

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

Specimen for 2007

GCE A LEVEL

MARK SCHEME

MAXIMUM MARK: 100

SYLLABUS/COMPONENT: 9700/04

**BIOLOGY
STRUCTURED QUESTIONS**

3 (a) Either
If genetic diagram used

Penalise once for incorrect symbols

orange dominant to black (for converse);

orange scallop

parents	$S^o S^o$	$S^o S^b$	X	$S^o S^o$	$S^o S^b$
gametes	S^o	S^b		S^o	S^b
genotype	$S^o S^o$	$S^o S^b$		$S^o S^b$	$S^b S^b$
phenotype		orange			black
black scallop		$S^b S^b$	X	$S^b S^b$	
parent					
gametes		(S^b		S^b)	
genotype			$S^b S^b$		
phenotype			black		

Or
If text explanation given

orange dominant to black (or converse);
orange are heterozygous;
(because) ref. 3:1 ratio;
link data to ratio;
black are homozygous;
because all offspring are black;

[6]

(b) separate orange scallops produced from first cross/test cross orange with black;
some will produce only orange offspring;
these will be homozygous for orange allele/pure breeding;

[2max]

Total: 8

4 (a) Fungi; (accept fungus)
Protoctista; (accept Protista)
Animalia; (accept animal)
Prokaryotae; (accept Prokaryote, bacteria)
Plantae; (accept plant)

[5]

(b) *advantages*
IDEA of simplicity;
easy to classify most organisms into the correct kingdom;
consistent with the traditional literature / AW;

Page 4	Mark Scheme	Syllabus
	GCE A LEVEL – 2007	9701

disadvantages

plant kingdom, is artificial / contains unrelated organisms / organisms that are not fundamentally similar;

ref. to prokaryotes and eukaryotes in the same kingdom;

ref. to other valid example of very differently organised organisms in the same kingdom;

problem of what to do with protoctists / AW;

detail of difficulty with protoctists (e.g. Euglena is motile (animal-like) but autotrophic (plant-like));

[4 max]

- (c) (i) IDEA that biodiversity is about the variety of different kinds of organisms; BUT there are far more than hundreds of sorts of organisms / there are millions of species; AND biodiversity is all kinds of organisms / not just animals; (independent points)
- ii) maintaining biodiversity is important because
IDEA of extinction is forever / once they are gone they are gone;
Any two from it is, a source of genes for future use / medicines not yet known / foods not yet known / the means of retaining stability of ecosystems;;
- iii) argues that protected species can be successfully protected in artificial environments / zoos / botanic gardens / seed banks;
argues that species can be successfully protected in controlled natural environments / conserved areas / national parks / AW;
a specific, named, example of successful conservation (e.g. golden lion tamarins in zoos);

Mark straight through

[6 max]

Total: 15

- 5 (a) restriction (endonuclease) enzyme;
named example; e.g. EcoR1
specific, sequence of bases/point;
ref. to sticky ends/exposed bases; [3 max]
- (b) sticky ends added to insulin gene;
ref. to complimentary base pairing/C and G bases pair up;
ref. H bonds;
(DNA) ligase;
formation of phosphodiester bond/seals sugar phosphate backbone; [3 max]
- (c) identical to human insulin (ref. to bovine/porcine insulin used previously);
ref. to reduced immune response/side effects;
cheaper to produce;
more rapid response;
pure/uncontaminated;
regular production not dependent on livestock;
ethical issues;
AVP; e.g. tolerance [2 max]

Page 5	Mark Scheme	Syllabus	Number
	GCE A LEVEL – 2007	970	

6 (a) anaerobic / in absence of oxygen;
glycolysis;
IDEA OF because if it was aerobic, no ethanol / only carbon dioxide and water, would be produced;
sugar(s) / named sugar is respiratory substrate;
ethanol produced;
carbon dioxide produced; [3 max]

(b) (i) end product not contaminated;
enzyme, more stable/less likely to be denatured;
enzyme recovery easier;
idea of enzyme being reused;
AVP; e.g. cost [3 max]

(ii) α amylase;
more maltose produce;
use of figures; [2 max]

Total: 8

7 (a) no petals;
no nectaries;
no scent produced;
large stigma;
feathery stigma;
to trap pollen;
stamens hang outside flowers;
flowers held on tall inflorescences;
pollen light and smooth; [4 max]

(b) *self pollination*
reliable;
if plants widely scattered;
effective in harsh environments;
e.g. high mountains max 2

cross pollination
genetic variation;
ref. outbreeding;
genes shuffled every generation;
species more likely to survive environmental change; max 2 [4 max]

Total: 8

8 (a) (i) anterior pituitary gland;
(ii) follicles in ovary; (*both required*)
(iii) corpus luteum (in ovary);
pituitary + ovary + ovary = 1 [3]

(b) (i) FSH is an oestrogen agonist / AW;

Page 6	Mark Scheme	Syllabus	Number
	GCE A LEVEL – 2007	970	

FSH stimulates follicles to develop (in ovary);
 as follicles grow they contain more (granulosa) cells;
 (granulosa) cells secrete oestrogen;
 oestrogen inhibits FSH production;
 peak in oestrogen stimulates LH release;
 LH triggers ovulation;
 ref. hormones circulate / reach target organs, in blood;

[4 max]

- (ii) rise / peak in oestrogen (before ovulation);
 causes proliferation / growth of uterus lining;
 rise / peak in progesterone (after ovulation);
 maintains uterus lining;
 IDEA OF transforms uterus lining from proliferative to secretory;
 Drop in progesterone, causes uterus lining to break down / initiates menstruation;
 correct ref. figures e.g. oestrogen peak at 10 days / progesterone peak at 21 days;
 ref. endometrium;

[4 max]

(c) (i) $\frac{4.0 - 2.2 \text{ cm}^3}{4y} = 0.45; \text{ cm}^3 \text{ per year};$ (accept $1.8 \text{ cm}^3 \text{ per 4 years}$ for 1 mark) [2]

(ii) $\frac{0.45}{2.2} = 0.20 \text{ or } 0.2; ;$ (accept errors carried forward) [2]

Total: 15

9 (a) Explain how a synapse functions. [9]

(b) Describe the role of glucagon in regulating blood glucose. [6]

- (a)
- 1 depolarisation/action potential;
 - 2 of presynaptic membrane/synaptic knob;
 - 3 opening calcium ion channels;
 - 4 calcium ions in;
 - 5 vesicles containing transmitter/acetylcholine;
 - 6 fuse with membrane;
 - 7 contents emptied into synaptic cleft/exocytosis;
 - 8 transmitter/acetylcholine diffuses across synaptic cleft;
 - 9 transmitter/acetylcholine binds to receptor; R protein channel
 - 10 on post synaptic membrane;
 - 11 Na^+ channels open/ Na^+ enters;
 - 12 depolarises post synaptic membrane;
 - 13 action potential set up/impulse transmitted
 - 14 breakdown/hydrolysis of transmitter/acetylcholine by enzyme/cholinesterase; [9 max]

Page 7	Mark Scheme	Syllabus	Number
	GCE A LEVEL – 2007	970	

- (b) 15 when blood glucose levels low;
- 16 glucagon released from alpha cells (in pancreas);
- 17 (acts on) liver (cells);
- 18 breakdown of glycogen to glucose;
- 19 use of fatty acids in respiration; **R fats**
- 20 production of glucose from other compounds/fats/amino acids/gluconeogenesis;
- 21 liver releases glucose into blood;
- 22 glucose levels rise/return to normal;
- 23 switching off glucagon secretion;
- 24 antagonistic to insulin;

[6 max]

Total: 15

- 10 (a) 1 ref. continuous/discontinuous variation;
- 2 genetic/inherited variation;
- 3 variation in phenotype/characteristics/AW;
- 4 (can be due to) interaction of genotype and environment;
- 5 e.g. of characteristic that influences survival;
- 6 ref. intraspecific competition/struggle for existence;
- 7 those with favourable characteristics survive/AW;
- 8 pass on favourable characteristics to offspring;
- 9 those with disadvantageous characteristics die;

[6 max]

- (b) 10 ref. to definition of species;
- 11 ref. allopatric;
- 12 geographical isolation;
- 13 ref. to examples e.g. islands/lakes/mountain chains/idea of barrier;
- 14 ref. to example organism;
- 15 ref. to populations prevented from interbreeding;
- 16 isolated populations subjected to different selection pressures/conditions;
- 17 over time sufficient differences to prevent interbreeding;
- 18 ref. sympatric;
- 19 ref. to reproductive isolation;
- 20 ref. behavioural barriers (within a population);
- 21 e.g. day active/night active;
- 22 correct ref. to gene pool;
- 23 change to allele frequencies;

[9 max]

Total: 15