JUNIOR LYCEUM ANNUAL EXAMINATIONS 2007
EDUCATIONAL ASSESSMENT UNIT – EDUCATION DIVISION

BIOLOGY – FORM V
TIME: 1H 45 MIN

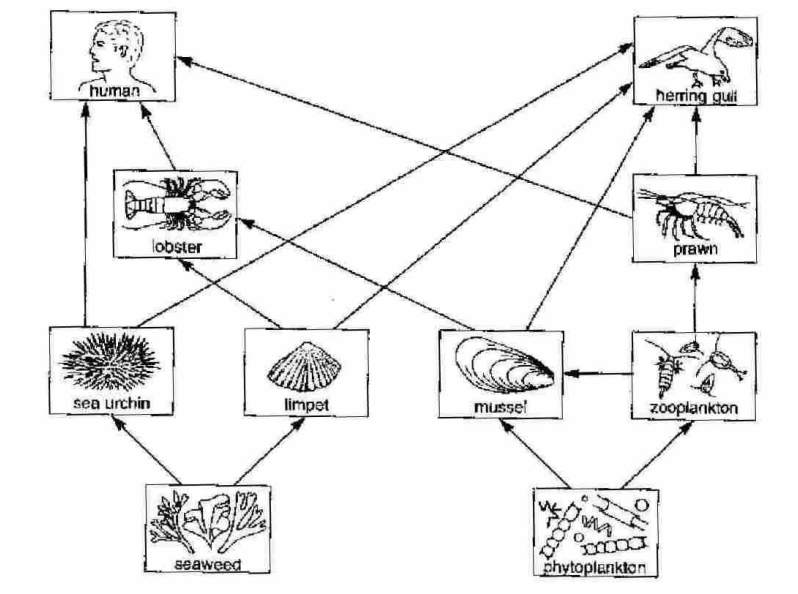
NAME: _____ CLASS: _____

Question No.	**Section A**								**Section B**					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	
Max mark	5	6	9	5	7	9	8	6	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. The following diagram shows a seashore food web.



a. From the food web write the name of:

(i) ONE crustacean _____

(ii) ONE mollusc _____

(iii) ONE endothermic (homeothermic) organism _____ (3 marks)

b. Use the food web in the diagram above to write a food chain involving four trophic levels.

_____

_____ (2 marks)

(Total: 5 marks)

2. Write the correct name of **each** of the following muscles:

(i)	the muscle that never fatigues	
(ii)	the muscle that raises hairs when a person is feeling cold	
(iii)	the muscle that contracts during labour (child birth)	
(iv)	the muscle that takes a dome-position during breathing out	
(v)	the muscles found between the ribs that contract during breathing in	
(vi)	the muscle flap that closes the trachea during swallowing	

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

(Total 6 marks)

3. The following Table shows a series of ten experiments carried out by a biology teacher in which a large leafy shoot attached to a bubble potometer, was subjected to various conditions of different abiotic factors.

		experiment number									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
abiotic factor	wind speed (m/s)	0	0	0	0	15	15	15	15	15	15
	temperature (°c)	5	25	5	25	5	25	5	25	5	25
	air humidity (%)	75	75	95	95	75	75	95	95	75	75
	light (L) / dark (D)	L	L	L	L	L	L	L	L	D	D
time taken by bubble to travel 100mm		3 min 3 s	1 min 35 s	4 min 28 s	3 min 2 s	1 min 56 s	0 min 30 s	3 min 22 s	1 min 57 s	24 min 10 s	22 min 4 sec

a. Compare the results of **each** of the following pairs of experiments and give a reason for your comparison.

(i) experiments 1 and 2

_____

_____

(ii) experiments 3 and 7

_____

_____

(iii) experiments 6 and 10

_____

_____

(2, 2, 2 marks)

b. Which experiment number in the Table above should be compared with experiment 9 to investigate the effect of darkness on the time taken by the bubble to travel 100mm?

_____ (1 mark)

c. The biology teacher carried out five other experiments in which the effect of a wider range of air humidity was investigated. The following Table shows the conditions for each of the five experiments.

		experiment number				
		11	**12**	**13**	**14**	**15**
abiotic factor	wind speed (m/s)	5	5	5	5	5
	temperature (°c)	20	20	20	20	20
	air humidity (%)	75	80	85	90	95
	light (L) / dark (D)	L	L	L	L	L

(i) In which experiment would you expect the bubble to take the longest time to travel 100mm? Give a reason for your answer.

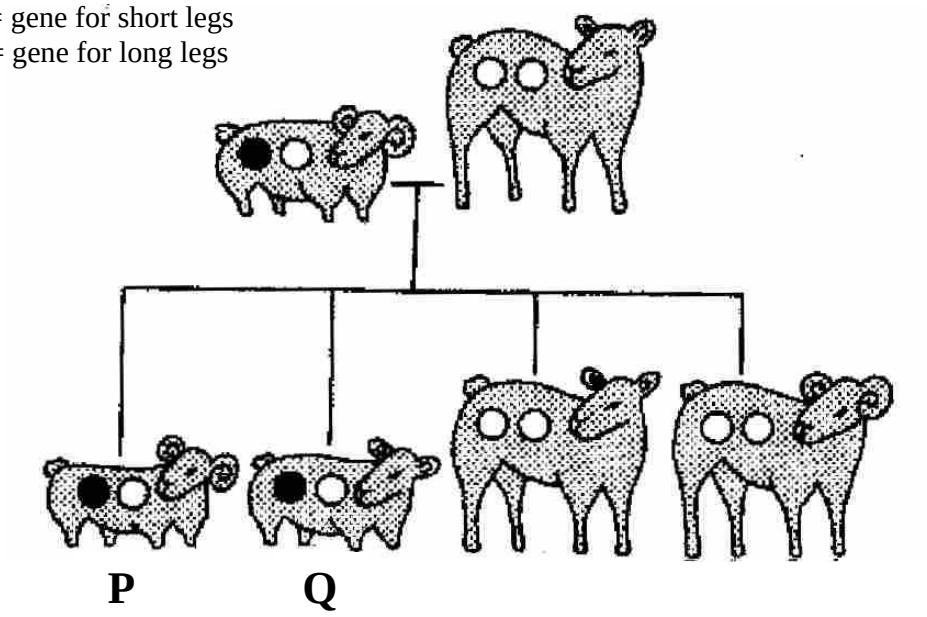
_____

_____ (2 marks)

(Total 9 marks)

4. A sheep farmer discovered a completely new variety amongst his flock of sheep. A male lamb had been born with short legs. The farmer found out that the new form of leg length had arisen as a result of the lamb inheriting a changed gene that neither of its parents possessed. The farmer decided that he would like to have more short legged sheep in his flock. So he crossed the unusual ram with a normal ewe as shown in the following figure.

• = gene for short legs
○ = gene for long legs



a. Write the term used to describe 'a changed gene that neither of its parents possessed'.

_____ (1 mark)

b. Using **R** to represent the gene for short legs and **r** to represent the gene for long legs, work out the phenotypes and genotypes of the lambs produced when crossing the short-legged ram (P) with the short legged ewe (Q).

(4 marks)
(Total 5 marks)

5. The following diagram shows the reaction of a man at the sound of ferocious barking.

a. Describe the sequence of events that would lead to the man's reaction.

_____

_____

_____

_____ (3 marks)

b. Explain why after some time both the man and the dog will be unable to run further.

_____

_____

_____ (2 marks)

c. Training improves the efficiency of the body because the heart increases in size and strength and so pumps blood round the body faster. Explain how training affects the 'oxygen debt' built after doing heavy exercise.

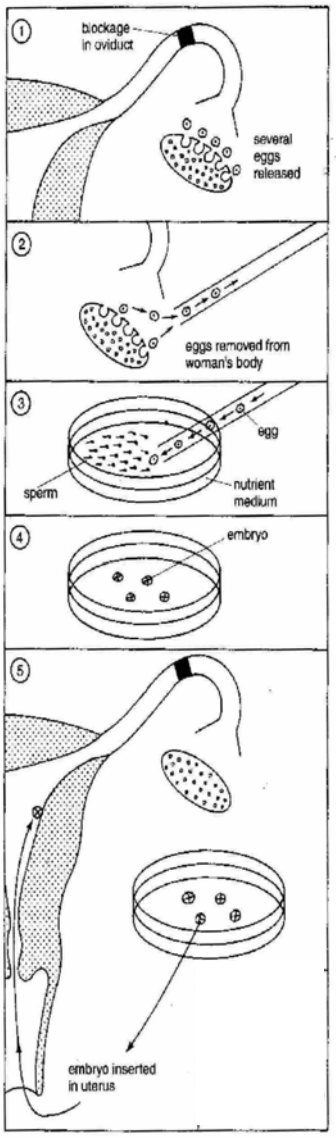
_____

_____

_____ (2 marks)

(Total 7 marks)

6. The following diagram shows the steps involved in the method of in-vitro fertilisation (IVF) that is used to treat some causes of infertility, such as the blockage of the oviducts (fallopian tubes).



a. Explain why a blockage in the oviducts as shown in part 1 of the diagram can be a cause of infertility.

_____

_____(1 mark)

b. i) Name the process that usually takes place when the embryo is inserted into the uterus as shown in part 5 of the diagram.

_____(1 mark)

ii) Name TWO structures that will develop if the process you name in 'b i' takes place successfully.

_____

_____(2 marks)

c. In the IVF process the female is given fertility pills in order to stimulate the secretion of the follicle stimulating hormone (FSH) and luteinising hormone (LH)

i) Name the gland that produces FSH and LH.

_____(1 mark)

ii) Name the process that is triggered by the production of LH.

_____(1 mark)

d. i) What change in menstruation would you expect to take place when the woman becomes pregnant?

_____(1 mark)

ii) Explain what brings about the change you mention in 'd i'.

_____

_____

_____

_____ (2 marks)

(Total 9 marks)

7. Various aspects of a woman's breathing were investigated. The results are shown in the Table below.

Concentration of oxygen in inhaled air (%)	20
Concentration of oxygen in exhaled air (%)	16
Number of breaths **per minute**	15
Average volume of **each breath** (cm^3)	500

a. Calculate the volume of oxygen (in cm^3) absorbed by the woman's lungs each minute.

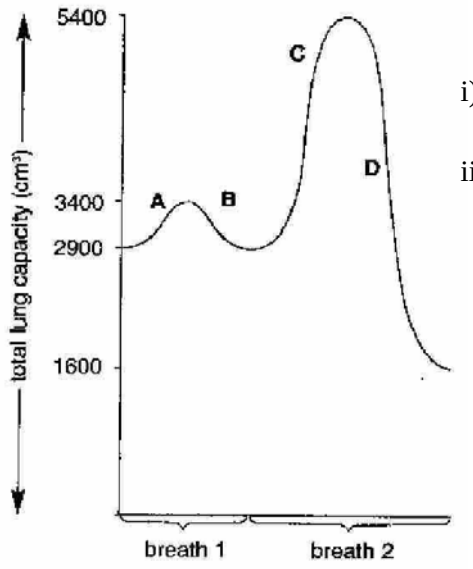
_____

_____ (1 mark)

b. Name the gas whose percentage concentration present in exhaled air will be greater than that in inhaled air.

_____ (1 mark)

c. The following graph shows the total lung capacity of the woman for two breaths.



Write the letter that shows:

i) shallow breath being inhaled _____

ii) deep breath being exhaled. _____ (1, 1 mark)

d. The basic rhythm of breathing is controlled by the brain. Name the part of the brain that controls breathing.

_____ (1 mark)

e. Interstitial lung disease is a disease in which the alveolar walls become thicker.

i) Explain why gaseous exchange would be low in a person suffering from interstitial lung disease.

_____ (1 mark)

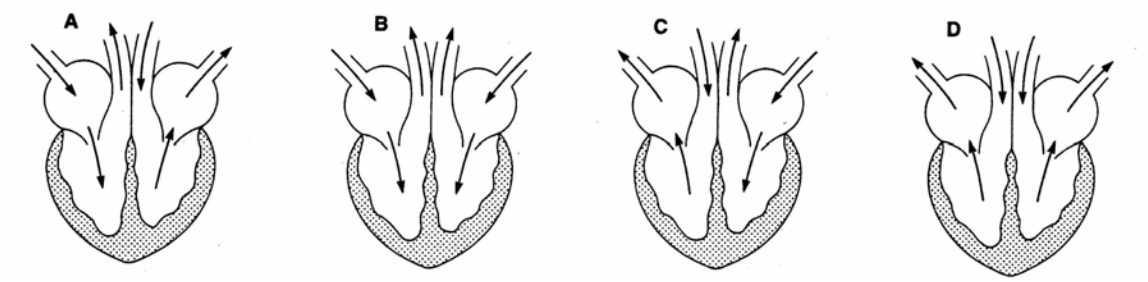
ii) In the space below draw a diagram to show the gaseous exchange taking place at the alveolus.

(2 marks)

(Total 8 marks)

8a. Write the letter of the diagram showing the correct direction of blood flow in the mammalian heart.

_____(1 mark)



b. (i) The lower chambers of the heart are called the ventricles. Name the upper chambers of the heart.

_____(1 mark)

(ii) The pressure exerted by the left ventricle is higher than that exerted by the right ventricle. Which feature of the heart's structure allows a different pressure to be exerted by the two sides of the heart?

_____(1 mark)

c. Explain why the heart has to exert more pressure on the blood in the left ventricle than in the right ventricle.

_____

_____(2 marks)

d. Angiotensin is a hormone which causes blood vessels to constrict (narrow). What is the effect of this hormone on blood pressure?

_____(1 mark)

(Total 6 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.

Killer Seaweed

While it poses no threat to humans the seaweed or alga *Caulerpa taxifolia* gained its nickname because it can rapidly wipe out marine plants such as the eelgrass. Eelgrass is an important plant that serves as food and shelter for snails and other invertebrates. These organisms are eaten by commercially important fish which in turn are eaten by a variety of wetland birds. *Caulerpa taxifolia* has no natural enemies; fish do not eat it because it is poisonous to them. A toxin in the alga can kill the microscopic marine organisms that form the basis for most marine food chains and harm the eggs of marine animals.
Like other algae, *Caulerpa taxifolia* can photosynthesise but also has a mechanism that can draw nutrients from the substrate. The alga spreads through fragmentation, meaning that each small piece of alga can regenerate a new filament.

a. At which trophic level of the food chain would you expect to find eelgrass? (1 mark)

b. A less harmful tropical alga *Caulerpa mexicana* is found naturally in the Mediterranean Sea. Explain why the first name of both the killer seaweed and the tropical alga is Caulerpa. (1 mark)

c. Describe ONE way in which *Caulerpa taxifolia* may wipe out eelgrass. (2 marks)

d. Explain the effect of decreasing numbers of eelgrass on the marine food chains. (2 marks)

e. A research team is carrying out laboratory tests with weed-eating slugs called *Asco glossum* imported from the Caribbean. If the tests are successful, the slug may be released into the affected area to control the killer seaweed.
   (i) To which phylum does the weed-eating slug belong?
   (ii) Predict ONE possible danger of introducing the slug to control the killer seaweed. (1, 2 marks)

f. (i) An ecologist suggested another way of controlling the killer seaweed, by covering the affected area with black sheeting. What is the benefit of this method?

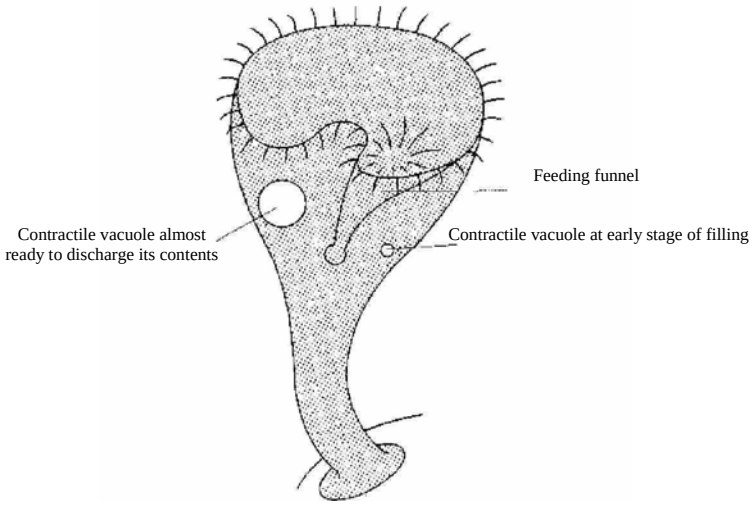
   (ii) A third method of controlling the killer seaweed is by using a herbicide. Write ONE disadvantage of this method. (2, 1 marks)

g. (i) What type of reproduction is taking place in the process of fragmentation?

   (ii) List ONE advantage and ONE disadvantage of the type of reproduction you mention in ‘g i’. (1, 2 marks)

(Total 15 marks)

2. The following diagram shows a free-moving freshwater unicellular animal, called *Stentor*, that becomes attached to vegetation by its lower end during feeding. Water from the surroundings enters *Stentor* by osmosis. Unwanted water is collected and discharged by two contractile vacuoles. Each filling and emptying of a contractile vacuole is called a pulsation.



a. (i) Write the name of the phylum to which unicellular organisms belong and mention ONE other organism belonging to the phylum.

(ii) Write the term used for the process of water regulation by means of contractile vacuoles. (2, 1 mark)

b. (i) Define the term osmosis.

(ii) Name ONE place in the human body where osmosis takes place.

(iii) Name ONE place in plants where osmosis takes place. (2, 1, 1 mark)

c. The unicellular condition imposes a restriction on size. Suggest a reason for this. (2 marks)

d. In an experiment, specimens of *Stentor* were placed in four solutions (A, B, C, D) of different salt concentrations. The following Table gives the average time of one pulsation in each of the four different concentrations.

Solution	Average time for ONE Pulsation (in seconds)
A	95
B	156
C	201
D	378

Which letter represents the:
(i) strongest salt solution?
(ii) least salt concentrated solution? (1, 1 mark)

e. Give a reason for your answer in 'd ii'. (2 marks)

f. The experiment was repeated by placing *Stentor* in pure water. How would the average time for one pulsation change? Give a reason for your answer. (2 marks)

(Total 15 marks)

3a. Most flowers are hermaphrodite, meaning that they contain both male stamens and female carpels. What is the benefit of this? (1 mark)

b. Draw a labelled diagram to show the structure of a typical insect pollinated flower. (4 marks)

c. Unlike an animal's sperm, pollen cannot move by itself. Explain. (2 marks)

d. Explain why a single mature oak tree might produce a million acorns (oak fruits) in a single year. (2 marks)

e. The broad bean is an example of a dicotyledon while wheat is a monocotyledon. Distinguish between monocotyledonous and dicotyledonous seeds. (2 marks)

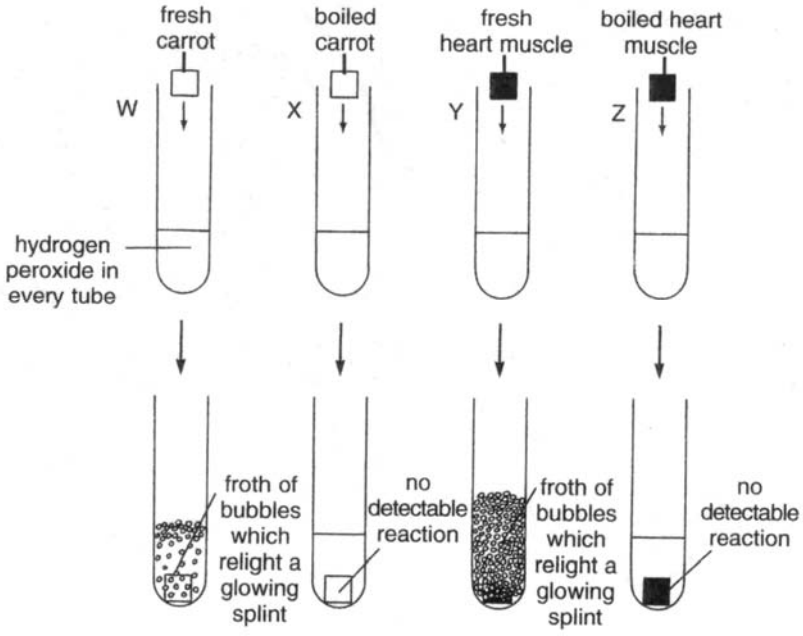
f. Many seeds contain food tissue. Name the food tissue present in many seeds and explain its importance. (2 marks)

g. A biology student planted some seeds in the school garden, but they did not germinate. Suggest TWO reasons why the seeds did not germinate. (2 marks)
(**Total 15 marks)**

4. The digestion of food depends heavily on the action of enzymes.

a. (i) Define the term enzyme.
(ii) An enzyme is specific to its substrate. Explain. (1, 1 mark)

b. **Catalase** is an enzyme made by living cells, used for the breakdown of hydrogen peroxide into water and oxygen. The following diagram shows the set-up used to investigate the effect of **catalase**.



(i) Explain why there was no detectable reaction in test-tubes X and Z.

(ii) Suggest TWO possible reasons why there are more bubbles of oxygen in test-tube Y than in test-tube W. (2, 2 marks)

c. (i) Name the enzyme that breaks down fats and explain the role of bile in the digestion of fats.

(ii) List the TWO end-products of fat digestion. (3, 2 marks)

d. Humans cannot digest cellulose however cellulose still plays an important function in the diet.

(i) Explain why cellulose cannot be digested by human beings.

(ii) Write the importance of cellulose in the diets of human beings.

(iii) Cows also cannot digest the cellulose present in the cell walls of plant cells. Explain how cows overcome this problem. (1, 2, 1 mark)

(Total 15 marks)

5. Give a biological explanation for **each** of the following statements:

a. Animals in warm climates frequently have larger ears when compared to related species from colder climates. (3 marks)

b. Lizards are fully adapted for life on land. (2 marks)

c. The polar bear has thick fur that is covered by a greasy / oily layer. (2 marks)

d. A person staying out on a cold day looks pale. (2 marks)

e. In summer it is advisable to drink more water. (2 marks)

f. During the day, a kangaroo rat which lives in the desert, produces a lot of saliva which it then licks over its body. (2 marks)

g. The Arctic fox changes its brown fur summer coat to pure white in winter. (2 marks)

(Total 15 marks)