i)	increase in muscle, mass / size **;** able to train, longer / harder **;** <u>i</u>ncreased competitiveness **;**	2	
		(ii)	*idea that* it is lipid soluble **;**	1	**CREDIT** idea that it diffuses directly as it dissolves in the phospholipid bilayer
			Total	**15**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6</td><td>(a)</td><td>(i)</td><td>idea that
death rate has decreased (for both)
AND
rate always lower for females / ora ;

comparative figures ;</td><td>2</td><td>IGNORE reference to changes in fluctuations as this is given later in the question

correct units quoted at least once

<table><tr><td rowspan="2">year</td><td colspan="2">death rate
(1000s per million population)</td></tr><tr><td>males</td><td>females</td></tr><tr><td>1901</td><td>26</td><td>22</td></tr><tr><td>2009</td><td>6</td><td>4.5</td></tr></table></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>increase in incidence of (named) infectious disease(s)
OR
epidemic / pandemic ;</td><td>1</td><td>DO NOT CREDIT reference to non-infectious diseases or smoking</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>development of vaccines / vaccination programmes ;

development of, antibiotics / antivirals ;

establishment of a National Health Service ;

establishment of, sanitation / hygiene,
education programmes ;</td><td>2</td><td>IGNORE general references to health care OR non-infectious diseases</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>amount of, carbon dioxide / methane, produced
(per person / country / year) ;</td><td>1</td><td>IGNORE greenhouse gases</td></tr>
</table>

Question			Answer	Marks	Guidance
		(ii)	• legislation to reduce CO_2 production **;** • investment in carbon capture programmes **;** • investment in renewable energy projects **;** • financial incentives **or** penalties to, business/public **;** • improve/promote, public transport **:** • AVP **;**	2	**LOOK FOR** a reference to **government** intervention e.g. by laws or incentives or targets e.g. regulate power station emissions e.g. scrubbers fitted to chimneys e.g. subsidies for solar panels e.g. grants for insulating houses e.g. employers operating work at home schemes / biodiesel cars e.g. promote / support carbon credit scheme
			Total	**8**	

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