ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2003

GCE

Biology B

Units BYB6/7/8/B

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Units 6, 7 and 8: Section B

Question 1

(a)		chromatography; mark solvent front / use IAA marker; Rf value / moves same distance as marker;	3
(b)	(i)	size / species / age of shoot / temperature / time;	1
		against hypothesis 1 - similar amounts of IAA in light and dark; (*allow use of appropriate letters e.g. Similar in **A** and **D***)	1
		in support of hypothesis 2 - **C** has more IAA on shaded side;	1
	(iii)	diagram showing growth of shoot to right;	1
(c)	(i)	(radioactive) carbon / ^{14}C;	1
	(ii)	provide anaerobic conditions / prevents aerobic respiration;	1
	(iii)	active transport; requires ATP / energy;	2
		Total	11

Question 2

(a)	(i)	decrease in consumption up to 25°C then stays constant;	1
	(ii)	oxygen used in respiration / metabolism; respiration / metabolism releases heat; as temp increases less (metabolic) heat required; after 25°C basal metabolic rate;	3 max
(b)		countercurrent flow / arterial and venous flow in opposite directions; heat from artery transferred to surrounding veins;	2
		Total	6

Question 3

(a)	(i)	oxygen concentration in air / water constant / surface area / thickness of skin constant;	1
	(ii)	skin more important in winter and lungs in summer;	1
(b)	(i)	(winter) – low temp – skin takes up more oxygen; (summer) – higher temp – lungs takes up more oxygen;	2
	(ii)	skin is more important in winter and summer / all the time / at all temperatures;	1
(c)	(i)	(thin) – short diffusion pathway; (hairs) – greater surface area for exchange;	2
	(ii)	provides more (oxygenated) water over surface / maintains the concentration gradient;	1
		Total	8

General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

Category	Mark	Descriptor
Good	16 14 12	Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy.
Average	10 8 6	Some of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved.
Poor	4 2 0	Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors.

Breadth of Knowledge (maximum 3 marks)

Mark	Descriptor
3	A balanced account making reference to most areas that might realistically be covered on an A-level course of study.
2	A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered.
1	Unbalanced account with all or almost all material based on a single aspect.
0	Material entirely irrelevant or too limited in quantity to judge.

Relevance (maximum 3 marks)

Mark	Descriptor
3	All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material.
2	Material generally selected in support of title but some of the main content of the essay is of only marginal relevance.
1	Some attempt made to relate material to the title but considerable amounts largely irrelevant.
0	Material entirely irrelevant or too limited in quantity to judge.

Quality of language (maximum 3 marks)

Mark	Descriptor
3	Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout.
2	Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate.
1	The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas.
0	Material entirely irrelevant or too limited in quantity to judge.

Total 25 marks

Additional guidance for assessing Scientific Content and Breadth of Knowledge in Essays

The following provides guidance about topics which might be included in the essays. It is not an exclusive list; the assessment of scientific content does not place restrictions on topics that candidates might refer to, provided they are

- relevant;
- at an appropriate depth for A level and
- accurate.

It is not expected that candidates would refer to all, or even most, of the topics to gain a top mark; the list represents the variety of approaches commonly encountered in the assessment to the essays.

In both essays, topics either from the option modules or beyond the scope of the specification were also given credit where appropriate. For example, in the essay on cycles, the menstrual cycle and viral replication from the option modules, and the ornithine cycle, details of which are not required in the specification, were accepted as suitable examples.

(a) The structure and functions of carbohydrates

Contain the elements, carbon, hydrogen and oxygen.
Monosaccharides: glucose and fructose, monomers of which other carbohydrates are composed. Monosaccharides and discaccharides are small soluble molecules easy to transport – glucose transport in blood, sucrose in sieve tube.

Glucose: source of energy; a substrate in aerobic and anaerobic respiration; biochemistry of aerobic respiration (brief outline).

Structural formula of glucose, the condensation of glucose to form the disaccharide, maltose, and of glucose and fructose to form the disaccharide sucrose. The hydrolysis of disaccharides.

The formation and hydrolysis of the polysaccharides: starch, glycogen and cellulose; are polymers of glucose, differ in the number and arrangement of the glucose molecules.

Relationship of structure to function in starch, glycogen and cellulose molecules.

Starch: helical shape provides compact store (in plants); insolubility linked to storage (osmotically inactive), large size does not pass through membrane, provides large number of glucose molecules for respiration.
Starch-agar plates for assaying carbohydrase activity.

Glycogen: similar to starch but more branches, insoluble storage compound in liver and muscles (mammals). Conversion of glucose to glycogen for storage. Importance of control of blood glucose.

Cellulose: long straight chains of glucose molecules, OH groups of chains linked by hydrogen bonds forming microfibrils / macrofibrils. Layers of fibrils orientated in different directions are interwoven and embedded in a matrix - providing rigid cell wall; gaps in layers provide permeability.

Pentoses: Deoxyribose, Ribose in DNA and RNA – sugar-phosphate backbone providing strength.

Light-independent reactions: formation of carbohydrates, Carbon dioxide accepted by RBP, reduction of glycerate-3-phosphate to carbohydrate, and regeneration of RBP.

Breadth of Knowledge; max 3 marks
Condensation reactions resulting in formation of larger carbohydrate molecules (**C**)
Types of carbohydrates; mono, di- and polysaccharides or named examples (**T**)
Functions of carbohydrates – minimum of two. (**F1**, **F2**)
(The letters shown in bold should be used alongside relevant part of essay)

(b) Cycles in biology

Ecological cycles
Nitrogen cycle: role of microorganisms in the processes of saprophytic nutrition, deamination, nitrification, nitrogen fixation and denitrification. (Names of individual species are **not** required.)

Carbon cycle: role of microorganisms in breakdown (respiration) of complex organic compounds into carbon dioxide making it available for reuse (photosynthesis).

Metabolic cycles
Krebs cycle: acetylcoenzyme A combines with four-carbon molecule to produce a six-carbon molecule which enters Kreb's cycle; the four carbon compound is regenerated during cycle involving series of oxidation reactions and release of carbon dioxide; production of ATP and reduced NAD and FAD.

Electron transport chain: cyclical reduction and oxidation of NAD, FAD and other 'carriers'

Synthesis and breakdown of ATP

Light-independent reactions - Carbon dioxide accepted by RuBP to form two molecules of glycerate-3-phosphate, reduction of glycerate-3-phosphate to carbohydrate, and regeneration of RuBP.

Physiological cycles
Negative feedback mechanisms: Regulation of body temperature / blood glucose / blood water potential.

Cardiac cycle: relate pressure and volume changes in the heart and aorta to maintenance of blood flow.

Role of tropomyosin, calcium ions and ATP in the cycle of actomyosin bridge formation.

Nerve function – depolarisation / repolarisation of a neurone in terms of differential membrane permeability and cation pumps, synthesis and re-synthesis of acetylcholine (synaptic transmission) / rhodopsin (rods) and restoration of a resting potential.

Life cycles
Mitosis / Cell cycle – explanation of stages of mitosis, importance in growth and asexual reproduction - vegetative propagation.

Meiosis – importance in maintaining constant chromosome number from generation to generation; outline of process (details of stages **not** required)

Examples of life cycles might be provided in terms of mitosis, meiosis, fertilisation and chromosome number.

DNA replication – semiconservative replication;

Predator / prey life cycles

Breadth of Knowledge; max 3 marks
One mark for each type of cycle covered
Ecological (**E**); Metabolic (**M**); Physiological (**P**); Life (**L**)
(The letters shown in bold should be used alongside relevant part of essay)