

SECONDARY SCHOOL ANNUAL EXAMINATIONS 2011

Directorate for Quality and Standards in Education
Educational Assessment Unit

BIOLOGY – FORM V TIME: 2 HOURS

NAME: _____ CLASS: _____

Question No.	Section A							Section B				
	1	2	3	4	5	6	7	1	2	3	4	5
Max mark	5	6	5	10	11	11	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. Write the number of:

- a. chromosomes in a human skin cell _____
- b. the pH necessary for the action of pepsin _____
- c. the percentage concentration of oxygen in inspired air _____
- d. daughter cells produced by meiosis _____
- e. classes in the phylum Arthropoda. _____

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

Total: 5 marks

2. The platypus is a semi-aquatic mammal endemic to Eastern Australia. The body and the broad tail of the platypus are covered with dense brown fur. The platypus is a carnivore that feeds on annelid worms, insect larvae and freshwater shrimps. Natural predators of the platypus include snakes, water rats, hawks, owls and eagles. Low platypus numbers in Northern Australia are possibly due to predation by crocodiles.



a. From the passage above list:

- i. ONE reptile _____

- ii. ONE crustacean _____

- iii. ONE biotic factor that affects the population size of the species. _____

(1, 1, 1 mark)

- b. Mammals are endothermic vertebrates. List ONE other class of endothermic vertebrates. _____

(1 mark)

- c. Explain the benefit of having a body covered with dense fur. _____

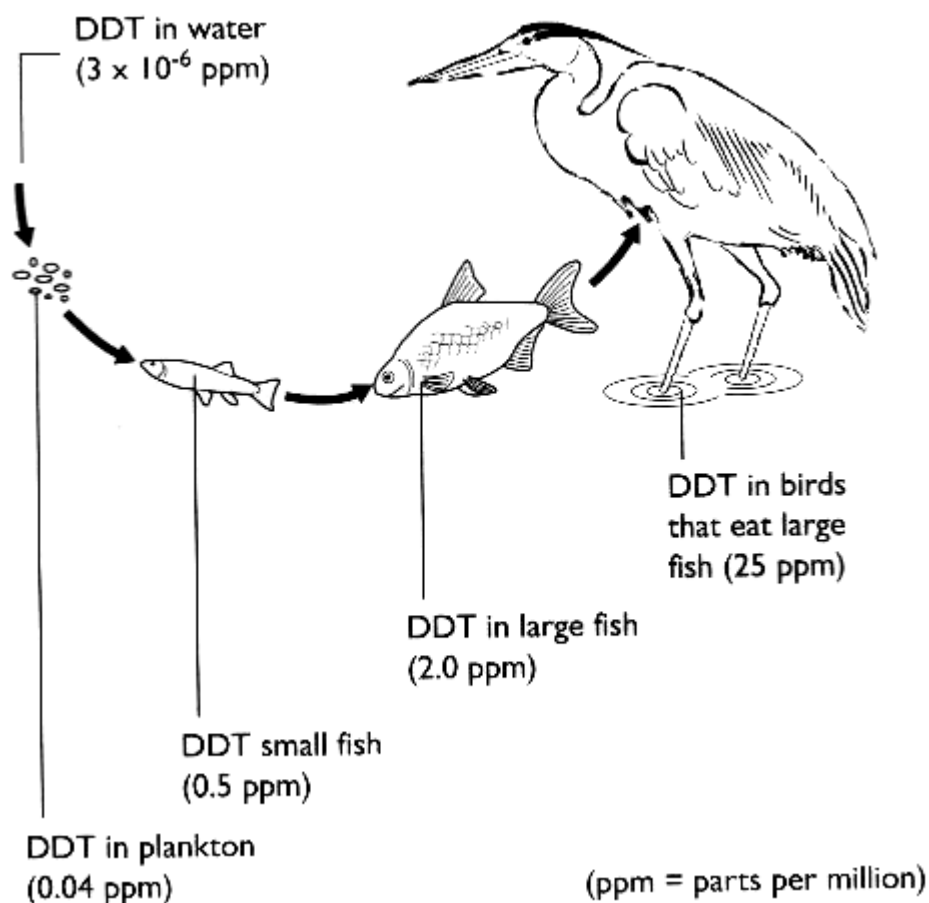
(1 mark)

- d. Define the term carnivore. _____

(1 mark)

Total: 6 marks

3. Some time after DDT was introduced as a pesticide, people noticed that the number of fish-eating birds like herons was falling. The tissues of these birds were analysed and found to contain amounts of DDT. The DDT made the birds produce eggs that had very thin shells that broke easily and killed the chicks inside. The following diagram shows the levels of DDT along the organisms in a food chain.



- a. With reference to the food chain shown in the diagram above to which trophic level do the fish-eating birds like the heron belong?

_____ (1 mark)

- b. Explain how the levels of DDT increase at each level of the food chain.

_____ (2 marks)

- c. List TWO alternative ways of pest control that limit the effects of pesticides such as the DDT.

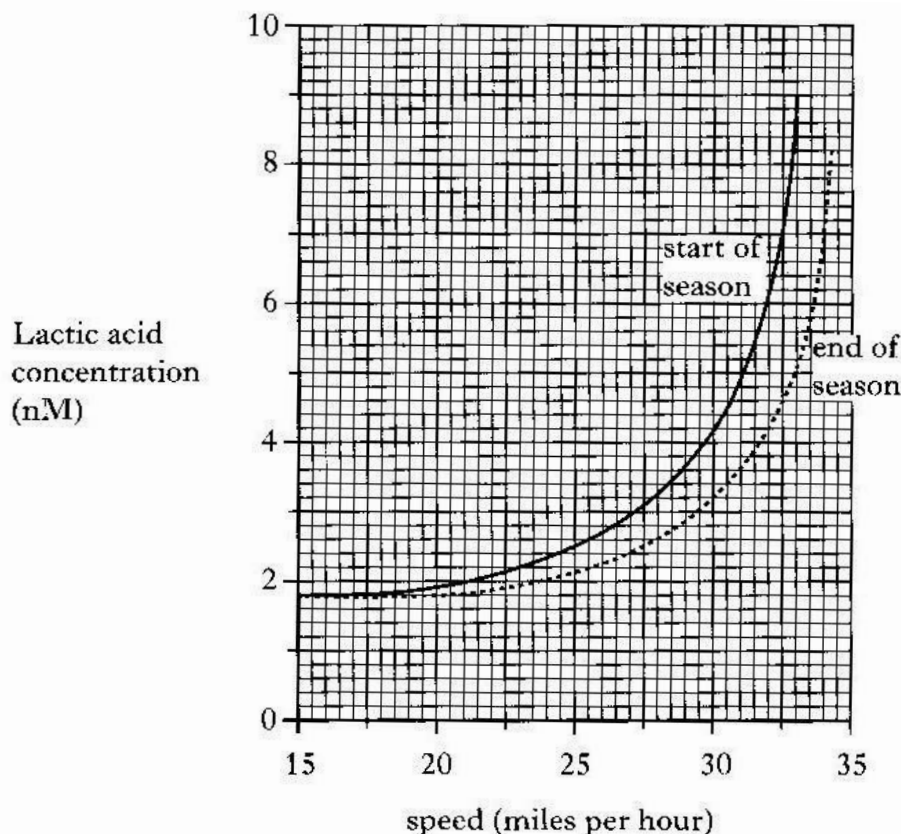
_____ (2 marks)

Total: 5 marks

4. The following table shows a comparison of the breakdown of 1g of glucose by the types (A, B and C) of cell respiration.

	Type of cell respiration		
	A	B	C
Energy released (kJ)	17.1	0.9	0.9
Oxygen used	1.07	0	0
Carbon dioxide produced (g)	1.47	0	0.49
Water produced (g)	0.6	0	0
Lactic acid produced (g)	0	1	0
Ethanol produced (g)	0	0	0.51

- a. Write the letter of the type of respiration that takes place in:
- yeast cells _____ (1, 1 mark)
 - muscle cells (after heavy exercise) _____ (1, 1 mark)
- b. Write the chemical equation for the type of respiration taking place in A. _____ (2 marks)
- c. The following graph shows the lactic acid content of the blood of a professional cyclist that was measured at different speeds. These measurements were taken at the start of the racing season and at the end.



- i. Compare the lactic acid concentration in the blood of the cyclist at the start of the season and at the end of the season.

- ii. What was the speed of the cyclist at the start of the season when he was producing 50% of the maximum lactic acid concentration?

(2, 1 mark)

- d. During exercise the heart pumps more blood per minute. Explain the importance of this.

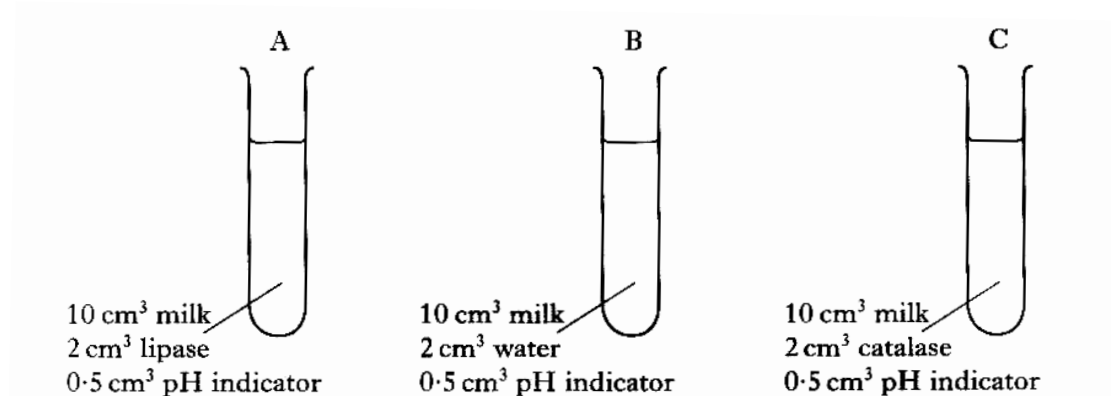
(1 mark)

- e. What is the *oxygen debt*?

(2 marks)

Total: 10 marks

5. A group of biology students investigated the activity of the enzymes lipase and catalase. Three test tubes were set up as shown in the diagram below. The colour of the pH indicator was noted at the start of the investigation and after 20 minutes. The results obtained are shown in the table below.



Test tube	Colour of pH indicator	
	At start of investigation	After 20 minutes
A	green	orange
B	green	green
C	green	green

- a. In the investigation the students used the same quantity of milk.
- i. List TWO other conditions related to milk that need to be kept the same during this investigation.

- ii. Write the letter of the test tube that acts as the control.

(2, 1 mark)

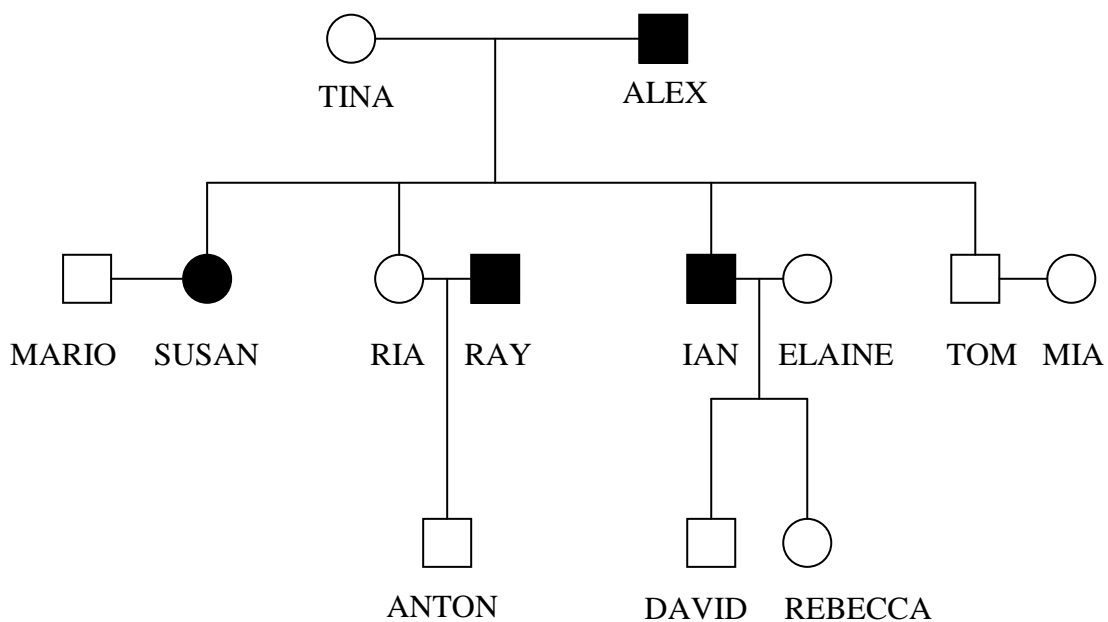
- b. In tube A, the pH indicator colour change was due to the production of fatty acids as the lipase reacted with the fat in the milk. Explain why there was no change in tube C.

(1 mark)

- c. Lactose is the disaccharide sugar component of milk.
Write the TWO monomers making up the disaccharide lactose.

(1 mark)

- d. Lactose intolerance is the inability to metabolise lactose because of the required enzyme lactase. Congenital Lactase deficiency (CLD) is inherited as an autosomal recessive trait (represented as **t**). This results in a marked deficiency of lactase production if any at all in the small intestine from birth.



Key:



Normal male



Normal female



Affected male



Affected female

- i. Define the term *recessive*.

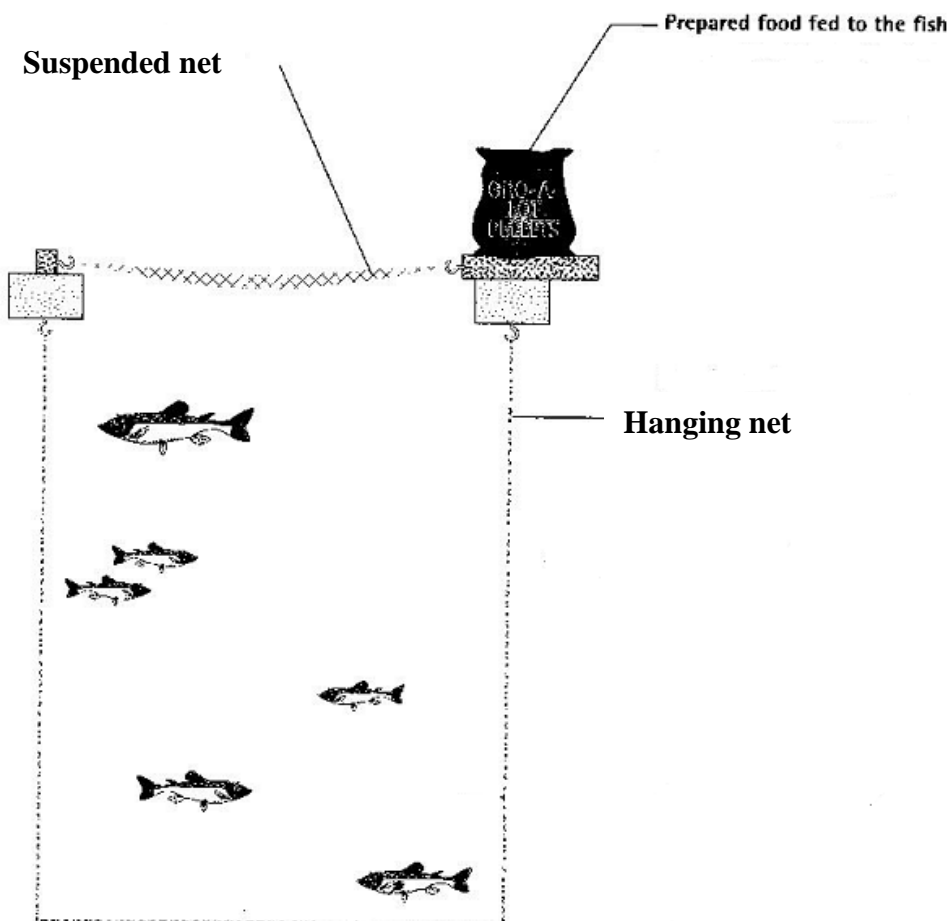
ii. Write Tina's genotype for CLD.

iii. Tom and Mia are both unaffected however they still have the possibility of having a child suffering from the lactose intolerance deficiency. Use genetic diagrams to work out the percentage chance of having an affected child.

(1, 1, 4 marks)

Total: 11 marks

6. Fish farming involves raising fish commercially in tanks or enclosures usually for food.



a. Explain why:

i. in fish farms there are suspended nets

ii. in fish farms there are hanging nets

iii. more pesticides are added to water in fish farm tanks/enclosures

iv. some fish farmers put air bubblers in the fish tanks/enclosures.

(1, 1, 1, 3 marks)

b. Salmon are commonly grown in fish farms. In their natural environment salmon lay their eggs in freshwater rivers. Young salmon migrate to the sea where they stay until they mature.

i. Explain why salmon need to drink water when they are in sea water.

ii. Compare the urine output of salmon living in sea water with that of salmon living in freshwater.

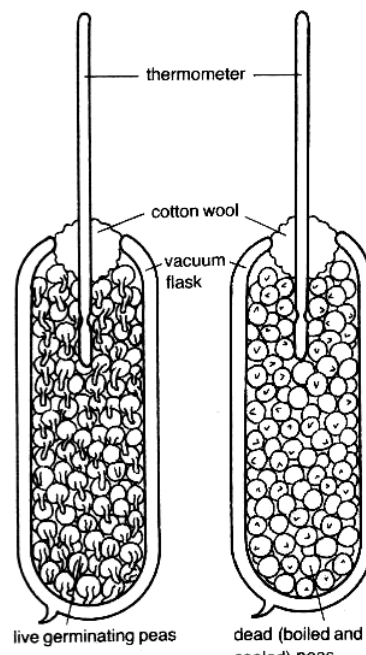
(2, 2 marks)

c. Salmon is a popular healthy food. Give ONE benefit of including fish in the diet.

(1 mark)

Total: 11 marks

7. A biology teacher set up the following apparatus.



- a. Describe the result you would expect after the apparatus had been set up for a few days. Give a reason for your answer.

Result: _____

Reason: _____

(3 marks)

- b. The pea leaf weevil *Sitona lineatus* is an insect that damages pea plants and other legumes. The weevil larvae feed on the root nodules of the pea plants. How does this affect the pea plant?

(2 marks)

- c. Peas show hypogeal germination. Explain the term hypogeal germination.

(2 marks)

Total: 7 marks

Section B

Answer any THREE questions from this section. Answer the questions of section B on a foolscap.

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

The Atkins Diet is a low-carbohydrate diet created by Robert Atkins. Atkins said that unrecognized factors in Western eating habits lead to obesity. Primarily he believed that the main cause of obesity is eating refined carbohydrates particularly sugar, flour and high-fructose corn syrup. The Atkins Diet involves restriction of carbohydrates to switch more frequently the body's metabolism from burning glucose as fuel to burning stored body fat. This process, called ketosis, begins when insulin levels are low.

- a. i. List the THREE elements present in carbohydrates.
ii. Name the TWO carbohydrates listed in the passage above. (1, 2 marks)
- b. i. Name the gland that secretes insulin and list ONE other hormone produced by it.
ii. Name the disease that is caused by an inadequate secretion of insulin. (2, 1 mark)
- c. i. Describe the structure of a fat molecule. (You may use a diagram in your description)
ii. What happens to a protein molecule if it is heated above 40°C? (2, 2 marks)

- d. The following poster was used in a national campaign to fight childhood obesity in



List TWO features evident in the poster that lead to increased chances of obesity in children.

(2 marks)

- e. Obesity causes heart disease. The heart contracts about 70 times a minute throughout our life, that is over 100,000 times a day. Explain how this is possible. (2 marks)
- f. Every time the heart beats it sets up a wave of pressure that travels along the main arteries. What is this called? (1 mark)

Total: 15 marks

2. Bees are one of the major insect groups responsible for pollination of rainforest trees. Plant species are often highly specialised to be pollinated by one unique species of bee.

- a. Define the term *pollination*. (2 marks)
- b. List TWO features that distinguish bees as insects. (2 marks)

- c. The area covered by rainforests around the world is rapidly shrinking. List TWO reasons for this. (4 marks)

- d. i. In biology the term *species* is one of the basic units (taxonomic ranks) used in biological classification. List the SIX other taxonomic ranks that come before species.

- ii. The World Wildlife Fund (WWF) has always worked towards the protection of endangered species. List TWO reasons why an increasing number of species are in danger of extinction. (3, 4 marks)

Total: 15 marks

3. IVF (in vitro fertilisation) is a process by which egg cells are fertilised by sperm outside the uterus.
- Name the organ that produces
 - sperm in males
 - eggs in females. (1, 1 mark)
 - How many chromosomes are present in a human gamete (sperm or egg)? (2 marks)
 - Once every 28 days or so an egg is shed into the oviduct. The egg then moves down the oviduct towards the uterus.
 - Name the lower end of the uterus.
 - What changes take place to the uterus lining if a female becomes pregnant?
 - Name TWO hormones that prepare the uterus for pregnancy.
 - After fertilisation, the egg divides up into a little ball of cells which moves down the oviduct to the uterus. Name the process that takes place once the ball of cells sink into the soft lining of the uterus. (1, 2, 2, 1 mark)
 - Some couples try to avoid conception by the male withdrawing his penis from the vagina just before ejaculation.
 - Name the fluid expelled from the penis during ejaculation.
 - Explain why this withdrawal method is considered as an extremely unreliable birth control method.
 - Explain why the sheath is considered as one of the more reliable birth control methods. (1, 2, 2 marks)

Total: 15 marks

4. Give a biological explanation for **each** of the following statements:
- Leaves have pores.
 - The liver deaminates amino acids.
 - Living things grow.
 - Feathers keep birds warm.
 - Ploughing can lead to soil erosion. (3, 3, 3, 3, 3 marks)

Total: 15 marks

- List TWO ways in which the human body loses water. (2 marks)
- List TWO differences in the composition of blood present in the renal artery with that in the renal vein. (4 marks)
- Define the term excretion. (1 mark)
- In a simple organism such as the *Amoeba* poisonous waste substances such as ammonia diffuse across the cell membrane into the surrounding water.
 - Why is diffusion a passive transport process?
 - Explain why a small organism like the *Amoeba* can take in all the oxygen it needs by diffusion but a large organism like a mammal cannot get all the oxygen it needs by diffusion. (1, 4 marks)
- Amoeba* reproduces by splitting in two. This is a type of asexual reproduction. Name this type of asexual reproduction and give TWO advantages of it. (3 marks)

Total: 15 marks