Rewarding Learning

ADVANCED
General Certificate of Education
2012

Biology

Assessment Unit A2 1

assessing

Physiology and Ecosystems

[AB211]

MONDAY 14 MAY, MORNING

MARK SCHEME

/ denotes alternative points
; denotes separate points
Comments on mark values are given in bold
Comments on marking points are given in italics

Section A

1 **(a)** Promote cell division;
gibberellins; [2]

(b) Light resulted in the displacement of auxin to the non-illuminated side/ away from illuminated side;
(accumulation of auxin) causes increased growth/elongation in cells;
plant not turned often enough to prevent series of phototropic responses; [3] 5

2 **(a)** Alternating bands of (mainly) actin and myosin/thin and thick filaments; [1]

(b) **(i)** Iris muscle is involuntary/skeletal muscle is voluntary; [1]

(ii) **Three from**
- contraction of radial muscle (and relaxation of circular muscle) makes pupil larger/iris smaller/allows more light through
- in low light conditions
- contraction of circular muscle (and relaxation of radial muscle) makes pupil smaller/iris larger/allows less light through
- in bright conditions

[only one consequence mark allowed, i.e. only one of points 2 and 4] [3]

(iii) Ciliary muscle/body; [1] 6

3 **(a)** **(i)** 172 000 ÷ 7500 000;
0.023 × 100 = 2.29 / 2.3%; [2]

(ii) **Any two from**
- light absorbed by clouds/atmosphere/reflected back into space
- light energy reflected from leaves
- light energy used in evaporating water
- light energy missing chloroplasts/passing through leaf/not hitting leaves
- wavelengths that cannot be used
- inefficiency of photosynthetic (photochemical/biochemical) process [2]

(iii) Respiration; [1]

(b) Very low value for decomposition pathway;
plants harvested before death/use of herbicides/pesticides reduce damage/ crops planted at densities that avoid excessive competition;
or
Very low value for primary consumer pathway;
herbivores kept out of ecosystem/elimination of pests/crop is harvested;
or
High production value/lot of energy available for harvesting;
appropriate planting densities/reduced self-shading/other appropriate reasoning; [2] 7

4 **(a)** **(i)** X – Dendrite/dendron;
Y – cell body/centron; [2]

(ii) Brain/spinal cord/grey matter; [1]

(b) **(i)** Allows transmission at synapses/between neurones;
cause depolarisation of post-synaptic membrane/creates EPSP/ some neurotransmitters stimulate while some inhibit; [2]

(ii) Large sample size; [1]

(iii) To confirm that procedures were rigorous (e.g. reliable, measurements accurate)/conclusions valid/ensure objectivity;
peer review involves experts in the field/allows development of the theory; [2] 8

5 **(a)** **Any four from**
- (sweep) net used to capture grasshoppers
- large number/sample of grasshoppers obtained
- permanency of marking technique/or described (e.g. drop of paint, etc.)
- non-toxic/non-damaging nature of marking
- mark must not make the grasshopper more obvious to predators [4]

(b) **(i)** Enables (marked) grasshoppers from the first sample to redistribute within the population/so that subsequent sample is representative of the population; [1]

(ii) **Any two from:**
- less chance for population to be affected by births/deaths
- less chance for population to be affected by immigration/emigration
- to ensure mark hasn't faded/been removed [2]

(c) (64 × 42) ÷ 8/clear statement of formula;
336; [2]

(d) Sample other habitats (for presence of grasshopper)/analyse reproductive rates/check for pest status/risk assessment/other appropriate suggestion; [1]

(e) **Any three from**
- (the heat from the Sun) increases kinetic energy of enzymes/substrates
- faster enzyme action/metabolism/respiration
- allows them to be more active/active more quickly/more growth/mature quickly
- avoid predators/readily find mate/feed more often/produce more eggs **(allow any two)**
- other appropriate response

(*Marking points must present relationships, where appropriate, and not merely list features*) [3] 13

6 **(a)** **(i)** Photosynthesis and respiration; [1]

(ii) Carbon dioxide reflects/traps heat (LW radiation);
back towards Earth/so that heat is retained within atmosphere/heat prevented from escaping into space; [2]

(iii) **Any two from**
- habitat removal for agricultural land removes forests/natural habitats;
- less photosynthesis to remove carbon dioxide from the atmosphere/ burning of forests produces more carbon dioxide;
- methane produced by livestock/organic fertilisers
- (increased) mechanisation uses more fossil fuels/production of artificial fertilisers relies on use of fossil fuels
- other appropriate suggestion [2]

(b) **Any four from**
- willow is (rapidly) renewable (sustainable)/can be renewed after three years
- less fossil fuel (which adds carbon dioxide to the atmosphere) is used
- maintains existing forest ecosystems/natural habitat for wildlife
- therefore maintains biodiversity
- (when growing) photosynthesises and removes carbon dioxide from the atmosphere
- therefore 'carbon neutral' (or explained) when used as a fuel/less effect on global warming
- reduces use of artificial fertiliser/reduces run off into waterways (eutrophication)
- combustion of willow releases less SO_2/NO_x (less acid rain produced)

(*Marking points must present relationships, where appropriate, and not merely list features*) [4] 9

7 **(a)** **(i)** More sodium in *Powerade* than other ions; [1]

(ii) Can be directly absorbed (digestion not required)/used rapidly in respiration (to provide energy); [1]

(b) Cells have/maintain a more negative water (solute) potential;
able to gain water by osmosis (from tissue fluid/blood)/so don't lose water by osmosis (as a result of ions having been absorbed into the tissue fluid); [2]

(c) **Any three from**

- isotonic drink will not influence the blood's water (solute) potential/ drinking water would increase the blood's water (solute) potential
- therefore no influence in production of ADH/drinking water would decrease production in ADH
- therefore no influence in water reabsorption (permeability of collecting ducts)/drinking water would cause decreased reabsorption of water into the blood (through decrease in permeability of collecting ducts)
- no increase in urine production/drinking water would cause increase in urine production

(*Marking points must present relationships, where appropriate, and not merely list features*) [3]

(d) **(i)** **Any two from**

- absorbed by facilitated diffusion/active transport
- involves use of membrane carriers
- removed in blood/extensive capillary network/maintain diffusion gradient [2]

(ii) Similarity – both increase surface area;
Difference – villus is composed of many cells (folding of ileum wall)/ microvilli are sub-cellular (folding of cell membrane); [2] 11

8 **(a)** **(i)** Between 87–97 kg ha^{-1};
maximum yield achieved with minimum cost [*both points required*]; [2]

(ii) Fertiliser toxic at higher concentrations/fertiliser would make solute potential of soil more negative (more concentrated) therefore water would not enter (possibly leave) roots; [1]

(iii) **Any two from**
- increased aeration for roots therefore more respiration/more active uptake of minerals
- increased aeration for more nitrification/nitrogen fixation
- increased drainage discourages denitrification/prevents waterlogged conditions that would encourage denitrification
- increased aeration for decomposition

(*Marking points must present relationships, where appropriate, and not merely list features*) [2]

(b) **(i)** **Any two from**
- pests can feed on/damage leaf material therefore reducing photosynthesis/growth
- they can feed on/damage the 'crop', e.g. potato
- they can feed on/damage the roots, restricting the uptake of mineral ions needed for growth
- they can spread organisms that cause crop diseases
- they can feed on the nutrients in the phloem therefore reducing carbohydrate available for storage
- production of faeces/other waste may make the crop unsuitable for consumption
- weeds may compete for nutrients/light

(*Marking points must present relationships, where appropriate, and not merely list features*) [2]

(ii) Successive application of pesticide kills fewer pests;
the overall number of pests increases with time;

Any two from
- some pests survive as did not come in contact with pesticide
- some pests have resistance to the pesticide (and therefore survive pesticide applications)
- resistant pests reproduce
- the pesticide also kills natural predators of the pest (causes pest resurgence) [4]

(c) Crop rotation – pests do not get an opportunity to complete life cycle/target crop is removed so pest numbers don't reach high numbers/different crops have different pests so no one pest can become established;

sterilisation of the males of pest species – many females will fail to become fertilised therefore reducing the numbers of pests in the next generation; [2] 13

Section A **72**

Section B

9 (a) Any ten from

- antibody-mediated immunity combats 'free' microorganisms/viruses in blood/tissue fluid (cell-mediated immunity combats microorganisms/ viruses in cells)
- involves B-lymphocytes
- specific B-lymphocyte has receptor to invading antigen/responds to (sensitised by) a particular antigen
- division of B-lymphocyte produces plasma and memory cells
- plasma cells produce antibodies
- antibodies are globular proteins (that can form specific shapes)
- reference to complementary shape between antibody and antigen *[must be complementary not similar or implied]*
- causes agglutination/clumping (or other role of antibody-antigen interaction explained)
- antibody-mediated responses subject to delay following infection
- memory cells remain in blood to provide long-term immunity
- memory cells allow rapid/greater (secondary) response
- illness can be avoided by vaccinations with attenuated/weakened pathogen
- passive immunity involves donation of an antibody from another source
- provides rapid immunity/short term immunity
- particularly effective in babies from antibodies contained in mother's milk/in adults when very ill (affected by 'new' antigens that immune system not programmed for) [10]

(b) Any six from

- tissue rejection is a T-lymphocyte response/cell-mediated response
- antigens stimulate the production of a variety of T-cells
- killer T-cells destroy 'foreign' tissue
- through production of perforins/nitric acid/enzymes
- will not occur if transplanted tissue is from an identical twin as antigens are the same
- concept of the importance of tissue-typing (matching) before transplanting
- immune responses can be inactivated by irradiation (X-rays)/ immunosuppressant drugs
- fewer T-cells to respond/reduced ability to respond/inhibit DNA replication
- but patient more susceptible to infection due to suppressed immune system [6]

Quality of written communication:

2 marks:	The candidate expresses ideas clearly and fluently through well-linked sentences, which present relationships and not merely list features. Points are generally relevant and well-structured. There are few errors of grammar, punctuation and spelling.	
1 mark	The candidate expresses ideas clearly, if not always fluently. The account may stray from the point or may not indicate relationships. There are some errors of grammar, punctuation and spelling.	
0 marks	The candidate produces an account that is of doubtful relevance or obscurely presented with little evidence of linking ideas. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the account. [2]	18
	Section B	**18**
	Total	**90**