1

90929

909290

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
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SUPERVISOR'S USE ONLY

Level 1 Biology, 2015

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

2.00 p.m. Friday 20 November 2015
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 2–12 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.

Low Merit

TOTAL 15

ASSESSOR'S USE ONLY

QUESTION ONE: TEETH FOR LIFE

ASSESSOR'S USE ONLY

The pictures below show the skull of a carnivore and the skull of a herbivore. They have different structures to assist with the digestion of the different types of foods eaten.

Cat skull

http://illuminationstudios.com/wp-content/uploads/2011/10/catskull.jpg

Sheep skull

http://www.cpr-savers.com/assets/images/prodimages/T30018.jpg

(a) Define the term digestion.

Digestion is the process whereby food is mechanically & chemically broken down so that it can be absorbed.

(b) Explain how the teeth and jaws of cats and sheep are adapted to deal with their different types of food.

In your answer you should:

- name the type of digestion that uses the teeth
- explain how each animal's teeth are adapted to suit each animal's typical diet
- compare the teeth and jaw of the cat with the teeth and jaw of the sheep, and explain how and why they are different.

Teeth is involved with physical digestion & are important as it increases the surface area of the food which increases enzyme efficiency in chemical digestion. and is why both cat & sheep posses teeth. Teeth are

adapted to suit the diet of an organism. In a cat, it has large canines (pointed incisors) and, carnassials and sharp incisors are present. This is because the cat is a carnivore. As it consumes meat, it requires teeth that are sharp in order for the meat to be sliced and teared into pieces. In contrast, a sheep contains large, flat molars & incisors. This is because it is a herbivore. As it consumes plant material, it requires teeth (large molars) which can thoroughly grind the ~~plant~~ tough, fibrous plant material as it contains cellulose & is, hence, harder to digest. The jaws of the cat & ~~skull~~ sheep are quite different as well. The cat has a large head in relation to jaw, so it can open its mouth wide when catching prey. ~~It~~ It also lacks a diastema, compared to the sheep. Sheep have a large diastema as it is a means for it to separate chewed grass with fresh grass as plant material is hard to digest

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(c) The rates of substrate breakdown by salivary amylase and pepsin were tested across a range of different pH values, and the results are shown in the graph below.

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Pepsin and Salivary Amylase Activity at Different pH Values

http://www.skill-guru.com/228/mcas-high-school-biology-test-spring-2011/questions

Referring to each of these enzymes, explain how these results relate to digestion in the mouth and in the stomach.

Your answer should include:

- a definition of chemical digestion
- a description of where each enzyme is produced, and where it carries out its function
- a discussion of how each enzyme's activity is affected by the pH changes that occur as food moves through the digestive system.

Chemical digestion is the process whereby enzymes (biological catalysts) break down complex ~~substrates~~ substances (~~carbohydrates~~ starch) into simpler chemical substances (glucose).

Pepsin is an enzyme produced in the stomach. Its ~~can~~ function is to break down proteins into polypeptides & functions in low pH conditions.

Salivary amylase is an enzyme produced in the mouth. Its function is to break down starch into maltose & it works in neutral - slightly alkaline conditions.

Enzyme activity is affected by pH and will function in a specific pH (called its optimum pH). If an enzyme is exposed to a pH far beyond / below its optimum pH, it will denature & be

unable to carry out its function. For instance, salivary amylase thrives in the mouth as conditions are relatively neutral/ alkaline (pH ≈ 7-8). whilst it denatures in the stomach as conditions are too acidic & the pH is too low (pH ≈ 1-2). Conversely, pepsin thrives in the stomach as it is acidic due to the hydrochloric acid in gastric juice. whilst it denatures in the mouth where the pH is too high (pH ≈ 7-8). Both enzymes denature in the small intestine though, as the pH is too high/ basic as bile is found there.

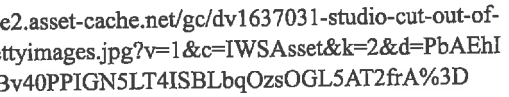
ASSESSOR'S USE ONLY

M5

QUESTION TWO: DIGESTIVE SYSTEMS

ASSESSOR'S USE ONLY

http://www.mirror.co.uk/news/uk-news/hero-bengal-cat-leo-scares-98886


http://cache2.asset-cache.net/gc/dv1637031-studio-cut-out-of-a-sheep-gettyimages.jpg?v=1&c=IWSAsset&k=2&d=PbAEhIrzoCHBv40PPIGN5LT4ISBLbqOzsOGL5AT2frA%3D


https://classconnection.s3.amazonaws.com/235/flashcards/2166235/jpg/picture11367354350876.jpg

Compare and contrast the digestive system of the cat with the digestive system of the sheep.

In your answer you should:

- describe the similarities AND differences in the features of the cat's and sheep's digestive systems
- explain how the different digestive systems are suited to the dietary requirements of a carnivore and a herbivore.

In both a cat & sheep's digestive systems, a stomach, small intestine & large intestine are found & as these 3 parts of the digestive system play important / similar roles in both organisms - hence, the similarity, i.e. stomach to digest, small intestine to absorb & large intestine to also absorb water & ions - nutrients

The differences exist between the 2 due to their diets.

The cat, which is a carnivore, consumes meat. This meat is mostly raw and, hence, contains many pathogenic bacteria. Its whole system ~~the~~, especially its small intestines, are relatively shorter ~~due to the fact that if~~ so the bacteria on the meat do not have a chance to grow & cause infections in the intestines. The hydrochloric acid secreted by the cat's stomach kills most bacteria & prevent infections.

In contrast, the sheep, which is a herbivore, consumes plant material. Plant material is much harder to digest as it contains cellulose &, hence, a more complex digestive tract is required. This is evident in the sheep's stomach. Its stomach consists of 4 chambers. The rumen, containing bacteria excreting cellulase begin digesting the cellulose found in plant material. Then the reticulum turns this into cud which the sheep regurgitates for further processing. Afterwards, the processed plant material goes into the omasum where, like the cat, acid is secreted to aid with digestion. Finally, it reaches the abomasum where water & ions are absorbed. The small intestine is very long ~~as there are~~ to maximise the amount of nutrients absorbed from the plant material. Finally, The large intestine, like the abomasum, absorbs any left-over water & ions to complete digestion.

ASSESSOR'S USE ONLY

A4

QUESTION THREE: DIGESTION AND TRANSPORT

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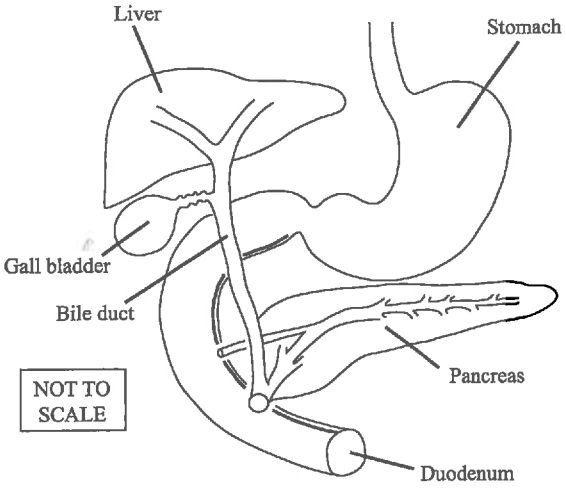
Once chyme (a thick semifluid of partly digested material) leaves the stomach, it enters the first part of the small intestine (duodenum), where further digestion can occur.

(a) Explain how digestion occurs in the small intestine.

In your answer you should:

- complete the table below
- explain how digestion is carried out by named enzymes and other substances that are released into the small intestine, including the substrates used and the products formed.

Digestive tract from the stomach to the duodenum



Adapted from: http://www.upmc.com/patients-visitors/education/gastro/Pages/ercp.aspx

Table of digestive enzymes and their substrates

Substrate	Enzyme	Product(s)
Lipid	Lipase	Fatty Acids + Glycerol
Protein	Protease (Pepsin) ~~Pepsin~~	Amino acids
Starch	Carbohydrase (Amylase) ~~Amylase~~	Glucose

In the small intestine, physical & chemical digestion takes place in the duodenum. Firstly, the bile produced by the liver & stored in the gall bladder is released into the duodenum (via the bile duct). This emulsifies lipids into many globules to increase its surface area & the enzyme efficiency of lipase. Then, the enzyme lipase binds to the substrates (lipid particles) & chemically breaks it down into fatty acids + glycerol. In addition to bile, pancreatic juice. This is an alkaline substance which neutralises the acidic chyme from the stomach and provides the optimum pH

level for the other enzymes to work in. In a similar fashion, carbohydrases convert starch into glucose & proteases, in the pancreatic juice, convert proteins into amino acids.

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Question Three continues on the following page.

(b) Discuss how the structures in the small intestine enable the nutrients to be effectively absorbed, then transported and assimilated into other cells around the body.

ASSESSOR'S USE ONLY

Adapted from: http://www.daviddarling.info/images/small_intestine_cross-section.jpg

In your answer you should:

- explain how the structures in the small intestine help increase absorption and transport of named substances to other cells within the body
- discuss how the final products of digestion are transported to other regions in the body, and what these products are used for in the cells.

The small intestine contains villi. These help increase the surface area of the small intestine which increases absorption rate of digested nutrients. In a villi, there is a capillary network transporting (absorbing glucose + amino acids and a lacteal absorbing fatty acids + glycerol. These are then transported by the bloodstream to other parts of the body where they are assimilated* and used as a source of energy when body cells carry out cellular respiration. The nutrients flow* through capillaries & reach cells by diffusion where, as said, they become part of living tissue.

*used as proteins/ to manufacture ribosomes and be anabolised make to new cell organelles!

*(they flow firstly to the heart where the blood gets oxygenated in the lungs)

ME

Low Merit exemplar for 90929 2015		Total score	15
Q	**Grade score**	**Annotation**	
1	M5	a. Definition correct = A b. Correctly identified that teeth do physical digestion = A Hasn't linked teeth descriptions to function, e.g. herbivores have large flat morals to grind/ crush the tough plant material c. Definition of chemical digestion correct = A Has what salivary amylase does and that it denatures when in wrong area but hasn't really described what happens to it as it moves through the digestive system only made a passing comment therefore only M	
2	A4	Only recalls comments on features, didn't link to them having microbes in rumen to produce cellulose which can digest cellulose Or that the small intestines are long because the sheep needs it's food to stay in them longer to give them more time to digest the tough cellulose Only A points	
	M6	a. Table correct Has idea of where bile is produced and what bile does = M Knows that pancreatic juices are added and what they do both neutralise the chime = M and the named enzymes in it and what they do = M b. Has correct idea about villi = A Idea about the capillary network and lacteal correct = 2M, but not clear enough about what amino acids are used for, therefore not E	

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High Merit

TOTAL 18

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QUESTION ONE: TEETH FOR LIFE

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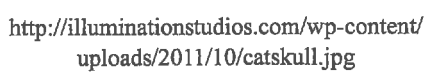
The pictures below show the skull of a carnivore and the skull of a herbivore. They have different structures to assist with the digestion of the different types of foods eaten.

Cat skull



http://illuminationstudios.com/wp-content/uploads/2011/10/catskull.jpg

Sheep skull

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(a) Define the term digestion.

digestion is the process of breaking down food via mechanichal or chemical

(b) Explain how the teeth and jaws of cats and sheep are adapted to deal with their different types of food.

In your answer you should:

- name the type of digestion that uses the teeth
- explain how each animal's teeth are adapted to suit each animal's typical diet
- compare the teeth and jaw of the cat with the teeth and jaw of the sheep, and explain how and why they are different.

Both herbivores and carnivores have a variety of teeth such as incisors however the have adapted to be diffrent in structure due to diffrent diets. Both herbivores and

ASSESSOR'S USE ONLY

Carnivores use mechanichale digestion to break down found in the mouth. Herbivores have large blunt incisors which helps to rip the roots of ~~[illegible]~~ plants, in comparision Carnivores have smaller and ~~[illegible]~~ sharper incisors this is so the carnivour can rip the flesh of the bone. ~~The~~ sheep ~~Herbivores~~ have adapted large, ~~[illegible]~~ flat molars, this with the herbivources large Jaw and side to side motion helps make mechanichle digestion more effective. Carnivoures in comparision have smaller and edgier molars known as Carnasials. The ~~Carnivoures~~ cat uses the ~~[illegible]~~ Carnasials to rip and chew the flesh, ~~[illegible]~~ The ~~Carnivoures~~ cats Jaw is not as large nor does move side to side however ~~[illegible]~~ the bite force and sharp teeth (carnassials, canines) help make chewing, mechanichle digestion effective. The cat also has large canines which is used to rip and tear the flesh apart, ~~[illegible]~~ sheeps (herbivours) dont need or have carnivours due to the difference in diets.

(c) The rates of substrate breakdown by salivary amylase and pepsin were tested across a range of different pH values, and the results are shown in the graph below.

ASSESSOR'S USE ONLY

Pepsin and Salivary Amylase Activity at Different pH Values

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Referring to each of these enzymes, explain how these results relate to digestion in the mouth and in the stomach.

Your answer should include:

- a definition of chemical digestion
- a description of where each enzyme is produced, and where it carries out its function
- a discussion of how each enzyme's activity is affected by the pH changes that occur as food moves through the digestive system.

Chemichk digestion is the process by which enzymes braice Specific nutrients into Smaller particles. Enzymes increase the rate of chemichk digestion, each enzyme is specific as each enzyme has a specific substrak which can fit in the active site (where the reaction occurs). Just as enzymes target specific nutrients enzymes also work at specific optimum pH, hence this is why they are found in diffrent places. If the enzyme were to be in an unsuitable pH the enzyme would

denatured, this means the Active site in no longer specific as they the enzyme loses its function. For example Amylase enzymes are found in the mouth and are produced in the salavery gland. Since ~~the~~ Amylase enzymes are found in the mouth the optimum pH is 7, this can also be seen in the graph. Amylase enzymes break down Carbs into glucose once this is done, the bolous moves down the oesophigus ~~and~~ & with the Amylase enzymes, however so the Amylase enzyme would denature when it reaches the stomache as the pH is to Acidic and it intolerable. the protease enzyme ~~that~~ then breaks down any protein in the bolus. The optimum pH for protease / pepsin enzyme is pH 2 as can be seen in the graph. lipase enzymes are found in the intestines (small) ~~and break down in~~ pH 7. and break down ~~fatty~~ lipids into fatty acids and Glycerol.

ASSESSOR'S USE ONLY

E7

QUESTION TWO: DIGESTIVE SYSTEMS

ASSESSOR'S USE ONLY

http://www.mirror.co.uk/news/uk-news/hero-bengal-cat-leo-scares-98886

http://cache2.asset-cache.net/gc/dv1637031-studio-cut-out-of-a-sheep-gettyimages.jpg?v=1&c=IWSAsset&k=2&d=PbAEhIrzoCHBv40PPIGN5LT4ISBLbqOzsOGL5AT2frA%3D

https://classconnection.s3.amazonaws.com/235/flashcards/2166235/jpg/picture11367354350876.jpg

Compare and contrast the digestive system of the cat with the digestive system of the sheep.

In your answer you should:

- describe the similarities AND differences in the features of the cat's and sheep's digestive systems
- explain how the different digestive systems are suited to the dietary requirements of a carnivore and a herbivore.

ASSESSOR'S USE ONLY

Both the cat (carnivore) and sheep (herbivore) have villis and micro villis throughout the small intestine, this is to increase the surface area of nutrient absorbtion and to make absorbtion more effective. The small intestine of the cat is much smaller and shorter in comparasion to the sheeps. However it is effective in talking in / break down (read available nutrients from the meat base diets. The sheeps small intestine is much longer this (reflects) on how long the digesta stands in the short intestine of a herbivore compered to a carnivore. The short intestine is much longer in the sheep this is because plant base diets contain cellulose which very hard to digest, whereas meat base diets dont contain cellulose. This also explains why the caecum of the sheep is much larger than that of a carnivore because cellulose is broken down by the micro-organisms in the caecum and carnivores dont eat cellulose base diets. The stomach of the cat is larger compared to it's other organs this is because carnivores gulp chunks of meat rather than mechanically breaking it and also because protease enzymes are found in the stomach not the mouth. In comparasion the herbivores stomach is much smaller compared to it's other organs, however it is larger than the cat's as it has 4 chambers inside as it is a ruminant (regurgitate food).

ME

QUESTION THREE: DIGESTION AND TRANSPORT

ASSESSOR USE ONLY

Once chyme (a thick semifluid of partly digested material) leaves the stomach, it enters the first part of the small intestine (duodenum), where further digestion can occur.

(a) Explain how digestion occurs in the small intestine.

In your answer you should:

- complete the table below
- explain how digestion is carried out by named enzymes and other substances that are released into the small intestine, including the substrates used and the products formed.

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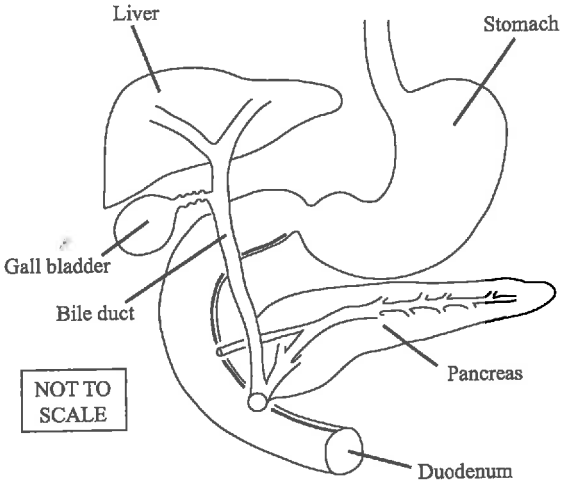

Adapted from: http://www.upmc.com/patients-visitors/education/gastro/Pages/ercp.aspx

Table of digestive enzymes and their substrates

Substrate	Enzyme	Product(s)
lipids	Lipase	fatty acids & Glycerol
Protein	Protease	Amino acids
Starch	Amylase	Glucose.

Once chyme enters the short ~~[illegible]~~ intestine pancreatic Juices and bile is added to the chyme this to neutralize the chyme as it came from the stomach. The bile salts emulsify the fat / lipids and it makes chemical digestion easier. The enzymes break down the larger particles into smaller particles. For example lipase enzymes are found in the intestine, and specifically breakdown lipids into fatty acids and Glycerol. The lipase enzyme

attatchs to a lipid particle, the lipid particle of substrate slots in the active site where the reaction occurs. The bonds that hold the lipid is no longer there, hence it is turned into fatty acids and Glycerol and then unravelled, so the lipase enzyme can break down more lipids.

ASSESSOR'S USE ONLY

Question Three continues on the following page.

(b) Discuss how the structures in the small intestine enable the nutrients to be effectively absorbed, then transported and assimilated into other cells around the body.

ASSESSOR'S USE ONLY

Adapted from: http://www.daviddarling.info/images/small_intestine_cross-section.jpg

In your answer you should:

- explain how the structures in the small intestine help increase absorption and transport of named substances to other cells within the body
- discuss how the final products of digestion are transported to other regions in the body, and what these products are used for in the cells.

Villi are found in the small intestine and help increase surface area and concentration gradient. Villi's help increase and maximise nutrient absorbtion. The villi have adapted structes which help make absorbtion more effective such as the cappilary bed. The Cappilary bed is 1 inch thick and it puts the lumen of the gut into close proximity to the blood. Once nutrients have been absorbed it is easy for them to diffuse into the blood steam as the cappilary bed is 1 inch thick. The lacteal

MS

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

Puts the lymph fluids into close proximity with the the lymphatic System making absorbtion easier. The final products of digestion help carry out Cellular respiration which occurs in the mitochondria of cells. One of the reactants of cellular respiration and product of digestion is Glucose. Amylase enzyme breaks down carbohydrates into Glucose. The Glucose is then absorbed into the blood stream via the Villi, and given to cells which need them. Oxygen is another reactant of cellular respiration. Oxygen is taken in the body via Gas exchange in the lungs. Oxygen is pumped and circulated around the body via Circulatory System. The equation for Cellular respiration is Glucose + Oxygen → Carbon dioxide + Water + ATP. excess by product such as CO_2 and water is taken out of the body. ATP is very crucial as it is used as energy for the cells and the body. ATP Gives energy to the cells which helps out carry life process such as moving, reproducing (MRS GREN).

High Merit exemplar for 90929 2015		Total score	18
Q	**Grade score**	**Annotation**	
1	E7	a. Definition incorrect b. Correctly identified that teeth do physical digestion = A Weak teeth answer with only really recalling what the teeth do c. Definition of chemical digestion correct = A Says what happens when enzymes are in wrong pH Says where salivary amylase is made and found and what it does and it's optimum pH is, linking to graph. Outlines what happens to salivary amylase when it moves into stomach = E (note it's abit weak on its discussion on pepsin)	
2	M6	Has idea that sheep have a larger caecum because it houses microbes that produce the enzyme cellulose which breaks down cellulose = M Has idea that sheep's small intestines are longer as cellulose is harder to digest therefore the food must spend more time in the small intestines = M	
	M5	a. Table correct Has idea of where bile is produced and what bile does = M Knows that pancreatic juices are added but only talks about what lipase does, need 2 enzymes explained to get a second M point b. Has correct idea about villi = A Talks about nutrients which isn't specific enough but does explain that glucose is needed for respiration in detail = M TWO M = M5	