Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2013

Biology

Assessment Unit AS 2

assessing

Organisms and Biodiversity

[AB121]

TUESDAY 15 JANUARY, AFTERNOON

MARK SCHEME

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

Section A

1 Platelets;
fibrinogen;
lymphocyte;
monocyte; [4] 4

2 **(a)** Drainage:
Loss of wetland plants/more homogeneous soil conditions/other appropriate answer;
Ploughing:
destroys plants/covers seeds/loss of seed-rich stubble/other appropriate answer;
Reseeding:
selected species out-compete other plant species/selected species are associated with only a few animal species/other appropriate answer; [3]

(b) **Any two from**
- planting of native tree species/example
- hedge restoration/management (trimming on a 2- or 3-year cycle/ maintain a variety of hedge heights/trim only in winter (avoiding destruction of birds' nests)/avoid cutting hedgerow trees
- use of sustainable agricultural practices (crop rotation/polyculture)
- areas of farmland left undisturbed (set-aside land/ungrazed margin of grassland/predator strips)
- reduced use of artificial fertilisers (testing soil and applying fertiliser according to specific needs)/use of organic fertilisers
- reduced use of pesticides/use of narrow-spectrum pesticides
- other appropriate response (e.g. establish wildlife corridors) [2] 5

3 **(a)** Symplast (solid arrows);
apoplast (dotted arrows); [2]

(b) Water movement directly between adjacent cells/part of the symplast route;
allows lateral movement out of the xylem vessels;
retains water within the xylem (waterproofing)/strengthens the cell wall to prevent collapse during water transport; [3]

(c) Evaporation;
diffusion/transpiration; [2] 7

4 **(a)** **(i)** Quadrats distributed randomly (allow description of random distribution); quadrats placed along a line transect (from one side of the sample area to the other); [2]

(ii) Percentage cover measured within the quadrat; [1]

(b) **(i)** In such a small sample an individual "one-off" or fluke result can have a larger effect/anomalous results have a greater effect (allow converse, i.e. anomalous results have less of an effect in a larger sample); increase sample size/select a sample of ten or more specimens (allow converse, i.e. a small sample has less reliability); [2]

(ii) Other variables considered (or by example, e.g. specimens sampled from the top of rocks)/the same species of seaweed is sampled/ seaweed is selected at random/other appropriate suggestion; [1] 6

5 **(a)** **(i)** A: atrioventricular/bicuspid/mitral valve;
B: chordae tendinae *[not heart strings]*;
C: ventricle wall; [3]

(ii) **Any two from**
- aorta carries blood from the left ventricle
- the wall of the left ventricle is particularly thick
- the chordae tendinae are thicker on the left side
- AV valve has two flaps [2]

(b) **(i)** **Any three from**
- contraction of the ventricles/ventricular systole
- increases the pressure/decreases the volume within the ventricles
- ventricular pressure exceeds the pressure in the arteries
- forcing the pockets flat as blood is forced out of the ventricles

[3]

(ii) Diastole; [1] 9

6 **(a)** **Any two from**
- members of a species share many distinctive anatomical/morphological features/many common genes/ancestry
- are capable of interbreeding
- to produce fertile offspring [2]

(b) **(i)**

1	Single root	→	2
	more than one root	→	*Spirodela polyrhiza*
2	round frond	→	3
	frond not round	→	*Lemna triscula*;
3	convex lower surface	→	*Lemna gibba*;
	lower surface not convex	→	*Lemna minor*;

1 mark for the identification of each species [3]

(ii) *Lemna minor*; [1]

(iii) *Spirodela polyrhiza*;
since it belongs to a different genus/all other species belong to the genus *Lemna*; [2] 8

7 **(a)** **(i)** $6 \times 12 \times 12 = 864\ \mu m^2$;
$12 \times 12 \times 12 = 1728\ \mu m^3$; [2]

(ii) $0.02 \times 864 = 17.28\ \mu m^3$
[answer consequential to answer above];

$0.01 \times 1728 = 17.28\ \mu m^3$
[answer consequential to answer above]; [2]

(iii) Activity requires more oxygen/respiration;
changing its shape can increase its surface area/supply of oxygen; [2]

(iv) Smaller specimens will have a larger surface area:volume ratio;
so proportionally more oxygen can be absorbed/more oxygen is absorbed relative to the volume supplied (for greater activity); [2]

(b) **Any two from**
- contains alveoli each of which is minute (approximately 100 µm in diameter)
- allows millions of alveoli to be accommodated
- shape of alveoli as a "bunch of grapes"/sacculation
- extensive/closely associated network of capillaries [2] 10

8 **(a)** **(i)** The relative amount of haemoglobin that is loaded with oxygen expressed as a percentage of total haemoglobin; [1]

(ii) 95 (for A) minus 64 (for B) = 31; [1]

(iii) Mouse A;
Explanation:
Curve to the left/has a higher affinity for oxygen;
which means it can load at the lower ppO_2 (that exists at high altitude); [3]

(b) **(i)** More haemoglobin molecules to carry oxygen;
compensating for a lower percentage being loaded/low level of oxygen being taken up; [2]

(ii) Increases the volume of air taken in each minute/maintains the diffusion gradient;
so that an increased amount of oxygen can be absorbed/compensates for lower partial pressure of oxygen; [2]

(iii) **Any two points**
- increased level of nitric oxide dilates the pulmonary/muscle capillaries/arterioles
- which increases amount of blood through the alveoli/muscle/ decreases blood pressure
- which increases the uptake of oxygen (in the lungs)/maintains a steep concentration gradient/increases the release of oxygen (in the muscle)/increases time for oxygen loading (or unloading) [2] 11

Section A **60**

Section B

9 (a) Any six points

- xerophytes are adapted to living in habitats with restricted water availability/where water loss might be excessive (where water loss needs to be reduced)
- conditions may be arid (dry)/windy/frozen soil/sandy (soil with low water content)
- possess a thick cuticle which increases the efficiency of the waterproofing layer/decreases cuticular transpiration
- very small leaves reduce surface area (-to-volume ratio)/reduce number of stomata
- few stomata reduces the main route for transpiration
- stomata sunken in leaf/leaf covered by hairs/leaf rolled (with stomata on the inside) deflects air currents/allows humid air to build up outside the stomata (reducing the diffusion gradient out of the leaf) **[any two points]**
- water storage cells/succulent leaves provide water stores for use during periods of drought
- leaves adapted as spines prevent grazing and the exposure of tissue to evaporation
- extensive shallow root system/deep network of roots allow greater uptake of water when it becomes available
- other appropriate response [6]

(b) Any seven points

- organisms within a population are variable
- some are better adapted to their environment/habitat/some individuals are fitter
- differential survival of the better adapted individuals
- leading to reproductive success/the fittest leave more offspring
- when the feature is inheritable/genetically determined this influences future generations
- in a stable (non-changing) environment stabilising selection may occur
- selection of the adaptive norm (modal form)/selection against extreme forms
- in a changing environment directional selection may occur
- one (extreme) variant may be selected for/previous adaptive norm selected against
- frequency of selected variant may increase
- leading to new adaptive norm [7]

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]

15

Section B **15**

Total **75**