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Mark Scheme (Results)
Summer 2007

GCE

GCE Biology SNAB (6132/01)

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General Principles

Symbols used in the mark scheme

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point.
eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting. It is used because it is not always possible to list every alternative answer that a candidate may write that is worthy of credit.
/ oblique	Words or phrases separated by an oblique are alternatives to each other.
{} curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion.
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point.
[] square brackets	Words inside square brackets are instructions or guidance for examiners.

Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
  e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
  e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
  e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
  e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not

- candidates must make their meaning clear to the examiner to gain the mark.

- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark – irrelevant material should be ignored.

Question 1 **Maximum mark**

	Feature	Sperm	Egg
	Tail	✓	X
(i)	Haploid nucleus	✓	✓
(ii)	Acrosome present	✓	**X**
(iii)	Mitochondria present	✓	✓
(iv)	Cytoplasm containing many lipid granules	**X**	✓
(v)	Use ATP for movement	✓	**X**

(1) per line

NB an empty box = **(0)** for that line
a tick/cross hybrid = **(0)** for that line

Total 5 marks

Question 2 **Maximum mark**

(a) (i) onion / garlic / other suitable species;
(ii) root tip;

2 marks

(b) (acidic/acidified/acetic/ethanoic/propanoic) orcein / feulgen / toluidene blue;

1 mark

(c) to macerate them/to separate the cells;

1 mark

(d) A = centromere;
B = chromatids;

1 mark

Total 6 marks

Question 3 **Maximum mark**

(a) by wind;
large surface area / spins as it falls / falls more slowly / eq;
increases chances of being blown further;

2 marks

(b) (i) {thick / tough / strong / impermeable / {enzyme/decay} resistant}
{(seed) coat / testa} / reference to dormancy;

1 mark

(ii) identify appropriate food store e.g. starch / carbohydrate / lipid / triglycerides / protein;
starch / carbohydrate / lipid / fatty acids and glycerol provide energy;
protein / amino acids for growth;

2 marks

Total 5 marks

Question 4 **Maximum mark**

(a) (i) height (partly) determined by genes;
half of child's genes (for height) from each parent / children of tall parents more likely to inherit genes for tallness (than children in general);
{taller children / children of tall parents}stronger / more likely to survive (in the past);
tall {women/men} might be {more fertile / more able to survive child birth};
tall people tend to marry tall people;

3 marks

(ii) protein/amino acids {important/needed/essential} for growth / making new cells;
in the past growth of (many) children was limited by lack of protein (compared with today)/ adequate protein intake needed to reach genetic potential/eq / reference to dietary protein a source of amino acids to make human protein;
improved quality of protein / all necessary amino acids;

2 marks

(iii) children who are (frequently) unwell do not grow (as well as healthy ones);
sick children use resources to fight disease instead of for growing;
sick children have reduced appetite/vomit a lot/have poor digestion;

1 mark

(b) mutation / reference to tumour repression substance;
triggered off by carcinogenic substances / tar in tobacco smoke;
leading to uncontrolled cell division;
leading to formation a mass of cells / tumour;
cycle/rate of cell formation exceeds rate of cell death/apotosis;
NOT 'more cell division', 'damages DNA'

3 marks

Total 9 marks

Question 5 **Maximum mark**

(a) reduced enzyme activity / metabolic activity / metabolism / eq;

1 mark

(b) global warming / climate change / getting warmer on average {year on year/eq} / they have evolved / natural selection;

1 mark

(c) hibernate before it gets cold / might be too late to hibernate once it gets cold / day length better indicator of season than temperature;

1 mark

(d) genes / genetic factors / mutation;
not triggered by temperature change / it is genes (controlling response to day length) which trigger hibernation;

2 marks

Total 5 marks

Question 6 **Maximum mark**

(a) signal protein {binds to / joins to / interacts with / activates}
receptor on surface membrane;
messenger molecule crosses cytoplasm and enters nucleus;
{produces / activates} transcription factor;
reference to gene switching / gene promotion;
so transcription occurs / description of transcription e.g. in terms of base pairing;

3 marks

(b) DNA retained as master copy / eq;
DNA molecules are {much larger (than RNA)/{unable/too big} to pass through nuclear pores};
DNA double helix while RNA single strand / eq;
proteins cannot be made in nucleus /made in cytoplasm on ribosomes;
amino acids must be assembled in the sequence specified by genetic / DNA code;

2 marks

(c) pass through RER;
vesicles made;
vesicles fuse with Golgi apparatus; proteins modified to active form;
vesicles budded off Golgi apparatus;
ref to exocytosis / description e.g. fusing with membrane;

3 marks

Total 8 marks

Question 7 **Maximum mark**

(a) (i) photosynthesis;
(ii) decomposition;
(iii) respiration;
(iv) combustion;

4 marks

(b) (i) (coal contains) carbon that has been taken from the atmosphere (in the past) / carbon that has been taken out of circulation (in the carbon cycle);

1 mark

(ii) burning wood does not add to the amount of CO_2 in the atmosphere / does not cause a net increase;
carbon dioxide in (roughly) equals carbon dioxide out;
burning wood releases carbon recently absorbed (by photosynthesis) / burning fossil fuels releases CO_2 trapped a long time ago / eq;

2 marks

(c) not enough room to keep planting enough forest to use up all the surplus CO_2;
a {mature/fully grown} forest is carbon neutral / only {young / growing} forest is a net absorber / eq;
in the end the forest will die and decay / be burnt by humans;

2 marks

Total 9 marks

Question 8 **Maximum mark**

(a) **One mark** (an honest attempt to make the contrast):
Global warming is a (general) increase in the temperature of the atmosphere / environment whereas greenhouse effect (is a way of explaining) explain why it is happening/the trapping of heat (in the atmosphere) / greenhouse effect is how the sun keeps the Earth warm whereas global warming is an increased greenhouse effect / greenhouse effect causes global warming;

Two marks – *As for one mark plus further detail:*
Global warming is {an increase in global mean surface temperature/average of measurements made in many different places throughout the world} / current global warming may be due to (anthropogenic) burning of fossil fuel / global warming is a fact whilst greenhouse effect is a theory / two greenhouse gases named;;

Three marks (makes the contrast with some detail and which clarifies fact and conjecture and clearly disentangles global warming, greenhouse effect and the possible role of burning fossil fuels):

As for two marks but also: **widely believed that (***some clear implication that it may not be the only explanation***) current global warming is due to {enhanced/increased} greenhouse effect due to raised CO_2 concentration (of the atmosphere) / global warming may be caused by something other than greenhouse gases e.g. changes in solar radiation;;;**

3 marks

(b) (i) any reasonable attempt at a J shaped curved best fit line;

1 mark

(ii) credible attempt at extrapolating the line as a curve;
for correctly reading *both* points off the candidates own extrapolated graph;
(would expect 0.5^{0}C for 2000 and around 1.2^{o}C for 2020 if extrapolated as a curve or 1.0^{o}C extrapolated as a straight line)
for subtracting to get increase using own figures (e.g. 1.1-0.5 = 0.6^{o}C) including units;

3 marks

(iii) assumes present trend continues;
line not based on long enough series of data / older data may be less accurate / reliable;
(graph shows) that temperature has fluctuated (over period 1880 – 2000);
numerical evidence taken from graph to illustrate an occasion when the temperature fell approx 1900 to 1908 or approx 1945 to 1970 ;
ALLOW any reasonable attempt to use figures to make a valid point about predicting future climate from these data;
some unpredictable event may affect trend e.g volcanic eruption / sharper than expected change in fossil fuel consumption / changes in solar radiation;

3 marks

Question 8 continued **Maximum mark**

(c) enzymes temperature sensitive / damaged by high temperature;
damage to enzymes may affect respiration / metabolic activity / photosynthesis / supply of energy;
may give competitor an advantage;
may affect water availability;
may affect supply of food plants / prey species / predators;
change of sex ratio in reptiles / crocodiles;

2 marks

Total 12 marks

Question 9 **Maximum mark**

(a) (i) (superovulation) from IVF treatment;

1 mark

(ii) totipotent cells can give rise to a complete human/all cell types;
pluripotent can only give some cell types;

2 marks

(b) (i) cells allowed to multiply / produce more cells;
in petri dish/test tube / any reasonable attempt to refer to suitable culture vessel;
reference to culture medium/incubator/sterile conditions;
to produce more (identical) cells;

2 marks

(ii) cell becomes specialised (in function)/stem cells develop into different types of cells;
cells stop dividing;
one type of cell can be used to produce a specific type of tissue / named example;
one cell type can be sued to produce tissue / use of named example;

2 marks

(c) This question is intended to test the candidate's ability to deal thoughtfully with a moral dilemma and to balance scientific knowledge and ethical considerations. These are the kinds of skills developed through well-informed class discussion.

Candidates **must decide for or against** - a candidate who does not make his or her choice clear is limited to a maximum of 3 marks.

A candidate who presents points for and against without expressing an opinion is limited to a maximum of 3 marks for valid points either for or against (which ever is the greater) unless he or she presents a good case why the matter is too finely balanced to come down one way or the other.

To gain 4 marks a candidate must include one of the points marked with an asterisk in the mark scheme which attempts to counter the opposing view.

Against:

- Embryonic stem cells are (potential) people/babies;
- From the moment of conception;
- Objectional on religious/ethical grounds; [do **NOT** credit unqualified statements such as 'unnatural', against nature' 'playing God']
- Pressure on women to produce surplus embryos;
- Cloning/stem cell techniques may get into the wrong hands/regulation might be difficult to police* / might be the thin edge of a wedge like designer babies;
- It will soon be possible to use non-embryonic stem cells so research into the use of embryonic stein cells is unnecessary / eq; *
- Although there are some advantages there could be unexpected dangerous consequences therefore not worth the risk / eq;*

Question 9 continued **Maximum mark**

For:

- Potential for alleviating human suffering / eq*;
- Specific example e.g. culturing patient's own cells to provide replacement tissues/organs;
- Stem cells from IVF would otherwise be discarded;
- Embryos should not be considered as human at an early stage (awareness that only cells at a very early stage are used)*.
- Use of non-embryonlc cells will need a development phase using embryonic cells / more can be done with embryonic stem cells;
- Ethically questionable to use embryonic stem cells but these objections are outweighed by the greater evil of not using embryonic stein cells to alleviate human suffering*,
- Could be excesses but these can be regulated*;

4 marks

Total 11 marks

PAPER TOTAL 70 MARKS