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NZQA

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Level 1 Biology, 2017

90929 Demonstrate understanding of biological ideas relating to a mammal(s) as a consumer(s)

9.30 a.m. Thursday 16 November 2017
Credits: Three

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of biological ideas relating to a mammal(s) as a consumer(s).	Demonstrate in-depth understanding of biological ideas relating to a mammal(s) as a consumer(s).	Demonstrate comprehensive understanding of biological ideas relating to a mammal(s) as a consumer(s).

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Merit

TOTAL 17

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QUESTION ONE: DIGESTION

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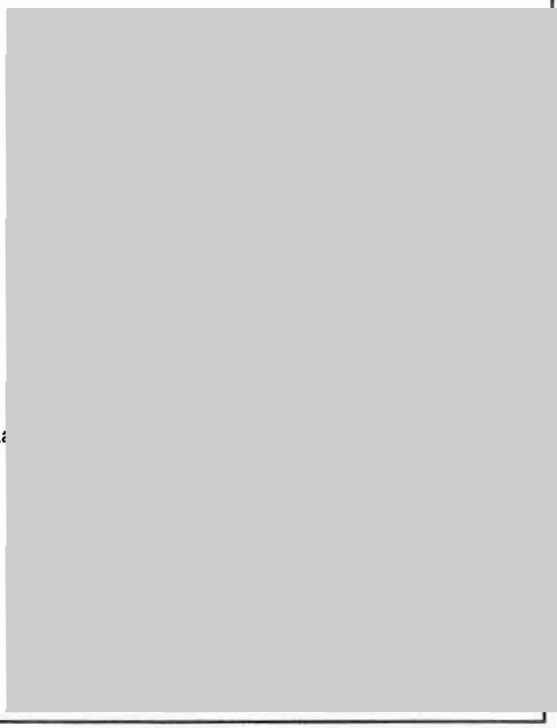
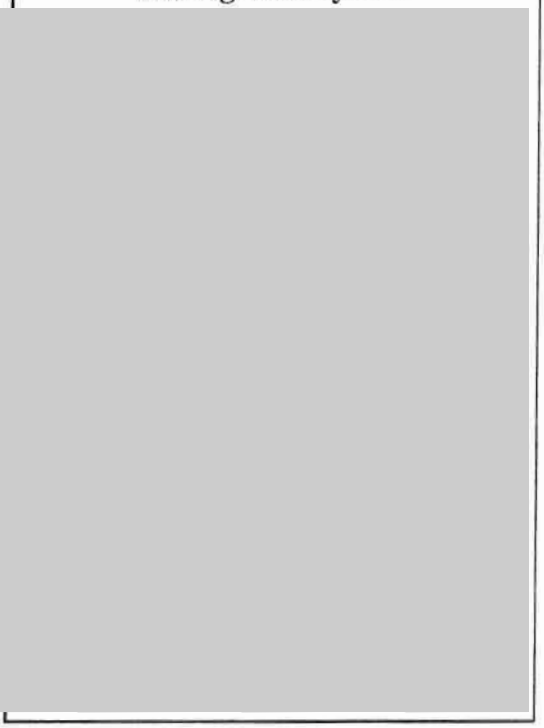
The diagrams below show the digestive system in the body and the pH of the different parts.

Digestive system	pH of different parts of the digestive system
	
http://pulpbits.net/7-label-the-parts-of-the-digestive-system/the-digestive-system-with-labels/	http://www.badgut.org/information-centre/a-z-digestive-topics/pill-coating/

Compare and contrast the physical and chemical digestion of proteins, carbohydrates and fats in the digestive system of a mammal such as a human.

In your answer:

- describe the purpose and location of the processes of physical and chemical digestion
- explain how digestion of proteins, carbohydrates, and fats occurs
- discuss why the pH of the different parts of the digestive system is important in the digestion of food, and how the pH is regulated.

In the mouth, physical digestion is mastication which is when the surface area of the food in increased to allow an enzyme called amylase (chemical digestion) to break down starch → maltose. The pH is neutral which is the optimum pH for the amylase enzyme. Physical digestion called peristalsis then occurs which is pushing the bolus down the oesophegus into the stomach. Here physical digestion is the

churning of the food with the juices, which are chemical digestion. HCl (low pH of 1-2) provides an acidic medium for the enzyme pepsin to break down protein → polypeptides.* This then moves into the small intestines where pancreatic juices (enzymes) chemically break down the food. Carbohydrases break down maltose → glucose ready to be diffused into the bloodstream for energy. Lipases break down lipids into glycerol and 3 fatty acids which are used for protection. Proteases break down polypeptides into amino acids which are used for growth and repair. Physical digestion in the small intestines is peristalsis which pushes the food through. Here, the pH is 7 - neutral. It is important that the enzymes break down these proteins, carbohydrates and fats because then they are able to be absorped and used by the body. The pH is very important because enzymes require an optimum pH to be most effective at breaking down large food molecules. If the pH in the mouth, for example, was too high, the amylase enzyme would denature meaning the shape of the active site would permanently change. This means that the enzyme can no longer break down the molecules of food!**

* The digestion in the stomach prepares the food for more digestion and absorption in the small intestines.

** The pH is regulated by the HCl in the stomach and then by bile where $NaHCO_3$ neutralises the acidic chyme before entering the small intestines.

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QUESTION TWO: HERBIVORE AND CARNIVORE DIGESTIVE SYSTEMS

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Herbivores and carnivores have differences in their mouths and guts which help them digest their different diets.

Rabbit gut (herbivore) **Dog gut (carnivore)**

http://www.vivahealth.org.uk/wheat-eaters-or-meat-eaters/length-digestive-tract

Rabbit (herbivore) skull

https://nz.pinterest.com/pin/299419075201863865/

Dog (carnivore) skull

http://www.angelfire.com/mi/dinosaurs/dogs.htm

Compare and contrast the differences in the digestive system and mouth of a herbivore and a carnivore.

In your answer:

- describe the diet of a herbivore such as a rabbit, and a carnivore such as a dog
- explain why and how the digestion that occurs in the mouths of a herbivore and a carnivore are different
- explain the main differences in structures and functions of the herbivore and carnivore gut
- evaluate the effectiveness of the digestive systems of a herbivore and a carnivore.

Rabbits have a very plant based diet consisting of a lot of cellulose whereas carnivores such as dogs have a protein based diet (meat). Both herbivores and

Carnivores have incisors and molars but these vary between the 2. Herbivores have long and sharp incisors to carefully crop the grass that they eat and cut it up whereas carnivores incisors are small and sharp to scrape meat off the bone of their prey. Herbivores some eg. rabbits do not have canines but instead have a diastema which allows them to sort their food. Canines on the other hand have large and pointed canines to rip and tear flesh and give a 'fatal neck bite'. Herbivores molars are large and flat to grind up and increase the surface area of the cellulose which is very hard to break down because of the tough cellulose wall. They grind it up a lot so they cellulase enzymes can work more effectively. Whereas canines have sharp molars called carnasials which cut up the meat. They do not have enzymes in their mouth as proteins are much easier to break down. In the mouth the canine purely relies on physical digestion while the herbivore relies on both. Rabbits (hindgut herbivore) have a very long system as cellulose is difficult to break down. They have a modified caecum - it is large and contains many microbes that help to break down any undigested cellulose from the stomach, however this cannot be absorbed in the large intestines so often rabbits will reingest caecel pellets to attain the maximum nutrition from their food. Canines eg. dogs have a very short digestive system. There is pepsin in the stomach to break down protein and the small intestines are short to avoid decay. If the gut was longer, the raw flesh may rot. The caecum here has little use. The digestive system of a herbivore is effective because cellulose is

(CONTINUED ON PG 8)

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QUESTION THREE: ABSORPTION, CIRCULATION, ASSIMILATION AND RESPIRATION

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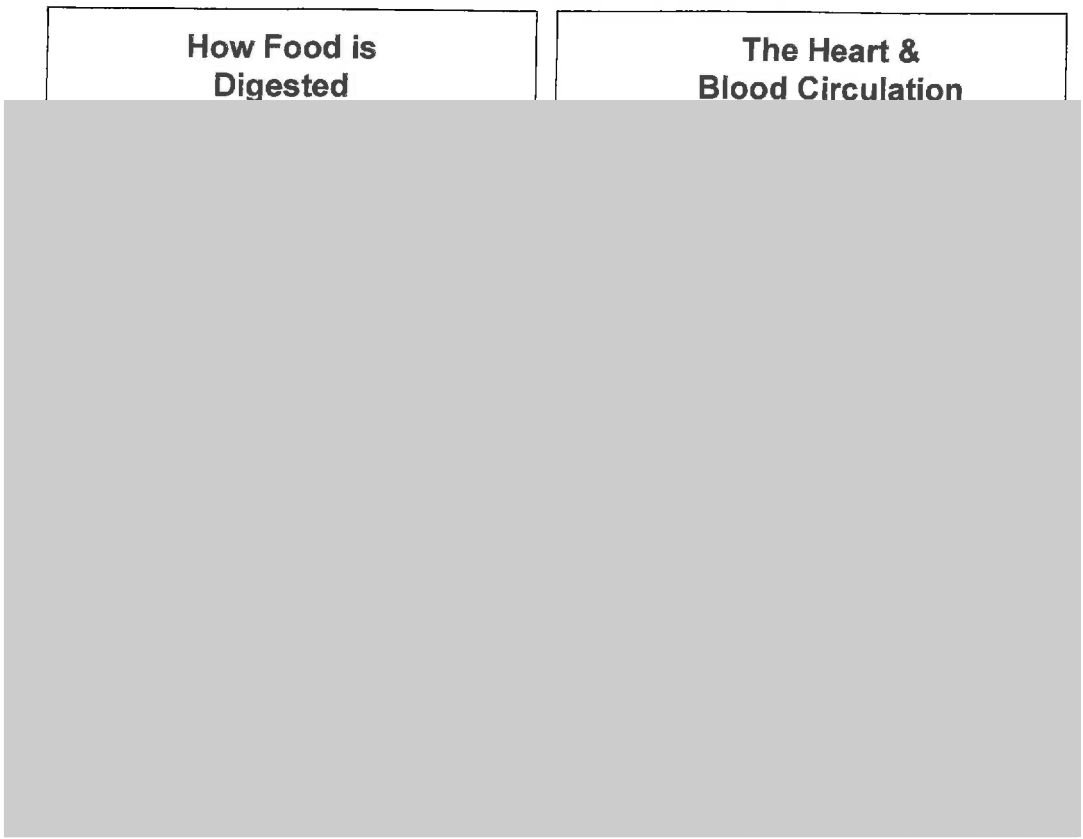
The pictures below show the main sites of digestion and how blood is circulated in the human body.



http://www.mentone-educational.com.au/how-food-is-digested-the-heart-and-blood-circulati

Discuss how the processes of absorption, circulation, assimilation, and respiration work together to ensure the products of food digestion are distributed around and used by the body.

In your answer:

- describe the processes of absorption, circulation, assimilation, and respiration, and where these processes occur
- explain how and why the processes of absorption, circulation, assimilation, and respiration occur in the body
- discuss how the processes of absorption, circulation, assimilation, and respiration work together to ensure the healthy functioning of the body.

Absorption occurs in the small intestines where digested food is diffused into the bloodstream through structures called villi. The villi are one cell thick and have a large surface area to allow for rapid diffusion of things such as glucose into the bloodstream. There is also a lacteal network that absorbs ~~glycerol~~ glycerol and fatty acids ~~and transported to the~~ Circulation is the

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Movement of blood around the body and it occurs in the heart, ~~the~~ veins and arteries. The heart pumps deoxygenated blood to the lungs through the pulmonary artery where it is oxygenated and returns to the heart to be pumped all around the body so that cells can respire, and then it is returned back to the heart through veins to be reoxygenated. Assimilation is the process where digested food is built up to be used: ~~glucose is used for energy~~ for example, glucose is used for energy, amino acids are used ~~for~~ to make proteins which are used for growth and repair ~~and~~ etc. ~~It occurs in the liver.~~ Respiration is the process of taking oxygen and glucose to produce water and CO_2, as well as energy. This is essential to survive as our cells need energy to carry out their specific functions.

These functions work together ~~by~~ because absorption takes the food that we eat that is digested both chemically and physically in the gut and absorbs them into the bloodstream. From here, they are pumped around the body through the process of circulation and then assimilation takes these broken down molecules and builds them back up into things that our bodies can actually use - such as glucose. This is then ~~used in~~ pumped around to all the cells in the body where they can do the process of respiration which provides them with energy in order to carry out their specific functions and ensure the functioning of a healthy body.

M6

Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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2 hard to break down so they have large flat molars and a long system to try and digest the nutrients effectively. There is also a modified caecum which ensures it is fully broken down however they must reinject the faeces so that is perhaps negative. The carnivore digestive system is more effective because it accomodates well to their diet and they are able to quickly and easily digest and absorb the nutritional value.

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Subject:	Biology	Standard:	90929	Total score:	17

Q	Grade score	Annotation
1	M6	Described what physical digestion is, and where it occurs. (A points) Describes where chemical digestion occurs and implies that it uses enzymes, Naming specific examples of enzymes, describing where they work, what they breakdown and the products. (M points) Also outlines the pH of the areas some of the enzymes work best in. But still only outlining the digestive system mouth to small intestines. Explains what happens to enzymes if the pH isn't at its optimum (M point) But has not discussed why each part of the digestive system is compartmentalised and regulated so optimum pH can be provided for the enzyme to work, which is needed for E.
2	M5	Tells us that herbivores eat plants high in cellulose (A point) and told us that cellulose is hard to digest and therefore they have special adaptations. Outlines and explains (in limited detail) some of these adaptations in both organisms– Different length of digestive system described and linked to why (M point) and function of caecum (M point) Tells us that carnivores eat meat (A point) 2 Merit points = M5
3	M6	Outlines where absorption occurs and that the nutrients/ glucose moves through the villi into the blood stream and that fatty acids and glycerol move through the villi into the lacteal (M points) Told us blood is moved around the body then outlines where the heart pumps blood to which isn't needed. Describes assimilation (A point) and respiration (A point)