**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**Cambridge International General Certificate of Secondary Education**

# MARK SCHEME for the March 2015 series

# 0610 BIOLOGY

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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the March 2015 series for most Cambridge IGCSE® components.

® IGCSE is the registered trademark of Cambridge International Examinations.

CAMBRIDGE
International Examinations

**Abbreviations used in the Mark Scheme**

- **;** separates marking points
- / separates alternatives within a marking point
- **R** reject
- **ignore** mark as if this material was not present
- **A** accept (a less than ideal answer which should be marked correct)
- AW alternative wording (accept other ways of expressing the same idea)
- underline words underlined (or grammatical variants of them) must be present
- wiggly underline the idea conveyed by the word(s) underlined must be present in the answer
- max indicates the maximum number of marks that can be awarded
- mark independently the second mark may be given even if the first mark is wrong
- ecf credit a correct statement that follows a previous wrong response
- (n)ecf (no) error carried forward
- ( ) the word / phrase in brackets is not required, but sets the context
- **ora** or reverse argument
- AVP any valid point

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| 1 (a) (i) | **A** palisade / mesophyll (layer/cells) ;<br>**B** guard (cell) ; | **[2]** | |
| (ii) | (palisade cells)<br>contain many chloroplasts / lots of chloroplasts ;<br>are tightly packed ;<br>are located near the top of the leaf ;<br>arranged 'on end' / vertically / lengthways / columnar ; | **[max 2]** | **ignore** large vacuole / large surface area |
| (b) (i) | through stomata ;<br>by diffusion ;<br>from an area of high concentration to an area of low concentration ;<br>guard cells bend / become turgid ; | **[3]** | **A** down a concentration gradient |
| (ii) | glucose and oxygen ; | **[1]** | |

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| (c) | **1** submerged leaves are divided **;**<br>**2** providing large area for, photosynthesis / absorption **;**<br>OR<br>**3** leaves have large surface area **;**<br>**4** to float **;**<br>OR<br>**5** (floating leaves so) little xylem / little lignin **;**<br>**6** water provides support **;**<br>OR<br>**7** little / no roots / root hairs **;**<br>**8** roots for anchorage only / no need for roots to absorb water or mineral ions **;**<br>OR<br>**9** little / no, cuticle **;**<br>**10** no need to conserve water **;**<br>OR<br>**11** stomata only on upper surface **;**<br>**12** only upper surface exposed to air / to allow diffusion of gases **;**<br>OR<br>**13** lots of air spaces (between cells) **;**<br>**14** for flotation / buoyancy **;**<br>OR<br>**15** floating leaves **;**<br>**16** to allow, diffusion / AW of (named) gas(es) **;**<br>OR<br>**17** aerial roots **;**<br>**18** to allow roots to receive oxygen **;** | **[max 2]** | Accept any adaptation but explanation must be linked to the correct adaptation<br><br>**A** short roots |
| **2 (a) (i)** | <u>both alleles</u> are expressed **;**<br><br>neither <u>allele</u> is dominant / recessive to the other **;**<br><br>the phenotype of the heterozygote is intermediate **;** | **[max 2]** | **A** answers in terms of any correct example<br><br>**ignore** incomplete dominance<br><br>**A** both alleles are half dominant / equally dominant |

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| (ii) | correct gametes ; $C^B$ , $C^W$ + $C^B$ , $C^W$ ;<br>correct offspring genotypes ; $C^BC^B$, $C^BC^W$, $C^BC^W$, $C^WC^W$ ;<br>correct offspring phenotypes ; brown, roan, roan, white ;<br>correct ratio / percentage ; 1 brown : 2 roan : 1 white ; | [4] | **A** $C^BC^B$, $C^BC^W$, $C^WC^W$ in any order<br>**ignore** 1:2:1 without reference to phenotypes |
| (b) (i) | cows with best milk yield chosen ;<br>bull linked to cows with high milk yield chosen ;<br>these are mated / artificial insemination used / AI used ;<br>offspring checked / chosen for improved milk yield ;<br>these cows are then used to breed the next generation / AW / process repeated ; | [max 3] | |
| (ii) | resistance to disease ;<br>good temperament ;<br>milk quality / example ;<br>rapid / fast growth / development ;<br>meat quality / increase in meat quantity ; AVP ; | [max 1] | **A** improved taste / improved nutritional content |
| (c) | **1** consumer concerns about hormones in the milk ;<br>**2** possible effects on human health / allergies / side effects ;<br>**3** reference to animal welfare / health of cattle ;<br>**4** concerns about lack of consumer choice / unable to avoid consuming milk produced from cows which have been injected with BST ;<br>**5** unnecessary when there is no shortage of milk / already an overproduction of milk ;<br>**6** AVP ; | [max 3] | |
| 3 (a) | carbon dioxide ;<br>urea ; | [2] | |

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| **(b)** | 0 / 0.0 ($gdm^{-3}$) ;<br>proteins too big, to pass through the capillary wall (in glomerulus) / to be filtered (from the blood) / out of the glomerulus ; | **[2]** | |
| **(c)** | **1** blood flows into the (dialysis) machine / blood is returned to the patient ;<br>**2** blood passes over a dialysis membrane / countercurrent flow described ;<br>**3** the dialysis membrane separates the person's blood and the dialysis fluid ;<br>**4** dialysis fluid contains, glucose / salts / no urea ;<br>**5** movement (across membrane) by diffusion / down a concentration gradient ;<br>**6** urea leaves the blood / enters the dialysis fluid ;<br>**7** dialysis fluid is refreshed ;<br>**8** excess / some salt, leaves the blood / enters the dialysis fluid ;<br>**9** excess / some water, leaves the blood / enters the dialysis fluid ;<br>**10** glucose / salts in dialysis fluid same concentration as (should be) in blood ;<br>**11** no net loss of glucose ; | **[max 5]** | |
| **(d)** | *advantage*<br>no need to visit hospital ;<br>no need for dialysis / time not taken up with dialysis ;<br>no need for a restricted diet ;<br>no long term discomfort / pain ;<br>improved quality of life / lead a normal life ;<br>*disadvantage*<br>rejection of kidney ;<br>difficult to find suitable donor ;<br>risk associated with operation ;<br>need to take immunosuppressant drugs ; | **[2]** | max 1 for advantage and max 1 for disadvantage |

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| **(e) (i)** | breaks down / AW, dead / damaged red blood cells **;**<br>stores (named) vitamins / (named) minerals **;**<br>breaks down amino acids into ammonia / deamination **;**<br>makes urea **;**<br>stores glycogen **;**<br>converts glucose to glycogen / **ora** **;**<br>produces bile (salts / pigments) **;**<br>makes cholesterol **;**<br>makes (named) protein **;**<br>maintains glucose concentration in blood **;**<br>breaks down toxins **;**<br>AVP **;** | **[max 1]** | |
| **(ii)** | cirrhosis (of liver) / (chronic) liver disease / kidney failure / liver failure **;**<br>cancer of the liver **;**<br>brain damage **;**<br>stomach ulcers **;**<br>heart disease / high blood pressure **;**<br>oral cancer / mouth cancer / throat cancer / AW **;**<br>pancreatitis **;**<br>reduced fertility **;**<br>depression / AW **;**<br>addiction / dependence **;**<br>heart failure/stroke/heart attack **;** | **[max 2]** | |
| (iii) | violent crime / domestic violence ;<br>road accidents / drink driving ;<br>(petty) crime / vandalism ;<br>family breakdown / divorce / relationship breakdown ;<br>impaired performance at work / unemployment / difficulty getting a job ;<br>AVP ; | **[max 1]** | |

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| 4 (a) | **A**<br>extended / elongated, lower mandible ;<br>lower mandible longer than upper mandible **ora**/ AW ;<br>rounded caudal fin ;<br><br>**B**<br>thin / narrow / elongated, fin(s) ;<br>combined dorsal and caudal fin ;<br><br>**C**<br>spotted fin(s) ;<br>more than one dorsal fin ;<br><br>**D**<br>elongated / long(er), upper mandible ;<br>forked caudal fin / AW ;<br>extra fin, on side / bottom ; | [max 4] | max 1 mark for each fish<br>**A** long dorsal fin<br><br>**A** reduced / modified fins<br><br>**A** extra fin on back<br><br>**R** nose |
| (b) (i) | sulfur dioxide ;<br>nitrogen oxide(s) ; | [max 1] | |
| (ii) | **1** increase in pH to 7.0 increases the number of species of fish ;<br>**2** most species of fish were present at <u>pH 7.0 and 7.5</u> ;<br>**3** least species of fish were present at pH 4.0 ;<br>**4** increase in pH above 7.5 decreases the number of species of fish ;<br>**5** small changes in number of species of fish between pH 6.5 – pH 8.0 ;<br>**6** large change in the number of species of fish between pH 4.0 – pH6.5 ;<br>**7** acidic lakes have fewer fish species than pH neutral / alkaline lakes **ora;**<br>**8** reference to mean number of fish species at a particular pH ; | [max 3] | |

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| (iii) | reduces the pH of rivers / lakes / soils ;<br>(low pH) kills / harms, fish / invertebrates ;<br>(low pH) causes aluminium compounds to become soluble ;<br>aluminium compounds toxic to aquatic life ;<br>kills / harms, trees / lichens / plants ;<br>mineral / s / ions / salts, washed out of soil ;<br>damages limestone, buildings / statues / rock ; | [max 2] | |
| 5 (a) (i) | production of genetically identical offspring ;<br>from one parent ;<br>no gametes / (only) mitosis ; | [max 2] | |
| (ii) | *advantage*<br>fast ;<br>colonise new areas quickly ;<br>if the parent is well adapted to the environment the offspring will be also / AW ;<br>only one individual needed ;<br>*disadvantage*<br>little / no, variation ;<br>disease / change in environmental conditions, likely to kill all organisms / AW ;<br>limited ability to adapt to environmental changes / AW ;<br>no dispersal, so competition (with parent / others) likely ; | [max 2] | max 1 from advantage and 1 from disadvantage |
| (b) (i) | increase in, size / length / mass / volume / AW ;<br>increase in cell number ; | [max 2] | increase in dry mass = 2 marks<br><br>**A** reference to cell division / mitosis / reproduction of cells / tissues |
| (ii) | sucrose transported (to underground stems) ;<br>through phloem / translocation ;<br>sucrose converted to starch ;<br>stem swells ;<br>AVP ; | [max 3] | **A** sucrose stored as starch |

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| (c) (i) | – (negative);<br>25 — 40 ; | [2] | 1 mark for a number in range from 25 – 40 inclusive. |
| (ii) | *Accept the following 3 marking points written anywhere in response:*<br>**1** correct reference to osmosis ;<br>**2** cell membrane is, partially / semi / selectively permeable ;<br>**3** reference to movement of water down a water potential gradient ;<br><br>*between 0.0 mol dm$^{-3}$–0.4 mol dm$^{-3}$*<br>**4** water moves into the potato ;<br>**5** potato has a lower water potential than surroundings / **ora** ;<br>**6** increasing the potato's mass ;<br><br>*at 0.4 mol dm$^{-3}$*<br>**7** potato has the same water potential as the surroundings ;<br>**8** there is no net movement of water ;<br><br>*between 0.4 mol dm$^{-3}$ – 1.0 mol dm$^{-3}$*<br>**9** potato has a higher water potential than the surroundings **ora;**<br>**10** water moves out of the potato ;<br>**11** decreasing the potato's mass ; | [max 5] | marking points 1, 2 and 3 need to be in correct context<br><br>**A** there is no water potential gradient at 0.4 mol dm$^{-3}$ |
| (d) (i) | long filaments ;<br>anthers / stamens, hang outside / anthers / stamens, easily exposed to the wind ;<br>anthers loosely attached to the filaments ;<br>small / light, pollen ;<br>large / feathery / hairy, stigma ;<br>stigma / style, hangs outside ;<br>no / reduced, petals ; | [max 2] | |
| (ii) | self-pollination is within the same, plant / flower ;<br>cross-pollination is between different plants ; | [max 1] | |

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| (iii) | more chances of fertilisation ;<br>no need for pollinators ;<br>useful if plants are, geographically isolated / on their own / AW ;<br>if well suited to the environment the traits are kept / AW ;<br>less energy required for reproduction / less wastage of pollen ;<br>AVP ; | [max 1] | |
| 6 (a) (i) | selective breeding qualified with feature e.g. increase in crop yield ;<br>agricultural machinery, to work larger fields / AW ;<br>fertilisers, to increase plant growth / provide mineral ions / salts / (named) nutrient ;<br>pesticides / insecticides to kill pests to prevent crop destruction ;<br>herbicides to kills weeds to reduce competition ;<br>fungicides, to kill fungi to stop disease / reduce crop destruction ;<br>genetic engineering qualified with a correct feature ;<br>use of antibiotics to increase yield (in livestock) ;<br>AVP ; | [max 2] | must have correct explanation for the second 'explanation' mark |
| (ii) | better / AW, medical care / medicine / drugs / antibiotics ;<br>clean / treated, water ;<br>drainage / sewage treatment / sanitation ;<br>vaccination ;<br>improved housing conditions ;<br>improved food, storage / transport / availability ; | [max 1] | |
| (b) | **1** shorter food chain / plants at first trophic level / plants are producers / animals are at a higher trophic level ;<br>**2** energy lost, at each trophic level / along food chain ;<br>**3** energy from plants goes (directly) to humans instead of via animals ;<br>**4** animals / named animal, use up energy so less available ;<br>**5** example of energy loss from animals in food chain ; | [max 3] | |

© Cambridge International Examinations 2015

| Question | Expected answers | Mark | Additional Guidance |
|---|---|---|---|
| (c) | **1** soil erosion ;<br>**2** flooding ;<br>**3** landslides ;<br>**4** leaching / loss of nutrients ;<br>**5** drought ;<br>**6** desertification ;<br>**7** increase in, frequency / severity of storms ;<br>**8** loss of habitat ;<br>**9** extinction / endangerment of species / loss of biodiversity ;<br>**10** disruption of, food chains / food webs ;<br>**11** burning of trees increases carbon dioxide in the atmosphere ;<br>**12** decreased photosynthesis so, increased carbon dioxide / decreased oxygen, in atmosphere ; | **[max 4]** | |

© Cambridge International Examinations 2015