Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2011

Biology

Assessment Unit AS 2

assessing

Module 2: Organisms and Biodiversity

[AB121]

TUESDAY 18 JANUARY, AFTERNOON

MARK SCHEME

Section A

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

1 **(a)** Feed on/break down dead organisms/wastes; [1]

(b) Secrete enzymes (out of their cells onto the food);
enzymes digest food outside the cell/digested products are absorbed into the cells (by diffusion/active transport); [2] 3

2 **(a)** Bicarbonate/hydrogen carbonate indicator changed by carbon dioxide; [1]

(b) Acts as a heat shield/waterbath to maintain/control temperature/ provides an optimum temperature *[not just waterbath]*; [1]

(c) **Any two from**
- in dim light there is less photosynthesis;
- the amount of carbon dioxide absorbed by the pondweed is equal to the amount of carbon dioxide produced by the pondweed/the rate of photosynthesis equals the rate of respiration
- this is the compensation point [2] 4

3 **(a)** Systole; [1]

(b) **Any three from**
- atria have similar thicknesses of (cardiac) muscle
- which contract with equal force/forcing blood into neighbouring ventricle
- muscle in the left ventricle is much thicker than in the right ventricle
- therefore the force of contraction is much higher in the left chamber/left ventricle must force blood through the capillary networks of many organs/force of pressure from the right ventricle must be lower to ensure that fluid does not filter out into alveoli [3] 4

4 **(a)** Drawing skills:
complete block diagram showing tissue layers *[4 tissue layers shown]*;
accurate representation of the photograph *[curvature of the leaf]*;
precise proportionality *[much thicker upper epidermis]*;
quality of the drawing *[smooth continuous lines/no cellular structure necessary]*;
Labelling:
upper epidermis, palisade mesophyll, spongy mesophyll and lower epidermis/guard cells; [5]

(b) Reduces cuticular transpiration/increases the waterproofing of the epidermis;
reduces movement of air/maintaining humid air immediately outside stomatal pores/reduces diffusion gradient for moisture/increased diffusion shells; [2] 7

5 **(a)** A suitable example (seashore, grassland to woodland, slope, etc);
where there is an environmental gradient/random sampling may omit some of the gradations in the environment; [2]

(b) **(i)** $\mathbf{X} = 8 \times 7 = 56$;
$\Sigma n_i(n_i - 1) = 948$ **[Answer consequential to answer for X]**; [2]

(ii) $D = 948/5550$;
$D = 0.17$;
[Answer consequential to answer in (b) (i)] [2]

(iii) A;
A has the lower Simpson's index value, which suggests greater diversity; [2]
[Answer consequential to answer in (b) (ii)]

(c) **Any two from**
- hedges must not be cut/coppiced/laid during the summer months (between 1st March and 31st August)
- hedges must be maintained in a variety of heights and widths
- retain mature trees and allow saplings to grow into hedgerow trees
- only cut hedges in a 2–3 year cycle (except roadside hedges)
- hedges should be stock-proof/fenced to avoid browsing damage
- avoid applying slurry/fertiliser/pesticides within 1 metre of the hedgerow bottom
- hedge laying
- plant native species
- variety of species within hedge [2] 10

6 **(a)** **(i)** 74/4 = 18.5 and 18.5 × 100 = 1850; [1]

(ii) The counts for the upper epidermis are not that variable (relatively close)/for the lower epidermis the counts are variable *[not just quoting range]*;
the less variable the counts the more reliable the results (allow converse)/for lower epidermis reliability (of the mean) could be increased by further replication; [2]

(b) **(i)** **Any three from**
- the colour changes as water is lost from the leaf (stomata/ colour changes are more rapid on the upper surface)
- transpiration/water loss is occurring from both surfaces
- transpiration more rapid from the upper surface (allow converse)
- as there are more stomata on the upper surface (allow converse) [3]

(ii) Reduces air flow/blocks the light so that stomata close; [1]

(c) **Any two from**
- water molecules evaporated off the mesophyll surface/water diffuses out through stomata
- replaced by water from a continuous column (in the xylem)
- as water molecules stick together (cohesion)
- the whole column is pulled up/creates negative pressure/tension [2] 9

7 **(a)** **Any two from**
- lumen relatively small
- vessel wall/middle layer relatively thick
- lumen lining "crinkled"
- overall rounded shape [2]

(b) Allows for vasoconstriction/vasodilation of the artery;
provides control of the distribution of blood; [2]

(c) An atheroma is an accumulation (of macrophages/cholesterol)/ swelling in artery walls;
in atherosclerosis the artery wall loses its elasticity/artery lumen becomes narrower; [2]

Any three from
- atherosclerosis leads to an increase in blood pressure
- surface of the atheroma/plaque to become damaged/ atheromatous plaque forms
- change in blood flow/damaged surface may trigger the production of a clot or thrombus
- clot/thrombus may block the coronary artery
- starving the cardiac muscle of oxygen (metabolites)/leading to death of the cardiac muscle tissue [3] 9

8 **(a)** *Scolopax;* [1]

(b) **(i)** Acts as a control/allows for comparison of the original habitat and the habitat provided by SRC/allows the changing land use to be monitored; [1]

(ii) Lapwing;
SRC on arable land (increases biodiversity most); [2]

(iii) The SRC provides a different habitat/food source/other appropriate answer; [1]

(c) **(i)** Quadrats used repeatedly (at least 10);
randomly positioned (use of random numbers for coordinates); [2]

(ii) **Any two from**

- greater amount of light available at the edge/mosaic of light conditions
- may be easier for seeds to land and germinate at the edge/ seeds from both SRC and surrounding land
- grazing by animals at the edge may keep down competitor plant species so increasing successful germination
- edaphic factors such as pH, aeration, mineral availability or water availability may be more suitable at the edge [2]

(iii) Both regions show the greatest number of species after two years after which there is a decline;
shading by the SRC trees may increase beyond this time causing some non shade-tolerant plants to die out/other appropriate response;
or
The number of plant species in the middle of the SRC remains more constant/changes less over the years of the SRC;
conditions (e.g. shading/shelter/other appropriate) are relatively stable in the middle of the SRC; [2]

(d) **(i)** Established SRC has more insects in both sample areas;
recent SRC has more insects at the edge of the plantation/ established has more in the middle of the plantation; [2]

(ii) Important prey items for a variety of other animals/important pollinators of a variety of plants/important detritivores helpful to the process of decomposition; [1]

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Section B

9 (a) Any five from

- haemoglobin is a conjugated protein/contains haem groups
- haem is an iron-containing prosthetic group
- each haemoglobin molecule has four haem groups, each capable of carrying oxygen/can carry four oxygen molecules
- the percentage saturation of the haemoglobin with oxygen depends on the partial pressure of oxgen (allow by example)
- reference to S-shaped dissociation curve (allow diagram)
- cooperative loading/the effect of initial binding facilitating subsequent binding
- because binding of oxygen twists the polypeptide
- in the lungs, ppO_2 is high
- in the lungs/at high ppO_2, almost all the haemoglobin is carrying oxygen/is in the form of oxyhaemoglobin [5]

(b) Any eight from

- strenuously exercising muscle has a high rate of respiration
- increased rate of respiration consumes (more) oxygen/reduces the ppO_2
- a reduced ppO_2 causes dissociation/unloading of oxygen from the (oxy)haemoglobin
- increased rate of respiration also increases $ppCO_2$ (reduces pH)/ increases temperature (produces heat)
- increased $ppCO_2$ reduces the oxygen-carrying ability of the haemoglobin (dissociation curve moves to the right)
- so more oxygen is released/unloaded
- this is called the Bohr effect
- the Bohr effect is caused by carbon dioxide combining with the haemoglobin and bringing about a change in structure (which means that it loses some affinity for oxygen)
- the Bohr shift is also caused by an increase in temperature
- muscle (red muscle) may contain myoglobin
- which has a very high affinity for oxygen/acts as a store of oxygen
- releasing oxygen when the ppO_2 becomes especially low
- this allows aerobic respiration to continue/delays the onset of anaerobic respiration [8]

Quality of Written Communication

2 marks
The candidate expresses ideas clearly and fluently, through well linked sentences and paragraphs. Arguments 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. Arguments may sometimes stray from the point. There are some errors in grammar, punctuation and spelling, but not such as to suggest a weakness in these areas.

0 marks
The candidate expresses ideas satisfactorily, but without precision. Arguments may be of doubtful relevance or obscurely presented. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the passage. [2] 15

Total **75**