

GCE

Human Biology

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

Advanced Subsidiary GCE

Mark Scheme for June 2014

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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.

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These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

| Annotation | Meaning |
|---|--|
|  | Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response. |
|  | 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) | <p>Mantoux test ; tuberculin OR TB antigen ; injected (under skin) / AW ; wait 48-72 hours ;</p> <p><i>Idea of measuring (extent of) inflammation (to determine whether a person has TB)</i></p> <p>;</p> | 3 | <p>IGNORE Heaf Test ACCEPT sputum test IGNORE X-rays</p> <p>ACCEPT a figure within this range or 2–3 days / 2 days / 3 days ACCEPT measuring size of any raised hardened area / swelling</p> |
| | (b) | (i) | 2 | <p>IGNORE Spreads quickly ACCEPT ‘sudden outbreak’ – look for a time reference DO NOT CREDIT in the context of a pandemic (‘in the world’)</p> |
| | | (ii) | 2 | <p>IGNORE damp conditions</p> <p>IGNORE ref to lack of education IGNORE health care unqualified</p> <p>e.g. malnutrition OR HIV⁺</p> <p>CREDIT hygiene in the context of coughing / sneezing</p> |
| | | | | |

| Question | | Answer | Marks | Guidance |
|----------|-----|---|-------|---|
| | (c) | A E C B ;; | 2 | A first and B last ; E before C ; |
| | (d) | weak(ened) /compromised, immune system ; T <u>helper</u> cells, destroyed / infected / numbers fall ; (T helper cells normally) activate, other immune cells / B cells ; fewer / no, antibodies produced ; | 3 | CREDIT reverse argument for immune response in HIV negative people. IGNORE no or lower, immune response ACCEPT T helper cells infected, attacked, or damaged ALLOW description e.g. No cytokines released to trigger clonal expansion REJECT if T cells producing antibodies |
| | (e) | <u>herd immunity</u> not reached ; <i>Idea that</i> someone with TB has a higher chance of meeting someone who could catch it ; | 2 | CREDIT reverse argument (ref to reaching herd immunity when most are vaccinated) ACCEPT idea that unable to prevent spread to susceptible (non-immunised) people |

| Question | | Answer | | | | Marks | Guidance | | | | | | | | | | | | | | | | |
|-------------------------------------|------------|--|---|--|-----------|---------------------------|--|-----------------------------------|--|-------------------------------------|---|---|---|-------------------------|---|---|---|--------------------------|---|---|---|---|--|
| | (f) | <p><i>idea of high mutation rate in virus ;</i> <i>idea of change in antigens / different strains have different antigens ;</i> <i>idea of antibody specificity ;</i></p> <p>ref to antigenic concealment / described ;</p> | | | | 2 | <p>REJECT disease ACCEPT antigenic drift e.g. antibodies only fit one type of antigen / antibodies for one strain of HIV will not bind to antigens of a new strain</p> <p>Look for the idea of hiding in (correctly) named) cells</p> | | | | | | | | | | | | | | | | |
| | (g) | <table border="1"> <thead> <tr> <th><i>Structural feature</i></th> <th><i>HIV</i></th> <th><i>Mycobacterium tuberculosis</i></th> <th></th> </tr> </thead> <tbody> <tr> <td><i>Genetic material is RNA only</i></td> <td>✓</td> <td>X</td> <td>;</td> </tr> <tr> <td><i>Membrane present</i></td> <td>✓</td> <td>✓</td> <td>;</td> </tr> <tr> <td><i>Cell wall present</i></td> <td>X</td> <td>✓</td> <td>;</td> </tr> </tbody> </table> | | | | <i>Structural feature</i> | <i>HIV</i> | <i>Mycobacterium tuberculosis</i> | | <i>Genetic material is RNA only</i> | ✓ | X | ; | <i>Membrane present</i> | ✓ | ✓ | ; | <i>Cell wall present</i> | X | ✓ | ; | 3 | <p>1 mark per correct row</p> <p>ACCEPT 'present' instead of a tick, 'absent' instead of a cross ACCEPT empty boxes instead of crosses if ticks are correct DO NOT CREDIT empty boxes instead of ticks if only crosses are entered.</p> <p>DO NOT CREDIT hybrid ticks or hybrid crosses</p> |
| <i>Structural feature</i> | <i>HIV</i> | <i>Mycobacterium tuberculosis</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Genetic material is RNA only</i> | ✓ | X | ; | | | | | | | | | | | | | | | | | | | | |
| <i>Membrane present</i> | ✓ | ✓ | ; | | | | | | | | | | | | | | | | | | | | |
| <i>Cell wall present</i> | X | ✓ | ; | | | | | | | | | | | | | | | | | | | | |
| Total | | | | | 19 | | | | | | | | | | | | | | | | | | |

| Question | | | Answer | Marks | Guidance |
|----------|-----|------|---|-------|--|
| 2 | (a) | (i) | <i>idea of</i> (conserving plants) outside their (natural) environment / habitat ; | 1 | |
| | | (ii) | <i>Barcode</i> Short piece / (base) sequence / length of, DNA ; from a specific, position / locus, on a chromosome ; <i>Use</i> <i>idea of</i> comparing / matching / similar to, DNA (sequence) / barcode of a known medicinal plant ; <i>idea that</i> similar sequence / barcode indicate related species / related species more likely to have similar medicinal compounds ; | 3 | IGNORE gene and chromosome throughout ACCEPT <i>rbcl</i> , <i>matK</i> , <i>trnH-psbA</i> (plastid genomic regions) ITS (nuclear gene region) |
| | (b) | | reduces / slows, (chances of) blood clotting / thrombus formation ; reduces ability of <u>platelets</u> to, aggregate / stick together ; | 2 | ACCEPT prevents clotting / anticoagulant IGNORE thins blood / reduces blood viscosity |
| | (c) | (i) | complementary (therapy) ; | 1 | ACCEPT 'alternative medicine, holistic (treatment) |

| Question | | Answer | Mark | Guidance |
|--------------|------|---|-----------|--|
| | (ii) | <p><i>idea that</i> aromatherapy alone will not work (to treat cancer) ;</p> <p><i>idea that</i> might negatively affect prescribed treatment ;</p> <p><i>idea that</i> conventional treatment / medicine might be, refused / given up ;</p> | 1 | IGNORE gives false hope |
| | (d) | <p>carbon monoxide combines with haemoglobin ;</p> <p>nicotine reduces diameter of blood vessels (in placenta and fetus) ;</p> <p>reduces oxygen supply to, fetus / baby ;</p> <p>fetus's heart beats faster ;</p> <p>(increased chance of) premature birth ;</p> <p>(increased chance of) low birth weight ;</p> <p>baby's lungs less well developed ;</p> <p>higher risk of, still birth / death in early infancy ;</p> | 5 | <p>ACCEPT forms carboxyhaemoglobin</p> <p>ACCEPT vasoconstriction</p> |
| | (e) | <p>iron ;</p> <p>calcium ;</p> <p>the development of teeth / bones / membrane (formation) ATP / phospholipids /</p> <p>DNA ;</p> | 3 | <p>IGNORE phosphate, (as this is already provided in the bottom box)</p> <p>ACCEPT idea of strengthening bones</p> |
| | (f) | <p><i>idea of</i> quicker / cheaper / easier (to find , plants / active chemicals) ;</p> <p><i>idea of</i> known side effects / interaction ;</p> <p>idea that known dosage ;</p> | 2 | |
| Total | | | 18 | |

| Question | | | Answer | Mark | Guidance |
|----------|-----|------|--|------|--|
| 3 | (a) | (i) | 153 / 153.49 / 153.5 (%) ; ; | 2 | 2 marks for correct answer If answer incorrect, award 1 mark for correct working i.e. $\frac{10.9 - 4.3}{?} \times 100$ Where (?) = 10.9 or 4.3 |
| | | (ii) | <i>Idea of</i> (people who have smoked, more cigarettes / for longer have) more exposure to (named) carcinogens (in tobacco smoke) ; (the more a person smokes) the more likely they are to have a mutation ; increase in (number of) mutations increases the risk of cancer ; lung cancer takes a long time to develop ; | 3 | IGNORE 'chronic' disease without qualification |
| | | | | | |

| Question | | Answer | Mark | Guidance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|------------------------------|--|------------------------|---|-------------------------|------------------------------|--|--|------------------------|--------------------------|------------------------|-----|-----|-----|-----|-------|-----|-----|-----|-------|-----|-----|------|-------|-----|------|------|-----|------|------|------|
| | (iii) | <p><i>supports</i></p> <p>In the less than 20 years of smoking group, there is a higher (relative) risk (of lung cancer) if 10-19 cigarettes are smoked than if 20+ are smoked ;</p> <p>In the 40-49 years of smoking group, the (relative) risk (of lung cancer) when smoking 20+ is less than the risk when smoking 10-19 cigarettes ;</p> <p><i>does not support</i></p> <p><i>Idea that 20 –29 / 30 – 39 / 50+ years of smoking, the higher the number of cigarettes smoked per day the higher the risk of lung cancer ;</i></p> | 2 | <table border="1"> <thead> <tr> <th rowspan="2">Number of years smoking</th> <th colspan="3">Relative risk of lung cancer</th> </tr> <tr> <th><10 cigarette s smoked</th> <th>10-19 cigarette s smoked</th> <th>20+ cigarette s smoked</th> </tr> </thead> <tbody> <tr> <td><20</td> <td>0.9</td> <td>2.6</td> <td>1.3</td> </tr> <tr> <td>20-29</td> <td>1.4</td> <td>2.3</td> <td>2.8</td> </tr> <tr> <td>30-39</td> <td>4.3</td> <td>6.0</td> <td>10.9</td> </tr> <tr> <td>40-49</td> <td>5.7</td> <td>16.2</td> <td>12.6</td> </tr> <tr> <td>50+</td> <td>17.6</td> <td>22.6</td> <td>41.0</td> </tr> </tbody> </table> | Number of years smoking | Relative risk of lung cancer | | | <10 cigarette s smoked | 10-19 cigarette s smoked | 20+ cigarette s smoked | <20 | 0.9 | 2.6 | 1.3 | 20-29 | 1.4 | 2.3 | 2.8 | 30-39 | 4.3 | 6.0 | 10.9 | 40-49 | 5.7 | 16.2 | 12.6 | 50+ | 17.6 | 22.6 | 41.0 |
| Number of years smoking | Relative risk of lung cancer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <10 cigarette s smoked | 10-19 cigarette s smoked | 20+ cigarette s smoked | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <20 | 0.9 | 2.6 | 1.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20-29 | 1.4 | 2.3 | 2.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30-39 | 4.3 | 6.0 | 10.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40-49 | 5.7 | 16.2 | 12.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50+ | 17.6 | 22.6 | 41.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Question | | Answer | Marks | Guidance |
|----------|-----|---|-------|--|
| 4 | (a) | to produce gametes ; ref haploid (chromosome number) ; maintain / restore, correct number of chromosomes ; <i>Idea of source of (genetic) <u>variation</u> ;</i> | 3 | ACCEPT sex cells / eggs and sperm ‘to produce haploid gametes’ = 2 marks ACCEPT ‘one copy of each chromosome’ ACCEPT restore diploid number / 46 / 23 pairs (at fertilisation) ACCEPT genetically different gametes |
| | (b) | anaphase ; | 1 | IGNORE ref to Anaphase 1 or 2 |
| | (c) | (i) | 1 | ACCEPT any figure within the range 14.5 – 15years |
| | | (ii) | 2 | CREDIT reverse argument for female without Turner’s syndrome |
| | | (iii) | 1 | ACCEPT stunted growth / small stature /small |

| Question | | Answer | Marks | Guidance |
|--------------|-----|---|-----------|---|
| | (d) | <p><i>Ultrasound</i> <i>Idea of</i> to find / see the position of, fetus / placenta (during amniocentesis) ; OR to guide needle into amniotic sac / chorionic villus / placenta /AW ;</p> <p><i>amniocentesis</i> to obtain (fetal) <u>cells</u> (from amniotic fluid) ;</p> <p><i>karyotyping</i> to identify that there is, only one X / sex, chromosome / AW ;</p> | 3 | <p>ACCEPT to see where the baby or fetus or placenta is</p> <p>ACCEPT to know where to insert the needle</p> <p>ACCEPT to identify that X / Y / one sex, chromosome is missing</p> <p>ACCEPT to see the genotype is XO</p> <p>REJECT chromatid</p> |
| Total | | | 11 | |

| Question | | Answer | Marks | Guidance |
|----------|-----|--|-------|---|
| 5 | (a) | <p><i>Erythrocyte</i> disc-shaped / AW ; nucleus absent ; no organelles / named organelles; has haemoglobin ; no projections from surface ;</p> | 1 | <p>CREDIT reverse argument for stem cell</p> <p>IGNORE size ref (as no scale given)</p> |
| | (b) | <p><i>Idea of</i> (divides and) differentiates into / AW, a limited range of, cell types / AW ;</p> | 1 | |

| Question | Answer | Marks | Guidance |
|------------|--|-------------------------------------|--|
| <p>(c)</p> | <p>1 cells divide by <u>mitosis</u> ;</p> <p>2 to produce, <u>genetically</u> identical cells / clones ;</p> <p>3 cells differentiate / become specialised for a particular function / AW ;</p> <p>4 as some genes switched, off / on ;</p> <p>5 (and) different proteins made ;</p> <p>6 group of / AW, cells form tissues ;</p> <p>7 group of / AW, (different) tissues form organs ;</p> <p>nervous system, (fully) develops, early / AW ;</p> <p>8 <i>idea that</i> reproductive system not fully developed until, puberty;</p> <p>9 correct reference to named, reproductive / nervous, tissue / organ ;</p> <p>7</p> <p>QWC ;</p> | <p>7</p> <p><i>Any</i></p> <p>1</p> | <p>CREDIT named examples throughout</p> <p>e.g. CNS / brain / spinal cord / seminal vesicles / ovaries / testes</p> <p>AWARD QWC if at least 2 marks from MP 1-7 have been awarded and at least 1 mark from MP 8-10 have been awarded.</p> |

| Question | | Answer | Marks | Guidance |
|--------------|---------|--|-----------|---|
| | (d) | <p>(a mutation) causes it to become an oncogene ;</p> <p>(proto-oncogene) may code for / AW, (named) proteins involved in, the control of cell, division / cycle ;</p> <p>(if mutated) correct (named) protein, no longer produced / overproduced ;</p> <p>(if mutated) receptor protein triggers cell division in absence of growth factor / AW ;</p> | 3 | <p>named protein examples - receptor proteins / growth factors / cyclins / transcription factors</p> <p>ACCEPT mutation results in uncontrolled cell division or uncontrolled mitosis.</p> |
| | (e) (i) | controlled / programmed , cell death / AW; | 1 | IGNORE cell suicide unqualified |
| | (ii) | <p><i>Examples include but are not limited to</i></p> <p>finger / toe, separation / AW ;</p> <p>formation of synapses ;</p> | 1 | |
| Total | | | 15 | |

| Question | Answer | Marks | Guidance |
|----------|---|-------|---|
| 6 (a) | (make the person comfortable by) sitting them, with their knees bent / ref W position ; call, 999 / ambulance / emergency services ; check if the person takes medication for a heart condition / give aspirin (if available and person not allergic) ; monitor, consciousness ; monitor, heart / breathing, rate ; | 2 | IGNORE ref to CPR since the question refers to a conscious person IGNORE Recovery position |
| | | | |

| Question | | Answer | Marks | Guidance | | | | | | | | | | | | | | | | | | |
|------------|-----------|---|----------|--|------------|----|-----|-----|-----------|-----------|-----|-----------|-----------|-----|-----|-----------|-----|-----------|-----------|------|-----|-----|
| | (b) (i) | <p><i>Idea of conventional CPR , (always) more successful ;</i></p> <p><i>Idea of difference being small up to 8 minutes / at 7-8 minutes ;</i></p> <p><i>Idea of for 9-10 minute time delay conventional CPR has much better success / ORA ;</i></p> <p>successful outcomes decrease with time delay for <u>both forms of CPR</u> ;</p> <p>pair of correct comparative figures with units (% and minutes / mins) (allow calculated differences) ;</p> | 3 | <p>IGNORE if referring to a single time delay as this applies in every case</p> <p>ACCEPT 'similar at 7-8 minutes'</p> <p>ACCEPT 'about' related to a figure within the range</p> <p>DO NOT CREDIT 'above' or 'below'</p> <table border="1"> <thead> <tr> <th>Time delay</th> <th>CC</th> <th>CPR</th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>7.8 - 7.9</td> <td>8.5 – 8.7</td> </tr> <tr> <td>3-4</td> <td>6.5 – 6.7</td> <td>7.8 – 7.9</td> </tr> <tr> <td>5-6</td> <td>4.8</td> <td>4.9 – 5.1</td> </tr> <tr> <td>7-8</td> <td>3.8 - 3.9</td> <td>4.1 - 4.2</td> </tr> <tr> <td>9-10</td> <td>1.0</td> <td>4.2</td> </tr> </tbody> </table> | Time delay | CC | CPR | 1-2 | 7.8 - 7.9 | 8.5 – 8.7 | 3-4 | 6.5 – 6.7 | 7.8 – 7.9 | 5-6 | 4.8 | 4.9 – 5.1 | 7-8 | 3.8 - 3.9 | 4.1 - 4.2 | 9-10 | 1.0 | 4.2 |
| Time delay | CC | CPR | | | | | | | | | | | | | | | | | | | | |
| 1-2 | 7.8 - 7.9 | 8.5 – 8.7 | | | | | | | | | | | | | | | | | | | | |
| 3-4 | 6.5 – 6.7 | 7.8 – 7.9 | | | | | | | | | | | | | | | | | | | | |
| 5-6 | 4.8 | 4.9 – 5.1 | | | | | | | | | | | | | | | | | | | | |
| 7-8 | 3.8 - 3.9 | 4.1 - 4.2 | | | | | | | | | | | | | | | | | | | | |
| 9-10 | 1.0 | 4.2 | | | | | | | | | | | | | | | | | | | | |
| | (ii) | <p>will save some lives / better than doing nothing ;</p> <p>easier to do / less likely to put people off doing it / more likely to try it ;</p> <p>success rate for both similar / nearly as high (most of the time) ;</p> | 1 | | | | | | | | | | | | | | | | | | | |
| | (c) | <p>rejection ;</p> <p>(constant) use of immunosuppressants (in patient) ;</p> | 1 | IGNORE ref to waiting lists | | | | | | | | | | | | | | | | | | |
| | | Total | 7 | | | | | | | | | | | | | | | | | | | |

| Question | | Answer | Mark | Guidance | | | | | | | | | | |
|----------|--|---|------|---|------|--|---|-----|---|-----|---|-----|---|-----|
| 7 | (a) | <p><i>idea of</i> too much / high, intake of fat / sugar ;</p> <p><i>idea that</i> more (energy is) taken in than is used ;</p> <p>excess energy converted to fat (for storage) ;</p> | 2 | <p>IGNORE in the context of diabetes</p> <p>ACCEPT calories for energy</p> | | | | | | | | | | |
| | (b) | (i) | 3 | <p>mmol dm⁻³ should be used at least once.</p> <p>e.g. fasting blood glucose dropped from 9.3 mmol dm⁻³ in week 0 to 5.8 in week 1 or 'in the first week' (0 and 1 week implied)</p> <table border="1" data-bbox="1532 922 1962 1193"> <thead> <tr> <th>week</th> <th>fasting blood glucose (mmol dm⁻³)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>9.3</td> </tr> <tr> <td>1</td> <td>5.8</td> </tr> <tr> <td>4</td> <td>5.7</td> </tr> <tr> <td>8</td> <td>5.7</td> </tr> </tbody> </table> | week | fasting blood glucose (mmol dm ⁻³) | 0 | 9.3 | 1 | 5.8 | 4 | 5.7 | 8 | 5.7 |
| week | fasting blood glucose (mmol dm ⁻³) | | | | | | | | | | | | | |
| 0 | 9.3 | | | | | | | | | | | | | |
| 1 | 5.8 | | | | | | | | | | | | | |
| 4 | 5.7 | | | | | | | | | | | | | |
| 8 | 5.7 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

| Question | | Answer | Mark | Guidance |
|----------|-------|---|------|--|
| | (ii) | <p><i>Idea of</i> difficult to find people willing to volunteer for this type of study ;</p> <p><i>Idea of</i> (study had) limited funding / financial resources ;</p> <p><i>Idea of</i> quicker to conduct study ;</p> <p><i>Idea of</i> easier to monitor small group / harder to supervise a big group ;</p> | 1 | ACCEPT fewer samples to take |
| | (iii) | <p>eat less (food high in) fat ;</p> <p>eat less (food high in) sugar ;</p> <p>eat more high fibre foods ;</p> <p>eat five portions of fruit or vegetables per day /AW ;</p> <p>eat, complex carbohydrates / starchy food ;</p> <p>idea of reduce portion size ;</p> <p>reduce salt intake ;</p> | 3 | ACCEPT named food throughout IGNORE ref to snack / junk foods / water |
| (c) | (i) | <p><i>idea that</i> you can, check / see / know , if glucose concentrations are too, high / low ;</p> <p>(if untreated) high blood glucose may cause named condition ;</p> <p>(if untreated) low blood glucose may cause, faint / coma / death ;</p> | 2 | <p>ACCEPT to check levels are within limits</p> <p>DO NOT CREDIT 'to ensure'</p> <p>ACCEPT to detect hypoglycemia / hyperglycemia</p> <p>e.g. blindness / foot amputation / nerve damage / kidney failure / high blood pressure / heart disease / strokes / chronic infections / shortening of life</p> |

| Question | | | Answer | Mark | Guidance |
|----------|--|------|---|-----------|----------|
| | | | so the person can adjust their insulin dose / carbohydrate intake (if necessary) ; | | |
| | | (ii) | oxidase / dehydrogenase ; enzyme ; <u>gluconolactone</u> ; transducer ; | 4 | |
| | | | Total | 15 | |

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