**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**International General Certificate of Secondary Education**

# MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

# 0610 BIOLOGY

**0610/32** Paper 3 (Extended Theory), maximum raw mark 80

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UNIVERSITY of CAMBRIDGE
International Examinations

| Question | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|
| 1 | (a) | **A** left atrium ;<br>**B** mitral / bicuspid / atrioventricular, valve ;<br>**C** semi-lunar valve / pocket valve / aortic valve ;<br>**D** right ventricle ; | [4] | *reject if correct and incorrect answers given for each*<br>**A** atria<br>**A** auricle **A** 'oracle' / 'oricle'<br>**A** if given the plural<br>**A** if given the plural, **A** 'half-moon' valve |
| | | | | |
| | (b) | **E** (superior / anterior) vena cava ;<br>**F** aorta ; | [2] | |
| | | | | |
| | (c) | coronary ;<br>**1** fatty deposit in (wall of) artery ;<br>**2** blocks, artery / restricts, blood flow ;<br>**3** restricts, oxygen / nutrient, supply ;<br>**4** blood clotting occurs ; | [1]<br>[max 2] | **R** cardiac **A** phonetic spellings<br>*ignore incorrect name for MP1–4*<br>**A** atheroma / plaque **A** cholesterol / LDL / fatty acids **A** arteriosclerosis / described<br>**A** 'narrows' artery<br>**R** if 'to body' ***ignore*** high blood pressure |
| | | | | |
| | (d) | heart not pumping blood / keeps blood circulating ;<br>blood is oxygenated ;<br>carbon dioxide is removed from blood ; | [max 2] | **A** blood not pumped to the lungs<br>**A** exchange of oxygen and carbon dioxide for two marks<br>***ignore*** 'to keep patient alive' / 'supply heart with blood' |
| | | | | |
| | (e) | **1** ref. to (cardiac) muscle ;<br>**2** ref. to myogenic / heart has own pacemaker ;<br>**3** septum (divides heart into two) ;<br>**4** two (separate) ventricles / AW ;<br>**5** ventricle(s), contract / pump ;<br>**6** increase blood pressure ;<br>**7** right ventricle has thin(er) wall / left ventricle has thick(er) wall ;<br>**8** so low(er) pressure / higher pressure ; (in context)<br>**9** to lungs / to rest of body ; (in context) | [max 4] | **R** 'push'<br>**A** bigger , **R** tougher **A** muscle<br>**A** 'to whole body' for LV if blood to lungs described |
| | | | | |
| | | **[Total: 15]** | | |

| Question | | Expected Answers | | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 2 | (a) | *whole / part of, organism*<br>changes in position / changes in place **;** | | [1] | ***ignore*** locomotion<br>**A** (moves) from place to place / one place to another |
| | | | | | |
| | (b) | **(i)** | antagonistic **;** | [1] | **A** antagonism |
| | | | | | |
| | | **(ii)** | *idea of* muscle pull (don't push) **;**<br>biceps contracts **;**<br>triceps relaxes **;**<br><br>flexion / described as movement of (fore)arm **;**<br>during relaxation muscle is, stretched / passive **;**<br>both contract to maintain position / holding an object **;** | [max 3] | *assume answer is about flexion – credit ora for extension – mark through if both given*<br>if answer does not mention the names of the muscles but has the right idea for one contracts and the other relaxes, then allow one mark for MP2+3<br><br>contraction and relaxation of the pair must be linked to the correct movement of the arm. If not, no marks<br>**R** hand **A** named correct bone – radius and/or ulna<br>**A** lengthens |
| | | | | | |
| | (c) | **(i)** | *transmits impulses*<br>from, receptor / nerve endings / sensory endings / skin / sensory organ **;**<br>to, CNS / spinal cord / connector neurone / relay neurone **;** | [2] | ***ignore*** sensory neurone as question says 'describe'<br>***ignore*** 'messages' / 'signals' / 'senses the stimulus'<br>**R** 'fingers' / 'hand'<br>**A** interneurone<br>**R** 'brain' / 'brain and spinal cord' |
| | | | | | |
| | | **(ii)** | *idea that* impulses stimulate muscle to, contract / move hand **;**<br>(only) biceps contracts (to raise the forearm) **;**<br>ref. to impulse does not cross synapse to **H** **;** | [2 max] | *assume answer is about neurone G, but accept about H* |
| | | | | | |
| | (d) | **1**<br>**2**<br>**3**<br>**4** | many / different, stimuli **;**<br>brain, decides / controls / coordinates **;**<br>impulses in motor, neurones / nerves **;**<br>to, (many) muscles / effectors (involved) **;** | [max 2] | **R** if one muscle |
| | | | | | |
| | | | **[Total: 11]** | | |

| Question | | Expected Answers | | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 3 | (a) | 1 | root hairs ; | | |
| | | 2 | water moves from high(er) <u>water potential</u> to low(er) <u>water potential</u> ; | | **A** down a water potential gradient ***ignore*** water concentration<br>**R** dilute and concentrated |
| | | 3 | osmosis ; | | |
| | | 4 | through partially permeable <u>membrane</u> ; | | **A** semi-permeable / selectively permeable |
| | | 5 | ref. to protein pores ; | [max 3] | |
| | | | | | |
| | (b) | 1 | large surface area ; | | **A** minerals for ions |
| | | 2 | thin (cell) walls ; | | **A** thin wall as 'cell' is in the question |
| | | 3 | (many) mitochondria ; | | |
| | | 4 | ref. respiration ; | | |
| | | 5 | provide / release, energy, for active transport ; | | **A** active, uptake / transport, uses energy<br>**A** active uptake **R** if water also taken up by active uptake |
| | | 6 | proteins / carriers / channels, for, diffusion / active transport (of ions) ; | [max 3] | **A** 'moving against concentration gradient' for active transport |
| | | | | | |
| | (c) | *in appropriate boxes* | | | |
| | | adult and zygote = 90 ;<br>ovum = 45 ; | | [2] | **A** ***ecf*** if half incorrect diploid number<br>*only allow ecf if **both** diploid numbers are the same* |
| | | | | | |

| Question | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|
| | | | | |
| | (d) | *advantages **for plants*** | | **R** refs to number of plants produced |
| | | only one, parent / plant **;** | | **R** 'does not require male and female gametes' |
| | | fast / new plants establish themselves quickly **;** | | **A** 'more likely to leave offspring' idea |
| | | (potential) rapid spread close to parent / AW **;** | | |
| | | less energy required **;** | | ***ignore*** refs to avoiding mutations unqualified |
| | | no wastage of gametes **;** | | |
| | | (if parent well adapted) offspring will be adapted to surroundings **;** | | **A** 'good' traits / e.g., passed on **R** 'good' genes |
| | | plants grow in a suitable place / no wastage **;** | | |
| | | AVP **;** e.g. greater chance of reproduction | [max 2] | *do not accept advantages for humans* |
| | | *disadvantage for plants* | | |
| | | plants too crowded / overcrowding **;** | | |
| | | (lots of) competition for resources **;** | | |
| | | little / no, (genetic) variation **;** | | |
| | | disease transmitted directly to offspring **;** | | *genetic or infectious disease* |
| | | less evolution / less able to adapt **;** | | |
| | | (all identical so) can be wiped out by the same disease **;** | | **A** 'disease can spread easily' |
| | | no / little, dispersal **;** | | |
| | | AVP **;** | [max 1] | |
| | | | | |
| | | **[Total: 11]** | | |

| Question | | | Expected Answers | | Marks | Additional Guidance |
|---|---|---|---|---|---|---|
| 4 | (a) | (i) | lymphocyte ; | | [1] | ***ignore*** leucocyte **A** phonetic spellings |
| | | | | | | |
| | | (ii) | **1** | attach to, bacteria / viruses / pathogens ; | | **A** antigens |
| | | | **2** | cause them to, aggregate / stick together / AW ; | | |
| | | | **3** | stop them spreading ; | | **R** 'fight' against *anywhere in the answer* |
| | | | **4** | help phagocytes engulf them ; | | **A** opsonisation / described **A** 'makes bacteria more detectable by phagocytes' |
| | | | **5** | cause bacteria to burst / kill bacteria / destroy bacteria ; | | ***ignore*** 'dissolve bacteria |
| | | | **6** | stop bacteria moving / immobilise bacteria ; | | |
| | | | **7** | neutralise, toxins / poisons / harmful substances ; | | **A** 'detoxify' |
| | | | **8** | stop, viruses / bacteria, entering cells ; | [max 2] | |
| | | | | | | |
| | (b) | (i) | **1** | when blood clots / following a cut / when wounded / AW ; | | **A** injury |
| | | | **2** | when blood vessels are damaged ; | | |
| | | | **3** | on exposure of, blood / fibrinogen, to air ; | | |
| | | | **4** | flows over rough surfaces / AW ; | [max 1] | |
| | | | | | | |
| | | (ii) | **1** | (fibrinogen is converted into) insoluble (fibrin) ; | | *assume answer is about fibrin* |
| | | | **2** | forms, mesh / net / network / strands ; | | |
| | | | **3** | traps, (red) blood cells / platelets ; | | **A** 'gauze' / threads / fibres / web |
| | | | **4** | (dries) to form a scab ; | | |
| | | | **5** | prevents, loss of blood / more bleeding ; | | |
| | | | **6** | prevents infection / AW ; | | **A** prevents entry of (named) pathogens |
| | | | | | [max 3] | **R** foreign bodies |
| | | | | | | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| | (c) | (i) | 5°C – low (kinetic) energy / slow movement of molecules ;<br>low frequency of / few, collisions ;<br>70°C – enzyme <u>denatured</u> ;<br><br>ref. to active site / shape of enzyme ; | [max 3] | *accept that 'it' refers to the enzyme*<br><br>denatures active site = 2 marks, **A** thrombin for enzyme<br>**R** if 'die' / 'die and denature'**A** 'deformed' / AW, active site / enzyme |
| | | (ii) | time taken for fibrin to form / liquid to become sticky / AW ;<br>time taken for fibrinogen / substrate to disappear ;<br><br>how much fibrin produced in, unit time / stated time ;<br>how much fibrinogen converted, in unit time / stated time ; | [max 1] | **A** rate of fibrin production / how long it takes blood to clot / form a mesh / to reach same viscosity<br>**R** 'how long it took a scab to form'<br><br>**A** product for fibrin<br>**A** substrate for fibrinogen |
| | | | | | |
| | | (iii) | pH ;<br>volume of, enzyme / thrombin (solution) ;<br>concentration of, enzyme / thrombin (solution) ;<br>volume of, substrate / fibrinogen (solution) / blood ;<br>concentration of, substrate / fibrinogen (solution) ;<br>calcium ions ;<br>AVP ; e.g. equilibration time | [max 2] | **R** temperature<br><br>**A** 'amount' for concentration<br><br>**A** 'amount' for concentration **R** blood<br><br>**R** size of fibrinogen / substrate |
| | | | | | |
| | | | **[Total: 13]** | | |

| Question | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|
| 5 (a) | wings ;<br>beak ;<br>feathers / plumage ;<br>scales on, legs / feet ; | [3] | ***ignore*** adjectives such as grey / long / sharp |
| | | | |
| (b) (i) | quantitative (feature) ;<br>range between two extremes ;<br>ref. to (many) intermediates ;<br>not in distinct groups ;<br>influenced by the environment (and genotype) ; | [2] | **A** answer in context of wing length |
| | | | |
| (ii) | length of …… *anything suitable*<br><br>(body) mass ;<br>age ; | [max 1] | **A** height **R** any discontinuous variable, e.g. colour<br>**A** weight **R** size / size of …..<br>**A** height |
| | | | |
| | | | |
| (c) (i) | **1** largest number of / most, birds trapped ;<br>**2** oldest (mean age for) birds trapped ;<br><br>**3** comparative data quote for numbers ;<br>*accept fraction / percentage / proportion of total*<br><br>**4** comparative data quote for age ;<br><br>**R** 'greater life expectancy' | [max 4] | *assume answer is about birds trapped unless stated otherwise*<br><br>wing length at ringing / mm / number of birds trapped / mean age at trapping / days<br>less than 63 / 24 / 253<br>64 / 72 / 256<br>65 / 130 / 297<br>66 / 183 / 346<br>67 / 167 / 349<br>68 / 106 / 270<br>69 / 66 / 237<br>more than 70 / 23 / 199<br>total = 771 |

| Question | | | Expected Answers | | Marks | Additional Guidance |
|---|---|---|---|---|---|---|
| | | (ii) | | | | *look for types of evidence, not assertions* |
| | | | **1** | number of young birds of each wing length ; | | **R** wing length of newly hatched birds |
| | | | **2** | wing lengths of birds that died ; | | |
| | | | **3** | length of life / length of life after trapping ; | | |
| | | | **4** | results for birds in West Africa ; | | |
| | | | **5** | effects of migration ; | | |
| | | | **6** | wing lengths of birds that breed ; | | |
| | | | **7** | number of times each bird is trapped ; | | |
| | | | **8** | effect of trapping on behaviour ; | | |
| | | | **9** | larger sample ; | | **R** 'study should be repeated' |
| | | | **10** | other locations in, Sweden / anywhere in Europe ; | | |
| | | | **11** | AVP ; | | |
| | | | **12** | AVP ; | | e.g. number of eggs laid by birds of each wing length / test which birds fly furthest / test which birds best at catching food |
| | | | | | [max 3] | |
| | | | | | | |
| | | (d) | birds with wing length 66–67, survive / live longer ; | | | |
| | | | breed / reproduce / have offspring ; | | | |
| | | | pass on their allele(s) for wing length ; | | | **A** gene(s) *wing length may be implied* |
| | | | birds with smaller and larger wings, die ; | | | **A** 'the others' |
| | | | do not reproduce (as successfully) ; | | [max 4] | |
| | | | | | | |
| | | | | **[Total: 17]** | | |

| Question | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|
| 6 | (a) | amylase ;<br>prote(in)ase ;<br>lipase ; | [3] | **R** carbohydrase<br>**R** trypsin / pepsin / peptidase **R** 'protase', **A** 'proteas' |
| | | | | |
| | (b) | **1** prevents spread of (named) disease / AW ***ora*** ;<br>**2** avoids pollution / removes harmful substances ;<br>**3** makes, water / sewage / effluent, safe / AW ;<br>**4** avoids smells ;<br>**5** recycling of water ;<br>**6** AVP ; e.g. ref. to eutrophication | [max 1] | **A** removes harmful microbes / bacteria **R** 'germs'<br>**A** examples<br><br>no need to specify for whom or what it is safe, but **R** 'safer' unqualified, treat 'marine organisms' as 'aquatic' |
| | | | | |
| | (c) | **1** mixes microorganisms with sewage ;<br>**2** good contact between microorganisms and solids ;<br>**3** more collisions ;<br>**4** (aerobic) respiration ; **R** if anaerobic respiration<br>**5** microorganisms produce carbon dioxide ;<br>**6** gain / release / transfer, energy ;<br>**7** (for) growth ;<br>**8** (for) reproduction ;<br>**9** to make enzymes ; **A** ref. to digestion | [max 4] | **A** microbes / bacteria |
| | | | | |
| | (d) | to start the breakdown of the sewage quickly ;<br>continuous process ;<br>do not have to, breed / buy, the microorganisms ;<br>*idea of* without waiting for the lag phase ; | [max 3] | **A** 'the right organisms to digest the sewage'<br><br>**A** ref. to cost / less wastage of microbes<br>**A** keeps the population of microbes constant *idea*<br>**R** 'to save time' unqualified<br>**R** 'to use over and over again' |
| | | | | |
| | (e) | destroys / kills, bacteria / microorganisms ;<br><br>prevents spread of, disease / pathogens ;<br>makes water suitable for drinking ; | [max 2] | **R** disinfection<br>**R** 'removes bacteria' |
| | | | | |
| | | **[Total: 13]** | | |