

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the May/June 2009 question paper
for the guidance of teachers

0610 BIOLOGY

0610/32

Paper 32 (Extended Theory), maximum raw mark 80

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Question Expected Answers Marks

- 1** *one mark per row, treat blank spaces and crossed ticks as crosses*
if ticks and crosses and blanks in the same row, treat as incorrect
allow 'yes' and 'no' for ticks and crosses

feature	fish	amphibian	reptiles	birds	mammals
mammary glands	×	×	×	×	✓
fur / hair	×	×	×	×	✓ ;
scales / scaly skin	✓	×	✓	✓ A × (except feet/legs)	×
external ears	×	×	×	×	✓ ;
feathers	×	×	×	✓	×

[4]

[Total: 4]

- 2 (a) (i)** gut / alimentary canal / oesophagus / small intestine / ileum / duodenum / large (A big) intestine / colon / rectum / intestine / AW ; R stomach [1]
- (ii) hepatic portal vein ; A hephatic R HPV [1]
- (b) (i)** *answers may be in space below question*
A – nucleus ;
B – cell / plasma, membrane ; A plasmalemma
C – cytoplasm ; [3]
- (ii) *award two marks if correct answer (between 1983 – 2017) is given, ignore units*
award one mark if incorrect measurement is divided by 0.06
allow +/- 1 mm in reading the line

120 (mm) / 0.06 (mm) 12 (cm) / 0.006 (cm)
2000 ;; A 1983 – 2017 [2]

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(c) *award in either section*

- 1 ref to enzymes (within liver cells) ;
- 2 ref to negative feedback / homeostasis ;
A 'concentration returns to normal' / 'reduces glucose level' / AW

penalise once if insulin / glucagon are described as acting like enzymes - MP5/7

ignore incorrect source of hormone(s)

penalise once if starch is given instead of glycogen and if glycogen is misspelt

blood glucose concentration is higher than normal

- 3 insulin ;
- 4 glucose, enters / diffuses into / goes into / absorbed (by liver / cells) ;
- 5 (liver cells) store glucose as glycogen / convert glucose to glycogen ;
A increase respiration / increase metabolism of glucose / storage of fat / AW

blood glucose concentration is lower than normal

- 6 glucagon ;
- 7 (liver cells) convert / break down, glycogen to form glucose ;
- 8 glucose, goes out of cells / enters the blood ;

[5 max]

- (d)
 - 1 makes (named) protein / protein synthesis / forms peptide bonds / are assimilated ;
 - 2 (excess are) broken down / deaminated ;
 - 3 removal of, amino group / -NH_2 / nitrogen-containing part ; **R** nitrogen unqualified
 - 4 (to form) ammonia ;
 - 5 converted to urea ; **A** amino acids are, broken down / converted, to urea
 - 6 rest of molecule (**A** carbohydrate), is respired / used to provide energy / stored ;
 - 7 transamination / described ;

[3 max]

[Total: 15]

- 3 (a) *description required not an explanation, so ignore collisions / denaturation MP3 may be awarded for comments within the range 50 °C to 90 °C*

- 1 no activity, at / below, 10 °C ;
- 2 increased activity between 10 °C and 90 °C ;
- 3 steep(est) increase / exponential increase, between 50 or 60 °C and 90 °C ;
- 4 optimum / peak / maximum, at 90 °C ; **A** 'works best at' / most active at
- 5 above 90 °C activity decreases ;

[3 max]

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(b) *ignore details of genetically modified bacteria*

- 1 (bacteria grown in) fermenter / bioreactor / vat ; **R** tanks
- 2 (bacteria provided with) substrate / feedstock / food substances / glucose / sugars / starch / minerals / whey / waste substances / nutrients / amino acids / AW ;
R food / raw materials
- 3 oxygen / aerobic conditions ; **A** air bubbled through / aerated
- 4 optimum conditions / 26 °C / pH 5–6 / sterile ;
- 5 stirred to, prevent settling / mix bacteria with nutrients ;
- 6 (bacteria) grow / reproduce / divide / multiply, rapidly ;
- 7 (extracellular) enzymes, secreted / released / AW ; **R** production
- 8 enzymes, extracted / harvested / separated / collected / removed (from, bacteria / mixture) ;
A ref to filtration / crushing bacteria **R** crushing enzymes

[4 max]

(c) *enzymes must be in the correct context*
do not award MP9 if there are no other points made

- 1 protein digested to, amino acids / (poly)peptides ; **A** broken down / hydrolysed
- 2 (by) protease(s) ;
- 3 fats digested to fatty acids (and glycerol) ;
- 4 (by) lipase(s) ; **R** ligase
- 5 (by) amylase ;
- 6 starch to, sugar, maltose, glucose ;
- 7 (by) cellulase ;
- 8 breakdown cellulose (fibres) to release stains ; **A** reduces pilling
- 9 *idea that products are, soluble / washed away (in the water) ;*

[4 max]

- (d)
- 1 thrombin / protease ;
 - 2 fibrinogen converted to fibrin ;
 - 3 soluble (protein) converted to insoluble (protein) ;
 - 4 fibrin, traps blood cells / forms mesh / forms 'nets' ;

[3 max]

[Total: 14]

- 4 (a)
- 1 against concentration gradient / from low concentration to high concentration ;
 - 2 across membrane ;
 - 3 (carrier) protein ; *ignore* channel
 - 4 using, ATP / energy ;
 - 5 from, respiration / mitochondria ;

[3 max]

(b) 6.3 ;

[1]

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- (c) temperature ;
 humidity ;
 air speed ;
 light intensity ;
 carbon dioxide concentration ;
 same species / same variety / same type ;
 constant flow (of nutrients) ;
volume of (nutrient) solution ; **R** amount
concentration of (nutrient) solution ; **R** amount
 oxygen concentration / aeration, of water ;
R oxygen unqualified / oxygen in the air **R** nutrients unqualified [3]
- (d) leave to dry for a suitable period of time ; 12 hours / overnight minimum
 weigh / use a balance ; **A** scales
 repeat until two readings are the same ; [3 max]
- (e) (i) plants small(er) / stunted growth/ shorter plants / poor growth ;
short(er) roots ;
 small(er) / few(er), leaves ;
 pale / yellow, leaves ; **A** chlorotic
 leaves die early ;
stem is thin / plant is spindly ; **R** 'weak' / thin unqualified / stalk [2 max]
- (ii) used to make amino acids ;
 (amino acids) used to make protein ; **A** 'from nitrate'
 a use of protein in plants ; e.g. enzyme / membrane / wall / cytoplasm /
 protoplasm
 used to make, nucleic acids / DNA / RNA ;
 used to make chlorophyll ; **R** chlorophyll is a protein **R** chloroplast [2 max]
- (f) 1 it / magnesium, is needed to make / is part of, chlorophyll (molecule) / AW ;
 2 (so) little / no, chlorophyll ;
 3 little / less / no, absorption of light ;
 4 little / less / no, photosynthesis ;
 5 little / less / no, food / material (for growth) ;
 6 e.g. cellulose / sugars / protein / AW ;
 7 little / less / no, energy for, growth / active transport / AW ; [3 max]

[Total: 17]

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- 5 (a) (length of) DNA / part of chromosome / on a chromosome ,
that codes for a protein or polypeptide or enzyme / controls a characteristic ; [1]

- (b) $H^N H^S \times H^N H^S$; accept *N* and *S*

$H^N, H^S + H^N, H^S$; gametes must be clear *accept on dotted line or in Punnett square*

$H^S H^S$; *ecf from correct gametes if wrong parental genotype* [3]

- (c) check <http://www.sicklecellsociety.org/education/healthpr.htm> for AVPs

- 1 red (blood) cells become, sickle shaped / distorted / AW ; **R** abnormal unqualified
- 2 in areas of low oxygen concentrations / in tissues ;
- 3 fewer / less elastic / less flexible / short-lived, red blood cells ; *ora*
- 4 less haemoglobin ;
- 5 blood / haemoglobin, less efficient at transporting oxygen ; **R** no oxygen
- 6 less respiration ; **R** no respiration
- 7 less energy / fatigued / exhaustion / less active / feeling faint or tired / breathless ;
- 8 capillaries are blocked ;
- 9 pain ;
- 10 death of tissues linked to blood supply ;
- 11 'sickle cell crisis' ; **A** 'attacks needing oxygen'
- 12 slow / poor, growth ;
- 13 susceptible to infections ;
- 14 reduced life span ;
- 15 AVP ;
- 16 AVP ;

[4 max]

- (d) 1 *idea that* areas with high percentage of sickle cell (allele) are places with malaria ;
- 2 $H^S H^S$ / homozygous recessive, reduced life span because of sickle cell anaemia ;
- 3 $H^N H^N$ / homozygous dominant / without H^S , susceptible to malaria / AW ;
- 4 $H^N H^S$ / heterozygous / carrier/ with H^S , resistant / not affected / less susceptible ;
- A** $H^S H^S$ **R** immune / immunity
- 5 $H^N H^S$ (carrier) survive and have children / $H^N H^N$ or $H^S H^S$ do not ;
- 6 $H^N H^S$ / carrier, pass on the allele / H^S ;
- 7 (if $H^N H^S \times H^N H^S$) 1 in 4 chance of, $H^S H^S$ / homozygous recessive ;
- 8 2 in 4 / 50% / $\frac{1}{2}$, have advantage of resistance to malaria ;

[5 max]

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- (e) 1 *idea that* distinct groups / categories ; ref to bar chart
- 2 *either* sickle cell anaemia ($H^S H^S$), sickle cell trait ($H^N H^S$), normal ($H^N H^N$) /
or normal, anaemic ; **A** 'some people have disease, some do not'
A 'some people have the allele, some do not'
- 3 no intermediates / no continuous scale of anaemia / AW ;
- 4 genetic condition / environment has no effect (on its expression) ;
A ref to small number of, genes / alleles, involved [3 max]

[Total: 16]

- 6 (a) *this is **not** a question about energy losses in animals*
- 1 not all plant material is used in the animal feed ; **A** named e.g.
A lost in manufacture of feed
- 2 light transmitted through plants / not absorbed by plants ;
- 3 light reflected ;
- 4 water evaporates from plants / ref transpiration ;
- 5 temperature too, low / high (to use light efficiently) ;
- 6 carbon dioxide concentration too low (to use light efficiently) ;
- 7 loss of energy in (plant) respiration / loss of heat to surroundings / loss of
energy in metabolism ;
- 8 plants are eaten by, insects / pests ;
- 9 plants are diseased ;
- 10 leaves / roots, die ;
- 11 energy to decomposers ;
- 12 AVP ; e.g. active uptake of ions
- 13 AVP ;

ignore 'used for growth' / 'used for reproduction' / 'making protein' [3 max]

- (b) *award two marks if correct answer (19) is given
if incorrect answer or no answer award mark for correct working – look out for
×100*

380 000 / 2 000 000 × 100 ;
19 (%) ;

[2]

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- (c)
- 1 plants = producers / 1st trophic level ;
 - 2 animals / livestock = primary consumers / 2nd trophic level ;
 - 3 energy is lost, between / in each, trophic levels ;
A 'along the food chain' / only 10% is transferred
 - 4 2 000 000 kJ available from first trophic level but 380 000 kJ from, second trophic level / meat ;
 - 5 (only) 19% is transferred from crop plant to humans / 81% is lost / 1 620 000 kJ lost ; **A** *ecf* from (b)
- energy losses in animals*
- 6 respiration / movement / heat / method of losing heat ;
 - 7 urine / excretion / faeces / food egested ;
- [5 max]
- (d)
- 1 cannot lose (as much) energy in, movement / exercise ;
 - 2 do not have to use as much energy in, keeping warm / keeping cool ;
 - 3 easier to keep animals free of, disease / parasites ;
 - 4 may be provided with better food / food supply better controlled ;
 - 5 AVP ;
- [2 max]
- (e)
- 1 increased use of fossil fuels ;
 - 2 more industrialisation / more transport ; **A** 'more' implied
 - 3 nitrogen oxide(s) / sulfur dioxide, in atmosphere ; **A** NO_x
 - 4 dissolves, limestone (marble *or* sandstone) / corrodes zinc roofs ;
 - 5 acidification of, lakes / rivers / freshwater / soils ;
 - 6 kills fish ;
 - 7 some animals cannot form shells properly ;
 - 8 release of aluminium (ions) (in soils) ;
 - 9 defoliation / death of, trees / plants ; **A** crown die back
 - 10 AVP ; e.g. loss of biodiversity if no ref to plant or animals in MP6 / 7 / 9
- [2 max]

[Total: 14]