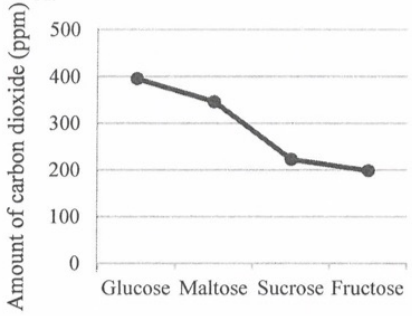
Directions: Questions 13 and 14 refer to the table below, which shows the effect of different substrates on the rate of anaerobic respiration of yeast:

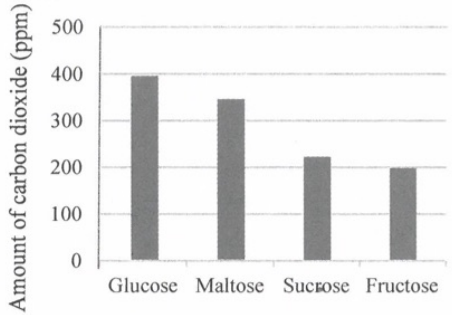
Substrate	Average amount of carbon dioxide produced after 10 min (ppm)
Glucose	395.2
Maltose	345.8
Sucrose	222.2
Fructose	198.2

13. Which of the following graphs is most suitable for presenting the data in the table?

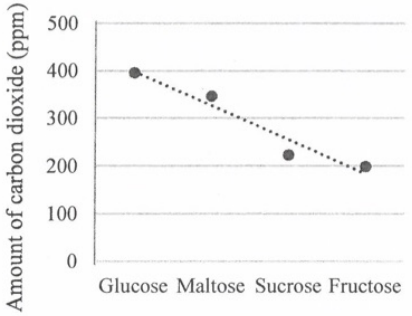
A.



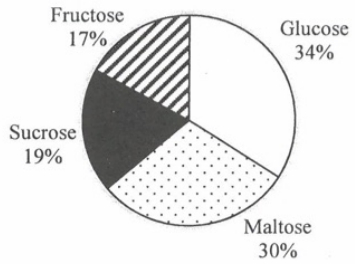
B.



C.



D.



You are required to present your answer to the following question in essay form. Criteria for marking will include relevant content, logical presentation and clarity of expression.

11. Recently, the use of the ketogenic diet for achieving weight loss is becoming popular. In fact, this high-fat, moderate-protein and very-low-carbohydrate diet has been used as an approach to control the blood glucose level in diabetics. However, the effectiveness of this diet in achieving weight loss is still controversial.

Describe how a ketogenic diet can be used to control the blood glucose level in diabetics. Evaluate the possibility of using this diet for weight loss and discuss the health concerns of adopting such a diet for healthy persons. (12 marks)

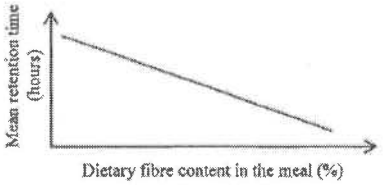
DSE M.C. Questions - Food and humans and Nutrition in humans
(sort by difficulty)

Challenging

2015 Q.9 (36%)
Which of the following combinations correctly describes the absorption of water in the alimentary canal?

	Occurs mostly in	*Major reason*
A.	ileum	it is the longest part of the digestive tract
B.	ileum	most digested food is absorbed in this region
C.	large intestine	its function is water absorption
D.	large intestine	absorption of food has completed in this region

2018 Q.25 (36%)
The graph bellow shows the relationship between the dietary fibre content of a meal and the mean retention time (i.e the duration for which the undigested material stay in the large intestine) in the human body:



Which of the following can be deduced from the graph?

A. Meals with more dietary fibre can increase the bulk of the faeces
B. Meals with more dietary fibre can hold more water, and so soften faeces better
C. Meals with less dietary fibre have more nutrients and a longer time is required for complete absorption
D. Meals with less dietary result in harder faeces due to an increased time for water absorption

Average

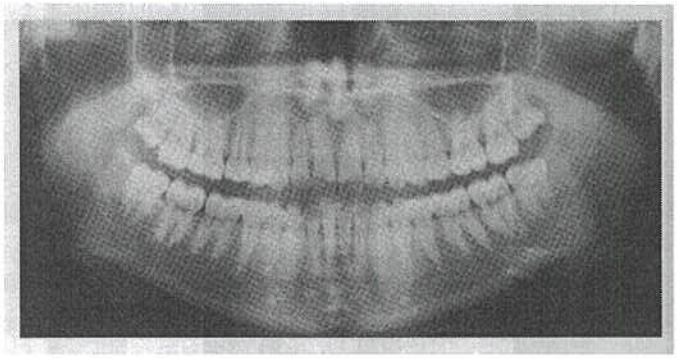
2012 Q.20 (64%)
Which of the following descriptions about the function of the liver is correct?

A. detects blood glucose level
B. breaks down red blood cells
C. secretes glucagon into the blood
D. secretes enzymes into the small intestine

2012 Q.34 (74%)
After consuming a boiled egg, chemical digestion begins in the

A. mouth. B. oesophagus C. stomach. D. small intestine.

2014 Q.24 (63%)
Which of the following dental formulae best represents the dentition shown in the photograph of the X-ray?

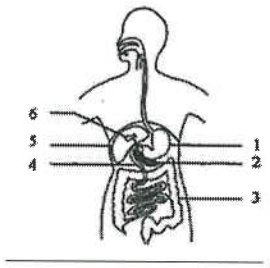


A. $\frac{2123}{2123}$ B. $\frac{2132}{2132}$

C. $\frac{3212}{3212}$ D. $\frac{2312}{2312}$

Average

Directions: Questions 25 and 26 refer to the diagram below, which shows the human digestive system:



2014 Q.25 (47%)

Physical digestion takes place at

A.1 and 3. B. 1 and 4. C.3 and 4. D.1, 3 and 4.

2014 Q.26 (62%)

Which of the following structures are responsible for producing digestive juices that help the digestion of fat?

A. 2 and 5 B. 2 and 6 C.5 and 6 D.2, 5 and 6

2015 Q.7 (47%)

Which of the following combinations correctly matches the gland, the enzyme secreted and the optimum pH of the enzyme?

	Gland	*Enzyme*	*Optimum pH*
A.	gastric gland	carbohydrase	2
B.	liver	lipase	8
C.	salivary gland	amylase	11
D.	pancreas	protease	11

2015 Q.10 (43%)

After absorption in the small intestine, most fat is first transported to the

A. large intestine. B. pancreas. C. heart. D. liver.

2016 Q.3 (43%)

In which of the following pairs of carbohydrates can Benedict's test be used to distinguish the two carbohydrates from one another?

(1) sucrose and starch
(2) sucrose and maltose
(3) glucose and maltose
(4) glucose and starch

A. (1) and (3) only B. (1) and (4) only C. (2) and (3) only D. (2) and (4) only

Average

Directions: Questions 5 and 6 refer to the diagram below, which shows the nutrition label of a food product:

Nutrition Information	Per serving
Energy	62 Kcal
Protein	3.1 g
Total fat	3.5 g
- Saturated fat	2.4 g
- Trans fat	0 g
Total carbohydrate	4.6 g
- Dietary fibre	0 g
- Sugars	4.6 g
Sodium	44 mg
Calcium	110 mg

2016 Q.5 (52%)

Which of the following food substances provides most of the energy content in this food product?

A. fat B.protein C. sodium D. carbohydrate

2016 Q.6 (68%)

The food product bearing this nutrition label is most likely to be

A. milk. B. bread. C. sausages. D. potato chips.

2018 Q.18 (63%)

Some people claim that we should chew food for a longer time before swallowing. Which of the following statements about this claim is ***incorrect***?

A. This stimulates the secretion of saliva
B. This moisten the food for easier swallowing
C. This provide enough time for digestion of starch into glucose
D. This increases the surface area of the food for chemical digestion

Average

2018 Q.23 (74%)

The following picture shows an X-ray photograph of the dentition of a person:

Which of the following dental formulae correctly describes the dentition in the above photograph?

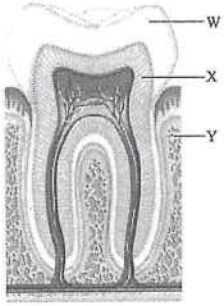
A. $\frac{2212}{2212}$

B. $\frac{2122}{2122}$

C. $\frac{2131}{2131}$

D. $\frac{2113}{2113}$

Directions: Questions 23 and 24 refer to the diagram below, which shows a section of one type of tooth and its associated structures:



2019 Q.23 (45%)

Which of the following are living tissues that contain a large amount of calcium salt?

A. W and X
B. W and Y
C. X and Y
D. W, X and Y

2019 Q.24 (41%)

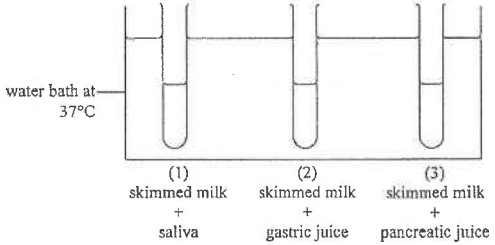
The number of this type of tooth in the milk dentition is

A. 0.
B. 4.
C. 8.
D. 12.

Average

2019 Q.25 (68%)

The diagram bellows shows a water bath with three test-tubes containing different mixtures:



Chemical digestion of food takes place in test-tubes

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

Easy

2015 Q.8 (76%)

After eating a hamburger, chemical digestion begins in the

A. mouth cavity.
B. oesophagus.
C. stomach.
D. small intestine.

2016 Q.7 (80%)

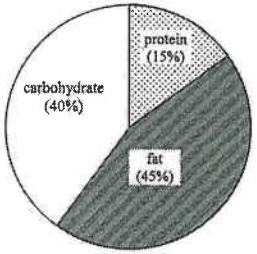
Which of the following organs produces digestive juice that does not contain enzymes?

A. liver B. mouth C. stomach D. pancreas

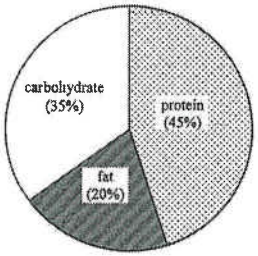
2019 Q.26 (80%)

The following charts show the composition of four different foodstuffs. Which foodstuff yields the highest amount of energy per gram?

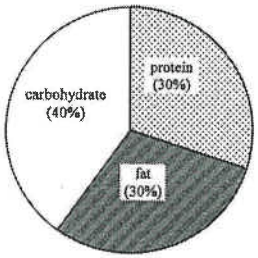
A.



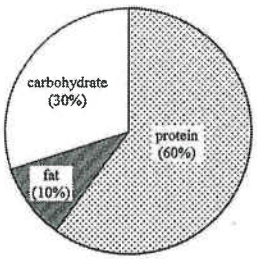
B.



C.



D.



2020 Q.10

10. Which of the following explain why a person cannot swallow food and talk at the same time?

(1) The epiglottis covers the opening of the trachea during swallowing.
(2) Swallowing is a reflex action while speaking is a voluntary action.
(3) Air must flow through the larynx to produce sounds.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

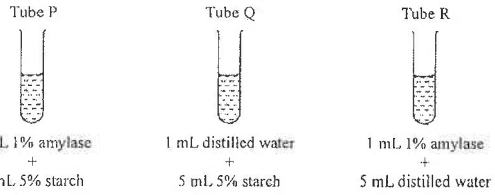
2020 Q.12

13. Both the villi of the small intestine and the air sacs of the lung are sites for material exchange. Which of the following is an adaptive feature common to the epithelium of both structures?

A. The epithelium is one cell thick.
B. There is a water film on the surface of the epithelium.
C. The epithelial cells contain a large number of mitochondria.
D. The epithelial cells have a modified cell membrane to increase surface area.

2021 Q.9,10

Directions: Questions 9 and 10 refer to the diagram below, which shows three set-ups used in the study of the activity of amylase:



9. We can conclude the action of amylase on starch by comparing the results of tubes

A. P and Q only.
B. P and R only.
C. Q and R only.
D. P, Q and R.

10. If the following tests are conducted on the reaction mixture of tube P, which test(s) will give the same result at the beginning of the experiment and after 10 minutes?

(1) iodine test
(2) albustix paper
(3) Benedict's test

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

2021 Q 7,19

7. Which of the following correctly describe the absorption of amino acids in the small intestine?

(1) Amino acids are absorbed into lacteals.
(2) The absorption is assisted by membrane proteins.
(3) Amino acids can move along or against a concentration gradient.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

19. Which of the following segments of the alimentary canal absorbs the largest amount of water?

A. the oesophagus
B. the stomach
C. the small intestine
D. the large intestine

Answers

Challenging

2015	2018
9 [B]	25 [A]

Average

2012	2014	2015	2016	2018	2019
20 [B]	24 [A]	7 [D]	3 [D]	18 [C]	23 [C]
34 [C]	25 [B]	10 [C]	5 [A]	23 [B]	24 [C]
	26 [A]		6 [A]		25 [C]

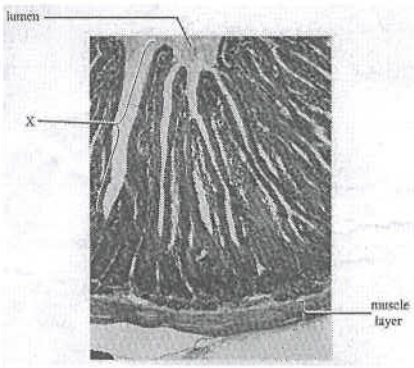
Easy

2015	2016	2019
8 [A]	7 [A]	26 [A]

2020
10[B]
12[D
]

CE - 2004

1. (a) The photomicrograph below shows a cross section of the small intestine of a mammal:



(i) With reference to two features of X observable from the photomicrograph, explain how these features facilitate the absorption of digested food substances. (4)

(ii) Use a flowchart to show how amino acids are transported to the heart after entering X. Indicate the major organs and blood vessels along the pathway. (2)

(iii) Describe how the muscle layer helps the movement and digestion of food inside the small intestine. (3)

CE - 2005

3. Read the passage below and answer the questions that follow:

> For many years, doctors believed that gastric ulcer (damage and bleeding of the stomach wall) was caused by excessive acid secretion in the stomach, so they used certain chemicals to treat ulcer patients. However, after recovery, many patients might develop gastric ulcer again. In the 1980s, an Australian doctor, Barry Marshall, observed that all his ulcer patients had a type of bacteria called *Helicobacter pylori* (幽門螺旋桿菌) in their stomach. He therefore put forward a new hypothesis about gastric ulcer. Based on this hypothesis, he treated his patients with antibiotics which are chemicals that kill bacteria. Many of his patients recovered rapidly and did not develop gastric ulcer again.

(a) If gastric ulcer is caused by excessive secretion of acid, what kind of chemicals should be used for treatment? (1)

(b) Many doctors were surprised at Marshall's observation because they thought that bacteria could not survive in the stomach. Why did they think so? (1)

(c) With reference to the treatment used by Marshall, what do you think is his hypothesis about gastric ulcer? (1)

(d) Suggest a method to test Marshall's hypothesis. What result would be obtained if his hypothesis is correct? (2)

(e) Explain the importance of the churning action of the stomach in the digestion of food.(3)

CE - 2005

6. Some vegetarians eat plant foods only.
   (a) From the nutritional point of view, explain two advantages of having a diet rich in plant foods over that with little plant foods. (4)
   (b) Most plant foods have a low protein content. Suggest a plant food that can provide a lot of protein to the vegetarians. (1)

CE - 2006

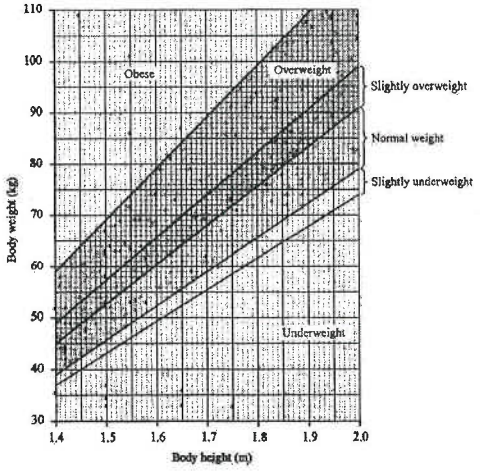
2. The table below shows the average amount of water entering the alimentary canal and the average amount being absorbed in the intestine of a person each day :

Water entering the alimentary canal		Water absorbed by the intestine	
Source	Volume (mL)	Site	Volume (mL)
Ingestion	2000	Small intestine	9000
Secretions along the alimentary canal	8000	Large intestine	850

   (a) Based on the above information, how much water is egested with the faeces each day?(1)
   (Note:Neglect the amount of water absorbed in the other parts of the alimentary canal.)
   (b) Give two examples of secretions that enter the alimentary canal. (2)
   (c) (i) Based on one structural difference between the small intestine and the large intestine, explain why a much larger volume of water is absorbed in the small intestine. (2)
   (ii) Explain how the absorption of digested food facilitates the absorption of water in the small intestine. (2)

CE - 2006

5. Body mass index (BMI) is a figure used to assess the body weight condition of a person. It is determined by two factors: weight and height of the person. The BMI chart below allows people to check their body weight conditions based on their weight and height:



   (a) (i) Mr. Wong weights 70 kg and his height is 1.7m. Using the descriptions given on the chart, state the body weight condition of Mr. Wong. (1)
   (ii) Mr. Wong's son is 1.55 m tall.
   What should be the ideal range of his body weight if he wants to be fit and healthy? (1)

   (b) According to the deposition of fat in the body, scientists classify body shape into two basic categories: apple shape and pear shape. To determine the category of body shape, the waist-to-hip ratio (WHR) can be used and it is represented by the following formula :

$$\text{WHR} = \frac{\text{waist circumference}}{\text{hip circumference}}$$

   The table below shows the categorization of the body shapes of men and women using the WHR :

	WHR	
	Men	Women
Apple shape	> 0.90	> 0.85
Pear shape	≤ 0.90	≤ 0.85

   (i) For most people, having extra fat around their waist increases health risk more than having extra fat around their hip. With reference to this information, which body shape has a higher health risk? (1)
   (ii) Mr. and Mrs. Wong have similar BMI, but their body shapes are different. Mr. Wong's waist and hip circumferences are 0.87 m and 0.97 m respectively, whereas Mrs. Wong's are 0.87 m and 0.95 m. Who has a higher health risk? Show how your arrive at your answer. (3)
   (c) Dieticians recommend that overweight people should have a diet with more vegetables. Suggest two reasons to explain why this diet may help these people to reduce the chance of becoming obese. (4)

CE - 2007

6. Read the paragraph below and answer the questions that follow.

> Gastric reflux describes a backflow of the gastric juice from the stomach into the oesophagus. This can irritate and sometimes damage the lining of the oesophagus, giving a feeling of heartburn. In Hong Kong, the rate of patient suffering from gastric reflux rose from 2.3 per 10 000 in 1996 to 6.2 per 10 000 in 2005. It is believed that the alarming rise is related to the lifestyles of people in Hong Kong. These include having midnight snack right before sleeping, excessive fatty foods, large meals, irregular mealtime, and drinking a lot of alcohol or coffee.

   (a) (i) With reference to the content of gastric juice, suggest a probable reason for its damage to the oesophagus. (1)
   (ii) Food entering the small intestine carries some gastric juice from the stomach. Explain why the gastric juice does not normally damage the small intestine. (3)
   (b) Suggest why the backflow of gastric juice is more likely to occur if a person has a meal just before sleeping. (3)
   (c) A patient suffering from severe gastric reflux will also likely to have tooth decay. Give an explanation for this. (2)

CE - 2007

9. (b) Glycemic Index(GI) is a ranking of foods containing carbohydrates. It is based on their immediate effect on the blood glucose level after consumption. The higher the GI value of a food, the quicker the rise of blood glucose level. Below are the major food constituents and the GI values of some common food items:

Food item	Major food constituents			GI value
	Carbohydrate	Fat	Protein	
Whole milk	✓	✓	✓	27
Fat-free milk	✓	×	✓	32
Cornflakes	✓	✓	✓	92
Oatmeal	✓	✓	✓	49

Key: '✓' means present
'×' means absent

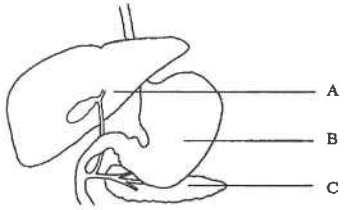
(i) With reference to the major constituents of whole milk and fat-free milk in the above table, suggest why whole milk has a lower GI value. (3)

(ii) For a diabetic person, which breakfast food item, cornflakes or oatmeal, is more suitablw? Explain your choice. (3)

(iii) Besides GI values, state and explain two other considerations regarding the nutritional content of food when you plan a healthy diet to reduce body weight. (4)

CE - 2008

1. The following diagram shows part of the human digestive system.



(a) Describe how structure A helps the digestion of food. (4)

(b) The table below lists some information about the components of the secretion from structures B and C. Complete the table. (5)

	Some components of the secretion	Function
B	Mucus	(i)
	Hydrochloric acid	(ii)
	Protease	(iii)
C	Amylase	Break down starch into maltose
	Lipase	(iv)
	(v)	Neutralize acid from gastric juice

CE - 2008

7. A person joined a fitness programme which involves both weight training and cardio-respiratory training for one month. The table below shows some data about his fitness status before and after the training.

	Before training	After training
Muscle mass (kg)	30.3	31.4
Mass of body fat (kg)	18.8	17.7
Mass of minerals in bone (kg)	3.15	3.29
Basal metabolic rate* (kcal per day)	1543	1580
Average heartbeat rate (beat per minute) when running at 6 km per hour for 5 minutes	143	135

* It is the minimum amount of energy needed to maintain basic body activities.

(a) With reference to the above data, suggest an explanation for the increased basal metabolic rate after the training programme. (2)

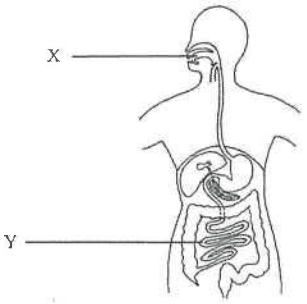
(b) How does the training result in the decrease in body fat of the person? (3)

(c) During this training, the diet should be changed accordingly. With reference to two changes in the fitness status shown above, state ***two*** nutrients that may require an increased intake. Explain how the increased intake of these nutrients contributed to the changes in the fitness status. (4)

(d) There is a change in the person's stroke volume (volume of blood pumped out of the heart in each heartbeat) when running at 6 km per hour before and after the training. Suggest the change in his stroke volume and explain the significance of such a change.(3)

CE - 2009

1. The diagram below shows the human digestive system.



(a) Describe the digestion processes that take place at part X. (2 marks)

(b) (i) Name structure Y. (1 mark)

(ii) With reference to ***one*** feature of structure Y observable in the above diagram, explain how this feature facilitates the absorption of digested food. (2 marks)

(c) Explain a role of the digestive system in body defence. (2 marks)

AL - 2004 2A

1. Vitamin A and vitamin D are fat-soluble while vitamin C is water-soluble. They are essential for normal growth and body functions.
   (a) Explain why an excessive intake of fat-soluble vitamins in general is undesirable whereas an excessive intake of water-soluble vitamins is not. (2)
   (b) Give ***one*** major function in the human body of vitamin A and vitamin C. (2)
   (c) By means of a flow chart, show the major vessels involved in the transport of vitamin D from the small intestine to the heart. (3)
   (d) Vitamin D undergoes the following enzymatic activation to form a highly active metabolite Y:

Vitamin D in blood $\xrightarrow{\text{enzyme 1}}$ X $\xrightarrow{\text{enzyme 2}}$ Y $\longrightarrow$ Increase in intestinal Calcium absorption

   i. Elderly people usually have problems in calcium absorption due to decreased concentration of X. Suggest ***two*** possible causes for this decrease of X. (2)
   iii. Explain how vitamin D deficiency might lead to skeletal problems in adults. (4)
   iv. Why is vitamin D deficiency more damaging to children than to adults? (3)

AL - 2008 1A

7. A man was diagnosed with a kind of pancreatic cancer which is characterized by overgrowth of endocrine pancreatic cells. He sometimes felt dizzy but became less so after drinking a solution of glucose.
   (a) Based on the above observation, suggest why this pancreatic cancer would cause dizziness in the man. (4)
   (b) After having an operation to remove a large part of the pancreas, the man was advised to take a low protein and low fat diet. Explain the biological reasons behind this advice. (2)

DSE-2012 1B

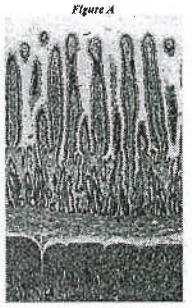
10. In mammals, the production of bile salts is very limited at birth and during early developmental stages. In an investigation of the effect of bile supplementation on fat digestion in piglets, four groups of piglets were fed with the same diet except that bile was added to diets in the proportion of 0, 0.15%, 0.30% and 0.45% respectively for 15 days. Faecal samples were collected each day for analysis and the body weights of the piglets were monitored. The results are shown in the table below:

	Bile level in diet (%)			
	0	**0.15**	**0.30**	**0.45**
Average initial body weight (kg)	4.90	4.46	4.65	4.52
Average final body weight (kg)	7.15	7.36	7.81	7.92
Average dry weight of fat in the faeces (%)	6.52	5.81	4.65	3.78

   (a) How do bile salts help with fat digestion? (2 marks)
   (b) What was the effect of bile supplementation on fat digestion in the above investigation? Explain your answer. (2 marks)
   (c) Suggest why it is important to monitor the body weight of the piglets in this investigation. (1 mark)
   (d) Suggest an in vitro experimental method that allows a direct measurement of the digestion of fat in a laboratory. (3 marks)

HKDSE - 2013 1B

3. Figure A shows a section of part of the human alimentary canal. Figure B shows another section of the same part with blood vessels stained.



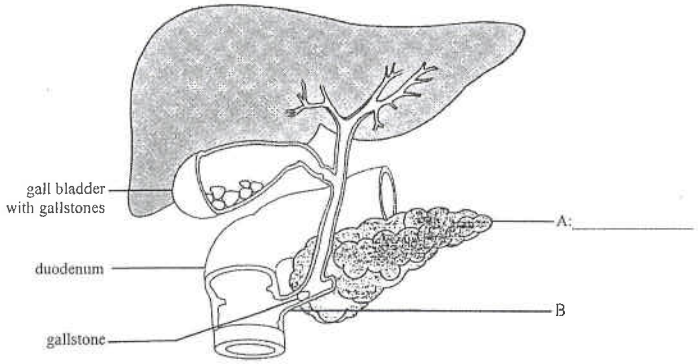
   (a) Which part of the alimentary canal is shown in the figures? Support your answer with evidence. (2 marks)
   (b) For each of the above figures, describe one observable feature and explain how it is related to the functioning of this part of the alimentary canal. (5 marks)

HKDSE - 2014 1B

11. Recently, some people have adopted a diet rich in lean meat in order to lose weight and build muscle. They may be able to achieve these aims but there are some health problems associated with this diet. Discuss the pros and cons of the controversial diet with regard to the nutritional needs of our body and protein metabolism. (12 marks)

HKDSE - 2021 1B

1. The diagram below shows the presence of gallstones in some parts of the human digestive system:



(a) Label structure A. (1 mark)

(b) With reference to *two* components of the secretion released from duct B, explain how the condition shown in the above diagram would lead to a decrease in the rate of fat digestion. (4 marks)

Past Papers Marking Scheme – Nutrition in humans

CE - 2004 Q.1 (a)

(i) X s a finger-like projection of the intestinal wall 1+
This feature provides a large surface area-for food absorption 1
The epithelium of X is very thin / one-cell thick 1 +
This shortens the distance of diffusion / transport of digested food substances 1

(ii) X → hepatic portal vein → liver→ hepatic vein →vena cava→ (heart) 4 x ½
(No arrow sign, deduct 1 mark)

(iii) The peristaltic contraction of the muscle layer 1
pushes food along the small intestine 1
This also helps to mix food with digestive enzymes 1

CE - 2005 Q.3

(a) alkaline substance / substance that inhibits acid secretion / substance that protects the stomach wall 1

(b) Because usually bacteria are killed by the acid secreted by the stomach 1

(c) *Helicobactor pylori* is the cause of ulcer 1

(d) Introduce *Helicobactor pylori* into the stomach of healthy mammals 1
If the hypothesis is correct, these animals would develop gastric ulcer symptoms 1

(e) The churning action of the stomach will break down food into smaller pieces 1
This helps to increase the surface area of food for the action of enzymes 1
It also helps to mix the food with the digestive enzymes 1

CE - 2005 Q.6

(a) A vegetarian diet has low fat content 1
This will reduce the risk of obesity / heart diseases 1

A vegetarian diet has a high content of dietary fibre 1
This helps maintain normal peristalsis / prevent constipation / reduce the risk of colon cancer / avoid overeating 1

A vegetarian diet has a high vitamin C content 1
This helps the formation of connective tissue/preventing scurvy 1
any two sets

(b) beans / peas / nuts / mushroom (accept other reasonable answers) 1

CE - 2006 Q.2

(a) 150 mL 1
(b) saliva/mucus, gastric juice, pancreatic juice, bile, intestinal juice (any two) 1,1
(c) (i) The small intestine is longer than the large intestine 1+
so the time for water absorption is longer / surface are for water absorption is larger 1
or The inner wall of the small intestine is highly folded / has a large number of villi 1+
Thus the surface area for water absorption is larger 1
(ii) The absorption of digested food into blood increases the water potential of

the gut content 1
As a result, water is drawn into the blood by osmosis 1

CE - 2006 Q.5

(a) (i) slightly overweight 1
(ii) 49.0-56.5 kg 1
(b) (i) apple shape 1
(ii) WHR of Mr Wong = 0.90, thus he is of pear shape 1
WHR of Mrs Wong = 0.92, thus she is of apple shape 1
Mrs Wong has a higher health risk 1
(c) This diet has high content of dietary fibre 1
which is indigestible / add bulk to the food to give the sense of fullness 1
It also has low fat content 1
and hence the overall energy intake through this diet will be lowered 1
reducing the change of obesity

CE - 2007 Q.6

(a) (i) Gastric juice is acidic / contains hydrochloric acid 1
(ii) Pancreatic juice / bile / intestinal juice in the small intestine 1
are alkaline 1
which neutralizes the gastric juice 1

(b) After meal, the release of gastric juice increases 1
and the pressure inside the stomach increases 1
Also, the stomach and oesophagus are at the same level while sleeping 1
These increase the chance of gastric reflux
(c) The acid in the gastric content dissolves 1
the enamel / calcium salts of the tooth 1

CE - 2007 Q.9 (b)

(i) Whole milk has more fat than fat-free milk 1
Presence of fat slow down the digestion of carbohydrates 1
and hence a slower absorption of glucose 1
(ii) Diabetics cannot lower their blood glucose level if it is too high 1
Oatmeal has a low GI value / causes a slow rise in blood glucose level 1
Therefore, oatmeal is better than cornflake 1
(iii) The overall energy intake should be less than the overall energy expenditure 1
so that the food reserve will be mobilized and used 1
The diet should contain sufficient amount and types of nutrient 1
for proper functioning of the body 1

CE - 2008 Q.1

(a) Structure A produces bile / bile salt 1
which is released into the duodenum 1
to emulsify fat and increase the surface area 1
this facilitates the action of enzyme on fat 1

(b) (i) Protect inner surface of the stomach from self-digestion / the action of enzyme or acid (gastric juice) 1
(ii) Provide optimum / suitable pH for enzyme activity / to kill bacteria 1
(release calcium salt from bones; hydrolyze larger molecule into smaller molecules)
(iii) Break down proteins into peptides / polypeptides / amino acids 1
(iv) Break down fat into glycerol and fatty acid 1
(accept monoglycerides as alternative to glycerol)
(v) Sodium hydrogencarbonate / hydrogencarbonate salts / hydrogencarbonates 1

CE - 2008 Q.7

(a) There is greater muscle mass after the training 1
Muscles are active cells that require more energy / respiration rate of muscle cells is higher 1
(b) There is an increase in the daily energy expenditure due to increased basal metabolic rate / energy expenditure also increases during training 1
Thus the energy expenditure is greater than the energy intake 1
our body has to utilize the stored fat to meet the energy demand 1
(c) The intake of protein should be increased ..... 1 +
as it is the major raw material for building muscles 1
The intake of calcium / phosphorous should be increased 1
as it is the major raw material for building bones 1
(d) The stroke volume increases after the training 1
This increases the amount of oxygen and carbon dioxide transported per heartbeat / a lower heartbeat rate can supply sufficient oxygen to muscles 1
A lower heartbeat rate is sufficient to sustain the same intensity of exercise / Exercise of higher intensity can be performed by the person 1

CE - 2009 Q.1

(a) Mastication breaks food down into smaller pieces 1
Amylase in saliva helps the breakdown of starch into maltose 1
(b) (i) small intestine 1
(ii) Structure Y is long 1+
to provide a large surface area / increase surface area for absorption of food 1
(c) Presence of hydrochloric acid in the stomach
kills most of the ingested bacteria

pH in different parts of the digestion system varies extremely } any one 1+
most bacteria cannot survive in such a great change of pH } 1

Presence of digestive enzymes
Enzymes digest most of the ingested bacteria

AL - 2004 2A

1. (a) • fat-soluble vitamins are not readily excreted in urine, but excessive water-soluble vitamins can be excreted in urine (1) — 2
   • fat-soluble vitamins accumulate in the body to reach toxic levels (1) / cause harm to the body

   (b) • vitamin A – retinal pigment / visual pigment / rhodopsin formation (1) (also accept pigment in rods, responsible for dim light vision) OR control normal epithelial structure and growth — 1
   • vitamin C (any one function):
   > proper metabolism / formation of connective tissue (1) /
   > healing of wound (1)
   (N.B. do not accept deficiency disease as answer)

   (c) small intestine → [(1) lymphatic vessels / lacteal] → [(1) thoracic duct] → [(1) (left) subclavian vein] → [(1) (anterior) vena cava] → heart — max. 3

   [If wrong concept included from vena cava → heart: max. 2 marks only.]

   (d) (i) Any two: — max. 2
   • indoor life, lack of sunlight for vitamin D synthesis (1)
   • lack of vitamin D in food (1)
   • poor vitamin D absorption (1)
   • lower enzyme 1 activity (1) / absence of or not enough enzyme 1 production (any other acceptable answer)

   (iii) • deficient vitamin D → decreased dietary Ca^{++} absorption (1) — 4
   • Ca^{++} level in blood decreased (1) / lower than normal
   • **Ca^{++} drawn from bone to maintain homeostasis (1)**
   • reduce bone mass (1) / bone weakens / bones easily break

   (iv) • children need more calcium than adults (1) as children continue to grow whereas adults stop growth / less growth (1) — 3
   • insufficient vitamin D → poor bone formation (1) / bone deformity / rickets / soft bone / poor teeth development

AL - 2008 1A

7. (a) • due to uncontrolled growth of insulin-secreting cells (1), this pancreatic cancer probably leads to an excessive secretion of insulin (1) — max. 3
   • as insulin stimulates the conversion of blood glucose by the liver (1)
   • / uptake of blood glucose by cells, excessive insulin secretion would reduce the blood glucose to a low level (1)
   • As a result of insufficient blood glucose supply to the brain(1), the man would feel dizzy — 1

   (b) • some tissues of the pancreas secrete protease and lipase (1) — (2)
   • they may be removed together with the cancerous tissues(1), and this would make the digestion of protein and fat difficult

DSE-2012 1B

10. (a) • bile salts emulsify fat into droplets (1) — (1)
    • such that there is an increase in surface area for the action of the lipase / enzyme (1) — (1)

    (b) • as the bile supplementation increased, the fat content of the faeces decreased (1) — (1)
    • this indicates increased digestion of fat (1) — (1)
    Remarks: If absorption instead of digestion is mentioned, no mark will be given

    (c) • to show that the addition of bile supplementation does not adversely affect **the growth of the pigs (1) / indicate the** effectiveness of the bile supplementation on promoting piglets' growth / effectiveness of fat absorption — (1)

    (d) Concept for mark award:
    • 1st pt: suitable substrate and correct enzyme used in the experiment
    • 2nd pt: the identification of parameter for meausring the dependent variable
    • 3rd pt: provide expected results

    e.g. • prepare a mixture of lipase, (bile salts) and oil (1) — (1)
    • add pH indicator into the mixture / use a data logger with pH sensor/ pH meter to show the change in pH of the mxiture (1) — (1)
    • the faster the drop in the pH of the mixture, the faster the digestion of fat (1) — (1)
    Accept other reasonable experiments

DSE-2013 1B

3. (a) • it is taken from the small intestine / ileum (1) (accept duodenum) — (1)
   • as evidenced by the presence of villi (1) in the region — (1)

   (b) Figure A: finger-like projections (villi) (1) provide a larger surface area for the absorption of digested food substances (1) — (2)
   Figure B: rich supply of blood / dense capillary network (1) helps transport away the absorbed food substances quickly (1), this maintains a steep concentration gradient of these food substances to (1) facilitate the absorption — (3)

DSE-20141B

11. Lose weight and build muscle (max. 4 marks) (A)
   • lean meat does not contain much fat and carbohydrates, this reduces the energy intake (1)
   • **when the** energy intake is lower than the energy expenditure (1), our body will utilise food **reserve, body fat in this case, to support** our daily activities (1)
   • protein will be digested to form amino acids (1)
   • amino acids will be assimilated to form muscle fibres (1) according to the needs of the body

   Health problems associated with the unbalanced diet (max. 2 marks) (D)
   • **such diet may lack other essential nutrients which are also important** for our health (1) such as certain mineals and vitamins:
   • insufficient intake of minerals **and vitamins le**ads to deficiency diseases (1) (may cite specific examples)

   Health problems associated with protein metabolism (max. 3 marks) (P)
   • excess amino acids will be deaminated in the liver forming urea (1)
   • and the urea will be excreted through the kidney (1)
   • this creates heavy workload to both the liver and the kidney (1) and may lead to failure of their functioning (1)

   C=max. 3