



ADVANCED
General Certificate of Education
2011

Biology

Assessment Unit A2 1

assessing

Physiology and Ecosystems

[AB211]

MONDAY 16 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

- | | | | AVAILABLE MARKS |
|---|---------|--|-----------------|
| 1 | (a) (i) | A – 1;
B – 4;
C – 2; | [3] |
| | | (ii) X: anywhere on membrane of post-synaptic neurone;
Y: on myelin sheath; | [2] |
| | (b) | Synaptic knob only at one end of neurone/transmitter substance on one side of synapse only/receptors on one side only/location of receptors; | [1] |
| 2 | (a) (i) | A – I (isotropic)/light band;
B – Z line;
C – sarcomere;
D – mitochondrion; | [4] |
| | | (ii) Muscle contracted; | [1] |
| | (b) | Free myosin binding sites on the actin filaments; | [1] |

- 3 (a) (i) $8.5 - 0.4$;
 $8.1 \div 8.5 \times 100 = 95.3\%$; [2]
- (ii) **Any three from**
- organic content of sewage is fed on by saprophytic microbes/decomposers/bacteria feed on sewage
 - population explosion of these organisms
 - increased respiration/aerobic activity of these organisms (causes fall in oxygen levels)/use of oxygen in respiration
 - increased turbidity of water would reduce photosynthesis [3]
- (b) **Any two from**
- bacterial/saprophytic population declines/less sewage available
 - reeds remove sewage/produce oxygen
 - dilution factor downstream
 - increased photosynthesis (produces more oxygen due to less turbidity/nitrate-rich water)
 - fast flowing (river) water will gain oxygen through mixing/turbulence [2]
- (c) Sample point 2;
 anoxic conditions will only favour specialist species/most river species unable to survive in very low oxygen levels; [2]
- (d) **Any two from**
- Each group of indicator species can tolerate particular conditions/particular level of anoxic conditions/pollution;
 - indicator species act as long term monitors of O_2 levels;
 - chemical tests only at specific times/give measurement at specific times;
 - measuring oxygen level using a chemical test does not indicate its effect on aquatic life. [2]

AVAILABLE
MARKS

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			AVAILABLE MARKS
4	(a) (i) Ruderals;	[1]	7
	(ii) Less energy allocated to reproductive effort compared to ruderals/favour stable habitats as provided on farms; grow more quickly than stress tolerators/do not have to survive difficult growing conditions;	[2]	
	(b) (i) An organism that causes economic damage (to a commercial/valuable crop species);	[1]	
	(ii) Any two from - less specific to controlling target species/may kill useful species - harms other ecosystems - bioaccumulation/food chain	[2]	
	(c) Fertiliser/drainage;	[1]	
5	(a) (i) Phytochrome;	[1]	12
	(ii) Leaves;	[1]	
	(iii) Short day plant; flowers only where there is more than twelve hours (a critical length) of continuous darkness;	[2]	
	(iv) Any three from - flowering in short day plants is inhibited by P_{730} - in light regime 3 the dark period is long enough to allow P_{730} to be converted to P_{660} - so the lack of P_{730} allows flowering to occur/the inhibitory effect is removed - in light regime 4 the flash of light converts the accumulated P_{660} back to P_{730} (and there is not enough time to reconvert it all into P_{660})	[3]	
	(b) (i) Hormone A/auxin stimulates cell elongation; Hormone B/cytokinin stimulates cell division; A is auxin and B is cytokinin;	[3]	
	(ii) Third shoot with agar block without hormone; to compare with hormone action (in A and B)/to show that agar has no effect;	[2]	

AVAILABLE MARKS		
6	(a) Succession: the change in species composition over time; climax community: the final stage of a succession that is in equilibrium with its environment/stability; [2] (b) Any four from • reeds and water lilies are aquatic plants/hydrophytes (from A to B) • dead vegetation leads to soil formation/water level becomes shallower • a community of grasses and small plants/herbaceous plants succeeds on land (after B) • soil formation continues/level of land increases • larger/woody plants succeed (at C)/longer-lived • with a greater variety of species • and a greater biomass [4] (c) (i) The conversion of atmospheric nitrogen into ammonium/nitrate/organic nitrogen (amino acids/proteins) (by nitrogen fixing bacteria); [1] (ii) Their proteins/amino acids are broken down; by decomposers to ammonium; which is converted into nitrates by nitrifying bacteria; [3]	10
7	(a) (i) Contains lysozyme enzyme (to break down microbes); [1] (ii) Protein has tertiary/globular structure/3D structure; variety of shapes/a specific shape; which is complementary to shape of antigen [<i>insist on complementary not same</i>]; [3] (b) Any four from • similar antigens detected • memory cells produced in response to earlier virus • if infected with swine flu/virus stimulates plasma cell production/ T killer cell production/secondary response; • produce antibodies complementary to swine flu antigens/T killer cells with complementary receptors; • antigen–antibody reaction (agglutination)/T killer cells destroy infected cells; • rapid response (prevents illness) [4]	8

8 (a) Any two from

- even out shading effects
- due to closeness of trees/gaps in canopy
- even out effects of cloud
- number of readings increases reliability [2]

(b) (i) Oak forest;**Any three from**

- higher light levels overall
- high light window in spring/autumn/greater range of light intensities
- encourages plants favouring different light conditions/different layers of vegetation
- producers at start of food chain/will provide food for animals
- decomposition of leaves enriches soil
- more habitats
- spruce harvested/habitats not given time to develop [4]

- (ii)** Didn't record species that only grow in earlier/later seasons/
didn't record species in trees/in soil/limitation of quadrats for
estimating the presence of animal species [1]

(c) Any five from

- formula – number in first sample × number in second sample
divided by number of marked beetles in second sample
- method of capture described, i.e. pitfall trap
- permanency of marking technique
- release and allow time for released beetles to redistribute to ensure
that marked animals evenly spread
- ensure marking doesn't affect survival (not toxic/or more obvious to
predators)
- retain some marked beetles to confirm above point
- repeat each year using a different "mark"
- discussion of assumptions inherent in sampling technique/large sample
size explained [5]

Section A**AVAILABLE
MARKS**

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Section B

9 (a) Any eleven from

- blood entering glomerulus is under high hydrostatic pressure
- because the afferent arteriole is wider than the efferent arteriole
- consequently ultrafiltration occurs from the glomerulus to Bowman's capsule
- composition of the filtrate is the same as plasma minus plasma proteins
- because some molecules are too big to pass through the basement membrane/the basement membrane acts as the filter
- the lining of the capsule is otherwise leaky due to the structure of podocytes
- water potential/solute potential of plasma is lower than that of the filtrate due to the presence of the plasma proteins
- which causes a solute potential (osmotic) gradient from filtrate to blood
- the hydrostatic pressure in blood must be high enough to overcome this osmotic gradient
- throughout the rest of the nephron/tubule toxic substances remain in the filtrate, while useful substances are reabsorbed
- within the proximal tubule glucose/salts/amino acids are reabsorbed by active transport (selectively reabsorbed)
- microvilli/brush border in the proximal tubule increase the surface area for this reabsorption
- and numerous mitochondria provide the energy for active transport
- water potential gradient is from proximal convoluted tubule to capillary network/hydrostatic pressure within capillary network is greatly reduced
- so that water leaves by osmosis
- small proteins are reabsorbed by pinocytosis
- the loop of Henlé produces a high osmotic gradient in the medulla (lowers the water potential in the medullary tissue)
- which allows water to be reabsorbed from the collecting ducts as they pass through the medulla
- salts actively reabsorbed from distal convoluted tubule/urea or creatinine absorbed into the distal convoluted tubule [11]

(b) Any five from

- water potential/concentration of blood is monitored by osmoreceptors in the hypothalamus
- low water potential/concentrated blood causes secretion of ADH
- ADH is then released into the blood from the pituitary gland
- in the kidney ADH increases the permeability of the collecting ducts (and distal tubule)/opening aquaporins
- so that increased amounts of water can be reabsorbed
- results in a concentrated urine
- drinking water raises the water potential of the plasma [if the blood is dilute the loss of water in the urine lowers the water potential of the plasma]
- when the water potential of plasma returns to normal/is high the levels of ADH secretion is reduced [5]

Allow reverse argument for osmoregulation, beginning with high water potential in blood and resulting in a large volume of dilute urine.

