

JUNIOR LYCEUM ANNUAL EXAMINATIONS 2009

Directorate for Quality and Standards in Education
Educational Assessment Unit

BIOLOGY – FORM V
TIME: 1H 45 MIN

NAME: _____ CLASS: _____

Question No.	Section A								Section B					
	1	2	3	4	5	6	7	8	1	2	3	4	5	
Max mark	6	5	7	8	10	7	5	7	15	15	15	15	15	
Actual mark														TOTAL MARK

85% Theory Paper	15% Practical	100% Final Score

Section A

Answer all questions in this Section.

1. List ONE effect of **each** of the following blocked passages:

- a. blocked fallopian tubes _____
- b. blocked bile duct _____
- c. blocked oesophagus _____
- d. blocked stomata _____
- e. blocked artery _____
- f. blocked synapse. _____

(1, 1, 1, 1, 1, 1 mark)

Total 6 marks

2. Alien species are among the major causes of decreased biodiversity. Alien species also known as introduced or invasive species, do not belong to ecosystems in which they are intentionally or unintentionally placed.

a. Define the term ecosystem.

_____ (1 mark)

b. A well known invasive species is the bivalve mussel called zebra mussel (*Dreissena polymorpha*).

Fill in the following classification table for the zebra mussel. The first one has been done as an example.

Kingdom	Animal
Phylum	
	Bivalvia
	Veneroida
	Dreissenidae
Genus	
Species	

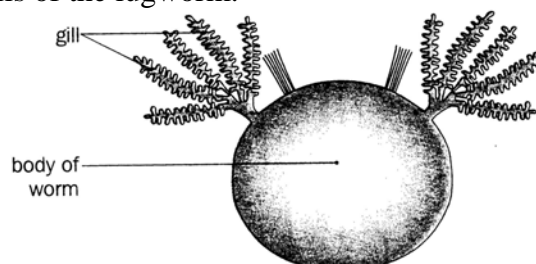
(3 marks)

c. List ONE effect of an alien species on the native species.

_____ (1 mark)

Total 5 marks

3. The lugworm is a marine annelid that lives in a burrow in the mid-shore. The lugworm has gills along its body that extract oxygen from seawater. The following diagram shows a cross-section through the body and gills of the lugworm.



a. From the diagram list ONE feature that makes the structure of the gill an efficient gas exchange surface.

_____ (1 mark)

b. Name and describe the gas exchange system in insects.

 _____ (2 marks)

c. Animals that use their body surface for gas exchange must have a high surface area to volume ratio. Explain.

 _____ (2 marks)

d. The following table shows the carbon dioxide concentration in blood and the amount of air taken in by breathing movements, at each carbon dioxide concentration.

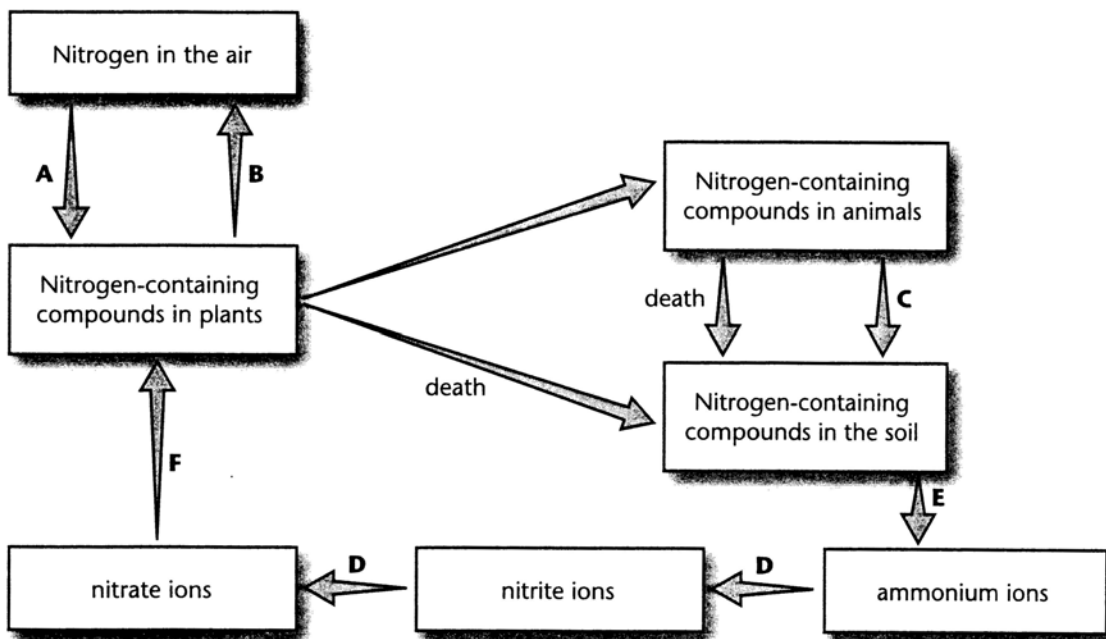
Carbon dioxide concentration in blood (arbitrary units)	40	42	44	46	48	50	52
Air taken in (dm ³ min ⁻¹)	8	15	22	29	36	43	50

Describe what happens to the amounts of air taken in, with increasing carbon dioxide concentration in blood. Give a reason for your answer.

 _____ (2 marks)

Total 7 marks

4. The following diagram shows the nitrogen cycle.



a. Name the process occurring at:

(i) A: _____

(ii) B: _____

(1, 1 mark)

b. Write the letter representing the process of excretion.
_____ (1 mark)

c. Name ONE biological molecule that contains nitrogen, that is present in animals.
_____ (1 mark)

d. Name the micro organism necessary for process:
(i) B: _____
(ii) D: _____ (1, 1 mark)

e. Explain why ploughing fields regularly can bring about a reduction of process B.

_____ (1 mark)

f. Give ONE reason why farmers do not like the soils in their fields to become waterlogged.
_____ (1 mark)
Total 8 marks

5. Sickle cell anaemia is an inherited disease in which the body makes sickle-shaped red blood cells; sickle cell means that the red blood cells are shaped like a “C”. Sickle shaped red blood cells contain abnormal haemoglobin. Sickle shaped red blood cells do not move easily through the blood vessels. They are stiff and sticky and tend to form clumps that get stuck in the blood vessels.

a. (i) Describe the structure of normal red blood cells.

(ii) Where are red blood cells produced?

_____ (1, 1 mark)

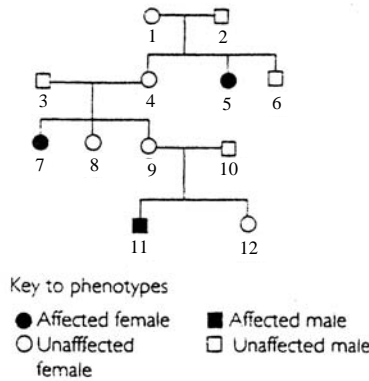
b. Name the mineral necessary for the formation of haemoglobin in red blood cells.
_____ (1 mark)

c. List ONE effect of the sickle red blood cells clumping and getting stuck in blood vessels.
_____ (1 mark)

d. Two concerned parents asked their son to avoid sitting in class near a child diagnosed with the sickle cell disorder. Explain whether the parents are correct in being concerned that their son will become affected by the sickle cell disorder.

_____ (1 mark)

- e. The following diagram shows the pedigree of a family affected with sickle cell anaemia. Sickle cell anaemia is an autosomal recessive inherited disorder.



- (i) From the pedigree chart above, list TWO numbers of individuals, that are **definitely** heterozygous.

_____ (2 marks)

- (ii) Individual 12 marries a male with no history of sickle cell anaemia in his family. Their three children did not suffer from the sickle cell disorder.

Using 'A' to represent **normal** and 'a' to represent **sickle cell anaemia** write the genotype of:

- the male married to individual 12 _____
- the TWO possible genotypes of individual 12 _____

(1, 2 marks)

Total 10 marks

6. When the back of the hand accidentally touches a hot object, the biceps muscle in the arm contracts and the hand is rapidly removed. This is an example of a reflex action involving three neurones.

- a. List TWO characteristics of reflex actions.

_____ (2 marks)

- b. Name the:

(i) receptor

and (ii) effector

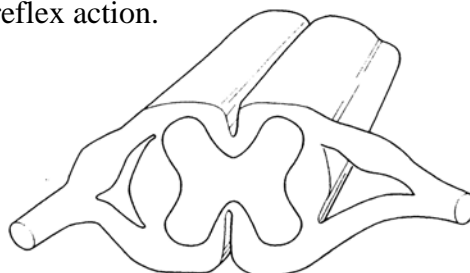
in the reflex action describe above.

(i) _____

(ii) _____

(1, 1 mark)

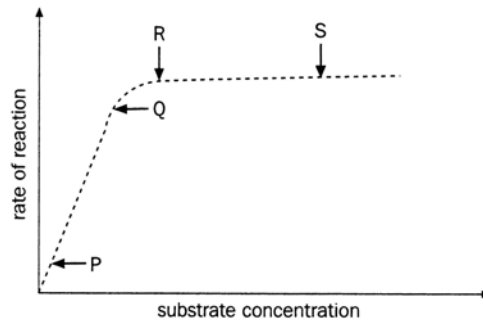
- c. Complete the following cross-sectional diagram through the spinal cord by showing the neurones involved in the reflex action.



(3 marks)

Total 7 marks

7. A biology student investigated the effect of increasing substrate concentration on the rate of an enzyme catalysed reaction. The following graph shows the results obtained by the student.



a. (i) Name the factor that determines the rate of reaction between points P and Q.

(ii) Describe what happens to the rate of reaction between points R and S.

(iii) Name ONE factor that could account for the rate of reaction between R and S.

(1, 1, 1 mark)

b. What should be measured in order to determine the rate of an enzyme-catalysed reaction?

_____ (1 mark)

c. Bile contains no digestive enzymes but it is important in the digestion of lipids. Explain.

_____ (1 mark)

Total 5 marks

8. List ONE positive effect of **each** of the following pro-environmental actions:

a. Using low-sulphur fuels in power stations.

b. Composting vegetable scraps.

c. Treating sewage before being released into the sea.

d. Building rubble walls around fields.

e. Re-using the blank side of printed paper matter.

f. Reducing the use of artificial fertilisers.

g. Recycling.

(1, 1, 1, 1, 1, 1, 1 mark)

Total 7 marks

Section B

Answer question 1 from this section and choose TWO other questions. Answer the questions of Section B on a foolscap.

1. Read the following passage and then answer the questions that follow.

Dutch elm disease (DED) is a disease caused by a fungus called *Ophiostoma ulmi*. It is one of the most devastating tree diseases in Europe and North America. The fungus causing DED is transmitted by bark beetles carrying spores on their bodies. After over-wintering in the bark of an elm tree, the beetle emerges in mid-April to mid-May and begins to feed on new elm trees. It is during this feeding period that the majority of DED infections occur.

After an elm tree is infected with only a few spores of the DED fungus, the spores reproduce rapidly in the vascular system of the tree. As a result they begin to block the tree's xylem vessels.

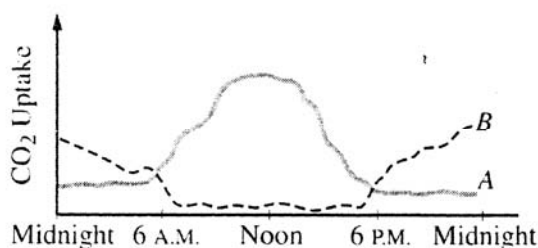
- a. (i) Name the reproductive organs in fungi in which spores are produced.
(ii) Fungi perform an essential role in all ecosystems. Explain. (1, 1 mark)
- b. There are three types of bark beetles:
the large Elm bark beetle *Scolytus scolytus*,
the native Elm bark beetle *Hylurgopinus rufipes*
and the European Elm bark beetle *Scolytus multistriatus*.
 - (i) Which two types of beetle are most closely related? Give a reason for your answer.
 - (ii) Bark beetles reproduce in the phloem tissue in the tree. In most plants, phloem is found on the outside of the xylem. Explain what takes place when a bark in a ring on the trunk or stem is stripped away. (2, 2 marks)
- c. In an attempt to block the fungus from spreading further, the tree reacts to the presence of the fungus by plugging its own xylem tissue with gum. Explain what is the effect of this on the tree. (1 mark)
- d. (i) The transport of substances through the xylem is a passive process while the transport of substances in the phloem involves active transport. Distinguish between a passive and an active process of transporting substances.
 - (ii) Compare the direction of the transport of substances in the xylem and the phloem.
 - (iii) Draw a diagram to show the arrangement of the phloem and xylem tissue in a root. (1, 2, 3 marks)
- e. In 2001 the English elm tree (*Ulmus procera*) was genetically engineered to resist the DED disease, by transferring anti-fungal genes in the elm genome.
 - (i) How is the DNA fragment containing the anti-fungal gene inserted in the elm genome?
 - (ii) Write ONE other use of genetic engineering. (1, 1 mark)

Total 15 marks

2. Give a biological explanation for **each** of the following statements:
- Rabbits eat their own faeces. (3 marks)
 - A sheep has no incisors on the upper jaw, and no canines at all. (2 marks)
 - Polar bears have small ears while camels have ears lined with fur. (2 marks)
 - The camel has short, thick dense hair while in the polar bear the fur is oily. (3 marks)
 - Small size and a fast rate of reproduction are two adaptations that ensure the success of prokaryotes. (3 marks)
 - The drone-fly is a species of hoverfly that resembles bees and wasps. (2 marks)

Total 15 marks

3. The following graph shows the uptake of CO₂ for two species of desert plants (**A** and **B**) over a 24 hour period.



- Describe the results shown in the graph.
 - Compare the time when stomata are open in plants A and B. (2, 2 marks)
- Draw a diagram to show an opened stomata. (3 marks)
- Compared with other terrestrial biomes, deserts have extremely low productivity. Discuss how:
 - temperature
 - soil composition
 - low annual precipitation
 limit the productivity of plants in deserts. (3, 3, 2 marks)

Total 15 marks

4. Prostate cancer is a disease in which cancer develops in the prostate gland in the male reproductive system. It occurs when cells of the prostate mutate and begin to multiply out of control. The gland is located in the pelvis under the urinary bladder and in front of the rectum. The prostate surrounds part of the urethra.

- Describe the function of the prostate gland. (1 mark)
- Name:
 - the part of the male reproductive system that contains the testes
 - the TWO fluids that pass through the male urethra. (1, 2 marks)
- Explain why if a male undergoes vasectomy, fertilisation cannot take place, even though the testes continue to produce spermatozoa. (1 mark)

- d. Name the main androgen and list TWO secondary sexual characteristics in males. (3 marks)
 - e. Draw a labelled diagram to illustrate the urinary system in humans. (3 marks)
 - f. Another common cancer in males is lung cancer. Smoking cigarettes is the main contributor to lung cancer. List TWO measures taken locally to help in reducing the incidence of lung cancer. (2 marks)
 - g. Define the term mutation and list ONE environmental factor that can lead to mutations. (2 marks)
- Total 15 marks**

5. Distinguish between **each** of the following:

- a. identical and non-identical twins
 - b. vasoconstriction and vasodilation
 - c. tissue suffocation and emphysema
 - d. plasmolysis and turgidity
 - e. Down's Syndrome and rickets
 - f. phototropism and geotropism. (2, 2, 4, 2, 3, 2 marks)
- Total 15 marks**