

Human Biology

Advanced GCE

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

Mark Scheme for January 2011

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

© OCR 2011

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

| Question | | Expected Answers | | Marks | Additional Guidance | | | | | | | | | | |
|----------------------------|------------|------------------|--|-----------|--|---------------------------|------------|--------------------|------------|----------------------------|------------|-------------------------|------------|---|--|
| 1 | (a) | (i) | mitosis / multiplication / increase in number of cells ; | 1 | DO NOT CREDIT cell division unqualified / meiosis / growth / maturity / replicating | | | | | | | | | | |
| | | (ii) | (stage) D ; | 1 | ACCEPT C | | | | | | | | | | |
| | | (iii) | growth / increase in size (of cells) ; | 1 | CREDIT ref to meiosis I IGNORE development / maturation | | | | | | | | | | |
| | (b) | | <table border="1"> <thead> <tr> <th>statement</th> <th>structure</th> </tr> </thead> <tbody> <tr> <td>contains protective fluid</td> <td>E ;</td> </tr> <tr> <td>produces oestrogen</td> <td>F ;</td> </tr> <tr> <td>has glycoprotein receptors</td> <td>H ;</td> </tr> <tr> <td>contains 23 chromosomes</td> <td>G ;</td> </tr> </tbody> </table> | statement | structure | contains protective fluid | E ; | produces oestrogen | F ; | has glycoprotein receptors | H ; | contains 23 chromosomes | G ; | 4 | |
| statement | structure | | | | | | | | | | | | | | |
| contains protective fluid | E ; | | | | | | | | | | | | | | |
| produces oestrogen | F ; | | | | | | | | | | | | | | |
| has glycoprotein receptors | H ; | | | | | | | | | | | | | | |
| contains 23 chromosomes | G ; | | | | | | | | | | | | | | |
| Total | | | | 7 | | | | | | | | | | | |

| Question | | Expected Answers | Marks | Additional Guidance |
|----------|-----|---|-------|---|
| 2 | (a) | <p>1 bonds are between R groups ;</p> <p>2 hydrogen (bonds) / H (bond) ;</p> <p>3 (H bond) between, polar groups / polarised H and O atoms ;</p> <p>4 (di)sulfide, (bonds / bridges) ;</p> <p>5 (disulfide bond) between, S-H groups / S-S atoms / cysteine molecules or are covalent (bonds) ;</p> <p>6 ionic (bonds) ;</p> <p>7 (ionic bond) between, amine and carboxyl groups / (positive and negative) charged groups ;</p> <p>8 hydrophobic interactions ;</p> <p>9 (hydrophobic) between non-polar groups ;</p> <p>10 ref. strength of bond ;</p> | 4 max | <p>Max 2 for named bonds (mp 2, 4, 6, 8) Description (mp 3, 5, 7, 9) must be linked to the correct bond</p> <p>ACCEPT Van der Waals forces</p> <p>DO NOT CREDIT hydrophobic bonds IGNORE hydrophilic</p> <p>e.g. H bonds weak / disulfide bonds strong</p> |

| Question | | Expected Answers | Marks | Additional Guidance |
|--------------|-----|--|----------|--|
| | (b) | <p><i>target</i> mammary gland / breast tissue ;</p> <p><i>function</i> (maintain / increase), milk production ;</p> <p>OR</p> <p><i>target</i> ovary ;</p> <p><i>function</i> inhibits ovulation ;</p> | 2 | <p>The function must relate to the appropriate target tissue. CREDIT either correct function if target left blank</p> <p>IGNORE secretion of milk</p> |
| Total | | | 6 | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|----------|-----|---|--|-------|---------------------|
| 3 | (a) | 1 | HCG (concentration) rises from week 0/2 till week 12 ; | 4 max | ACCEPT oestrogen |
| | | 2 | (and) stimulates / maintains, corpus luteum ; | | |
| | | 3 | (corpus luteum) releases / secretes, progesterone ; | | |
| | | 4 | (progesterone), maintains endometrium / AW ; | | |
| | | 5 | (progesterone), inhibits, LH / FSH, so no further ovulation / AW ; | | |
| | | 6 | (HCG concentration falls as) placenta now developed / AW ; | | |
| | | 7 | placenta produces progesterone / HCG not required now ; | | |

| Question | Expected Answers | Marks | Additional Guidance |
|---|--|------------------|--|
| <p>(b)</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> | <p><i>absorbent test strip</i></p> <p>early morning urine sample ;</p> <p>contains highest concentration of HCG ;</p> <p>HCG / urine, moves up strip ;</p> <p>HCG is an <u>antigen</u> ;</p> <p><u>variable</u> region (of antibody 1) binds to HCG ;</p> <p>(antibody1) also bound to coloured bead ;</p> <p><i>window L</i></p> <p>antibody (2) is, immobilised / fixed ;</p> <p>(complex binds to antibody 2) to give, coloured / blue, line which confirms pregnancy ;</p> <p><i>window K</i></p> <p>antibody 1 binds to antibody 3 to give, coloured / blue, line ;</p> <p>(coloured line) confirms strip is working ;</p> <p>idea of specific nature of antibodies ;</p> | <p>5 max</p> | <p>DO NOT CREDIT antibody 1 binds to HCG alone (as given in question)</p> |
| | <p>QWC - sequencing of steps – at least 1 mark point scored from each of the three sections</p> | <p>1</p> | <p>mp 1 / 2 / 3 / 4 / 5 / 6 + mp 7 / 8 + mp 9 / 10</p> |
| | <p>Total</p> | <p>10</p> | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|----------|-----|-------|--|-------|--|
| 4 | (a) | (i) | muscle / liver ; | 1 | |
| | | (ii) | <u>facilitated</u> diffusion ; | 1 | ACCEPT active transport DO NOT CREDIT 'diffusion' alone |
| | | (iii) | P – condensation / polymerisation / anabolic ; Q – hydrolysis / catabolic ; | 2 | DO NOT CREDIT build up DO NOT CREDIT break down |
| | | (iv) | glycolysis / respiration / lipid synthesis ; | 1 | ACCEPT link reaction / oxidative phosphorylation / Krebs cycle |
| | (b) | (i) | R glycogen concentration <u>gradually</u> increases over the week ; S glycogen concentration falls and then rises ; rises to be above R ; figs comparing R and S ; | 3 max | Needs idea of <i>gradual</i> increase glycogen conc values for R or S on two stated days |

| Question | | Expected Answers | Marks | Additional Guidance |
|----------|---------|--|-------|--|
| | (ii) | <p><i>days 1 to 4</i> 1. (low carbohydrate diet leads to) hydrolysis / breakdown, of glycogen ;</p> <p><i>days 4 to 8</i> 2. (extra / additional / more), carbohydrate in diet converted to glycogen ;</p> <p>3. <u>more</u> glycogen produced than usual / idea of <u>over</u>-compensation ;</p> | 2 max | ACCEPT idea of glycogen stores depleted |
| | (c) (i) | lipid soluble / non-polar, (so can) pass, through phospholipid (bilayer) ; | 1 max | ACCEPT cell surface membrane / plasma membrane as alternative for phospholipid bilayer |
| | | | | |

| Question | | Expected Answers | Marks | Additional Guidance |
|----------|------|--|--------------|--|
| | (ii) | <p>1 increase muscle mass / increase in number of muscle cells / increase in muscle cell size ;</p> <p>2 increase in, protein / actin / myosin, synthesis ;</p> <p>3 increase in erythrocyte production ;</p> <p>4 improved $VO_{2\max}$;</p> <p>5 can train, for longer / more intensively ;</p> <p>6 quicker recovery from injury ;</p> <p>7 AVP ;</p> | 2 max | <p>DO NOT CREDIT 'enhances performance' as this is given in the question ACCEPT increase in muscle growth</p> <p>e.g. idea of increased respiration / more ATP production</p> |
| | | | | |

| Question | Expected Answers | Marks | Additional Guidance |
|----------|---|---------------------|---|
| | <p>(iii)</p> <p>aggression / rages ;</p> <p>high blood pressure ;</p> <p>testicular atrophy / infertility / decrease in sperm count ;</p> <p>hair loss / acne ;</p> <p>increased (blood) cholesterol / adverse change to LDL:HDL ratio ;</p> <p>development of breast tissue ;</p> <p>weight gain ;</p> <p>liver damage ;</p> <p>CHD / increased risk of cardiac arrest / enlargement of left ventricle ;</p> | <p>2 max</p> | <p>Mark the first <u>two</u> suggestions only. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet.</p> <p>CREDIT idea of heart / cardiovascular problem</p> |
| | | | |
| | Total | 15 | |

| Question | | Expected Answers | Marks | Additional Guidance | |
|----------|-----|---|-------|---------------------|-----------------|
| 5 | (a) | <p>V S U W all above Q ;</p> <p>V S U W in correct order ;</p> <p>P X T all below Q ;</p> <p>P X T in correct order ;</p> | 4 | correct order | letter of stage |
| | | | | 1 | R |
| | | | | 2 | V |
| | | | | 3 | S |
| | | | | 4 | U |
| | | | | 5 | W |
| | | | | 6 | Q |
| | | | | 7 | P |
| | | | | 8 | X |
| | | | | 9 | T |

| Question | | Expected Answers | Marks | Additional Guidance |
|----------|-----|---|----------|--|
| | (b) | <p>1 idea of (provides energy) for power stroke ;</p> <p>2 binds to, myosin head / ATPase ;</p> <p>3 hydrolysis (of ATP) occurs / ADP and P_i formed ;</p> <p>4 (energy) releases myosin (head) from, actin / binding site ;</p> <p>5 myosin (head) can now swing back to original position / AW ;</p> <p>6 (ATP) used to pump, calcium ions / Ca²⁺, into sarcoplasmic reticulum ;</p> | 3 max | <p>DO NOT CREDIT ATP synthase</p> <p>DO NOT CREDIT calcium / Ca / Ca⁺</p> |
| | | QWC | 1 | 2 of the emboldened terms used and spelt correctly |
| | | | | |
| | | Total | 8 | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|----------|-----|------|---|-------|---|
| 6 | (a) | (i) | 1. idea of high yield in small area of land ; 2. net loss of nutrients to the system / open system ; 3. <u>inorganic / artificial</u> , fertilisers ; 4. <u>high</u> use of fertilisers ; 5. <u>high</u> use of pesticides ; 6. feed (more) people (more) cheaply / produces low cost food ; | 3 max | ACCEPT many animals or crops in a small area of land |
| | | (ii) | 1. idea of low animal welfare standards or consequences to animals ; 2. pollution / eutrophication, (from excessive, fertilisers) ; 3. high energy input / idea of increased carbon footprint ; 4. (pesticides / fertilisers), reduces biodiversity ; 5. disease more likely to spread ; 6. increased use of antibiotics leads to antibiotic resistance ; 7. idea of reduction in soil fertility ; | 2 max | Mark the first <u>two</u> suggestions only. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet. e.g. chickens pecking each other / pulling out their own feathers e.g. increased use of fossil fuels |

| Question | | Expected Answers | Marks | Additional Guidance |
|--------------|-----|---|-----------|--|
| | (b) | (i) | | |
| | | idea of carbon dioxide used in photosynthesis ; idea of carbon sinks forming ; | 2 max | e.g. in corals / limestone / fossil fuels |
| | | (ii) | | |
| | | 1. increased production of carbon dioxide (between 1958 and 2007) ; 2. (due to), increased numbers of, cars / planes / factories or increased burning of fossil fuels ; 3. idea of atmospheric carbon dioxide stopping <u>heat</u> from escaping ; 4. greenhouse effect ; 5. AVP ; | 3 max | ACCEPT methane instead of carbon dioxide IGNORE global warming e.g. natural cycles / effect of natural fluctuations |
| | | (iii) | | |
| | | 1. increased <u>rate</u> of photosynthesis ; 2. photosynthesis is enzyme controlled ; 3. rate of enzyme controlled reactions increased by temperature ; 4. greater production of, assimilates / organic molecules ; | 2 max | |
| | | (iv) | | |
| | | 1.8 ; ; | 2 | Correct answer = 2 marks even if no working shown. If the answer is incorrect or given to the wrong number of decimal places or incorrectly rounded, then allow 1 mark for working $75.6 \div 42$ |
| Total | | | 14 | |

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)

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

© OCR 2011

