Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/04**

Paper 4 Theory (Extended) **For Examination from 2016**

SPECIMEN MARK SCHEME

1 hour 15 minutes

MAXIMUM MARK: 80

The syllabus is accredited for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **8** printed pages.

mark scheme abbreviations

;	separates marking points
/	alternative responses for the same marking point
not	do not allow
allow	accept the response
ecf	error carried forward
avp	any valid point
ora	or reverse argument
owtte	or words to that effect
underline	actual word given must be used by candidate (grammatical variants excepted)
( )	the word / phrase in brackets is not required but sets the context
max	indicates the maximum number of marks
Any [number] from:	accept the [number] of valid responses
note:	additional marking guidance

1 **(a)** animals written in the correct boxes in the food web

vultures;

cheetahs;

mice / mouse; [3]

(b) (primary) producer;

primary consumer; [2]

(c) **(i)** Sun; [1]

(ii) (lost) to the atmosphere / (lost as) infra-red (radiation) / heat / owtte; [1]

(d) Any three from:

idea that small percentage of energy from Sun is 'fixed' by photosynthesis /

most energy from Sun not available / reference to wrong wavelength;

energy is lost between and within trophic levels;

ref. to 10% energy transfer / ora (per trophic level);

note: if magnitude given, e.g. '90% lost between trophic levels', award 2 marks

ref. to material that is inedible or indigestible;

ref. to (small) total percentage reaching fourth trophic level (cumulative idea);

not enough energy in fourth trophic level to support another level;

avp; [max 3]

(e) Any three from:

feed is expensive;

more energy efficient to feed humans on crops or producers or animals that are used to make the (fish) food;

waste feed causes eutrophication of water supplies;

diseases or parasites spread easily (in captivity);

diseases spread to other organisms in the wild;

chemicals used to control disease are also pollutants (e.g. antibiotics);

avp; e.g. animal welfare concerns [max 3]

2 **(a)** Any three from:

muscular contraction / movement / pump blood;

allow: maintain posture

maintenance of body temperature;

active transport described / example such as nerve impulses;

metabolic reactions / named example (e.g. excretion / biosynthesis / digestion);

mitosis / nuclear division / cell division;

growth / replacement / repair;

making gametes / owtte;

avp; [max 3]

(b) **(i)** respiration; [1]

(ii) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ [1]

(c) Any four from:

takes time for;

oxygen debt (to be repaid);

more oxygen needed;

lactic acid / lactate;

builds up in muscles / needs to be cleared away;

lactic acid is broken down / respired; [max 4]

(d) Any five from:

as body temperature increases;

<u>vasodilation</u>;

(relaxation / owtte) of arterioles;

allow: arteries

increase in supply of blood to skin capillaries;

(causes) loss of heat;

by, conduction / convection / radiation;

increase in blood flow to sweat glands;

increased production of sweat;

loss of heat by evaporation; [max 5]

3 **(a)** ability to detect and respond to changes in the environment; [1]

(b) correct label and name of:
sensory neurone;
relay / connector / intermediate neurone;
motor / effector neurone; [3]

(c) automatic / no thought required / not a conscious action;
allow: no (higher centres in) brain involved
ignore: reference to speed of response
stimulus always leads to the same response;
allow: fixed response [2]

(d) **(i)** a junction between two neurones; [1]

(ii) Any three from:
(an impulse triggers) the release of neurotransmitters (into the gap);
diffuse across the gap;
binds to receptors;
which allows the passage of the impulse; [max 3]

(e) Any two from:
heart beats faster / increased pulse;
increased rate of breathing;
stimulates breakdown of glycogen in the liver;
increases blood glucose concentration;
dilate pupils;
heightened sensitivity / increased mental awareness / owtte;
allow: sharper senses / more alert / owtte [max 2]

(f) Any one from:
nervous control is faster / ora;
hormonal control is longer-lasting / ora;
note: comparison must be made [max 1]

4 **(a)** **R and Y**;
RY;
orange; [3]

(b)

	genotypes of offspring
cross 2	**RR**, **YY**, **RY**
cross 3	**RR**, **RY**
cross 4	**YY**, **RY**

allow: ecf from **4(a)** [3]

(c) Any three from:
phenotype of **RY** (offspring of **cross 1**) is different from either parent or the homozygous genotypes / owtte;
the phenotype was intermediate / mixture of two colours;
offspring of **cross 2** gives three phenotypes not two;
offspring of **crosses 3** and **4** both give two phenotypes;
if dominance **cross 3** or **4** would give one phenotype only;
allow: incomplete dominance
allow: both alleles are expressed [max 3]

(d) Any two from:
transfer of pollen from anthers or stamen to stigma;
self = within same flower (or flower on same plant);
cross = between flowers on different plants (of same species); [max 2]

(e) Any four from:
limited variation;
offspring become homozygous (over time) / owtte;
allow: reference to inbreeding / limited gene pool
variation is due to mutation;
low chance that mutations will be expressed / owtte;
offspring will be well adapted to conditions near parent;
if environment does not change;
limited opportunity for evolution if environment changes / will not be able to adapt to change in the environment;
allow: reference to disease in context (as a change)
avp; e.g. some variation due to reassortment of chromosomes and crossing over during meiosis / reduced variation leads to intraspecific competition locally; [max 4]

5 **(a)** *water jacket*

Any four from:

maintain optimum / constant temperature;

allow: prevent overheating

to prevent enzymes denaturing;

(because as) fungus respires;

releases heat so temperature in the fermenter increases;

which would kill fungus;

(therefore) no product / no penicillin / owtte;

addition of acids and alkalis

Any two from:

maintains pH / keeps pH constant;

enzymes need optimum pH;

to give maximum enzyme activity / rate of reaction at its fastest;

to give maximum yield / owtte;

allow: stop enzymes denaturing

[max 6]

(b) **(i)** 40–50; [1]

(ii) mitosis; [1]

(iii) Any three from:

nutrients are used up;

limiting (factors);

explanation of limiting factor;

allow: factor in shortest supply / owtte

waste products accumulate;

wastes are toxic;

penicillin could inhibit growth;

population reaches carrying capacity;

avp; [max 3]

(c) **(i)** fungus grows when no penicillin produced;

during first 20 hours; [2]

(ii) Any one from:

no more growth of fungus / fungus is dead;

no further production of penicillin / no advantage in continuing; [max 1]

[Turn over

(d) Any three from:
purifying or separating penicillin;
from waste or toxins / owtte;
concentration;
making into pills / owtte;
avp; e.g. colour / taste [max 3]

(e) Any two from:
viruses have no metabolism;
allow: viruses do not have ribosomes
idea that viruses have no target for antibiotics / owtte;
antibiotics stop cell wall growth;
viruses have no cell wall;
antibiotics stop enzymes working; [max 2]

6 **(a)** **A** epithelium / epithelial lining;
B lacteal;
C capillary / blood vessel; [3]

(b) Any three from:
microvilli
increases / large surface area;
for absorption;
allow: diffusion / active transport (into villus)
mitochondria
(for) respiration;
provide energy / ATP;
for active uptake / transport; [max 3]