



K2E Nutrition and Digestion: Depth and Practice

AQA AQA KS3 Biology · Calculator allowed · about 75 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Name the nutrient group that is the main source of energy for the body.

(1)

- 2** State two functions of protein in the human body.

(2)

- 3** A student looks at two biscuits. Biscuit A lists sugar and refined flour first. Biscuit B lists oats and wholemeal flour first. Using this information, suggest which biscuit is better for a slow release of energy and explain why.

(3)

- 4** Complete the table by matching each organ to its main role in digestion.
Organs: Mouth, Stomach, Small intestine, Large intestine.
Roles: absorbs water, breaks down protein with acid, starts digestion by chewing and enzymes in saliva, absorbs nutrients into the blood.

(4)

5 What is the name of the tiny finger-like structures that increase the surface area for absorption in the small intestine?

(2)

6 A teacher asks a class to test for starch in two samples: mashed banana and apple juice. Describe a fair test method for testing each sample for starch using iodine solution. Include how to prepare the samples, what to observe, and one control or precaution to make the test fair.

(3)

7 State one example of a simple sugar found in food.

(1)

8 A student wants to investigate which of three cereal brands has the most fibre. Give a simple experimental method using the Nutrition label data (fibre per 100 g) and state one variable that must be controlled and one suitable way to present the results.

(3)

9 Which organ produces bile and which organ stores it? Give both organ names.

(2)

- 10** A packet of crisps contains 450 kilojoules of energy per 50 g serving. Calculate how many kilojoules are in 120 g of crisps. Show your working.

(5)

- 11** The test for fats uses ethanol then water to make a cloudy emulsion. State the colour change or observation that shows fat is present.

(1)

- 12** Explain why fibre in the diet is important even though it is not digested and does not provide nutrients.

(3)

- 13** A food label shows 12 g of protein per 100 g. How much protein is in a 75 g portion? Show working and give the answer in grams.

(2)

- 14** State the name of the process where food in the mouth is broken down into smaller pieces by the teeth.

(1)

- 15** A student measures how long it takes two different snacks to be digested by placing them in artificial stomach fluid and recording the time until they become liquid. Suggest two improvements to make this investigation more like human digestion and explain why each improvement helps.

(5)

- 16** Extended 6-mark question: A school wants to design a short healthy eating leaflet aimed at pupils aged 12 to 14. Describe the key points the leaflet should include about a balanced diet and digestion, how to present the information so pupils will read and understand it, and one simple practical suggestion pupils could try to improve their digestion. You will be assessed on the quality of your written communication.

(6)

- 17** A teenager needs about 2200 kcal per day. If their lunch provides 820 kcal and their breakfast provides 420 kcal, calculate how many kilocalories they have left for the rest of the day. Show your working and explain whether a snack of 250 kcal would be sensible.

(6)

18 Describe how enzymes help digestion and give one example of an enzyme and the nutrient it breaks down.

(6)

19 Design a simple table for recording the results of a class test for sugar in five fruit juices using Benedicts reagent. The table should include space for recording the juice name, initial colour with reagent, final colour after heating and a conclusion about presence of reducing sugar. Give an example row for orange juice that changes from blue to green indicating a small amount of reducing sugar.

(4)

Mark scheme · K2E Nutrition and Digestion: Depth and Practice

Question 1

- **B1** carbohydrates cao
- Answer: **Carbohydrates**

Question 2

- **B1** one correct function such as growth or repair of tissues
- **B1** one other correct function such as making enzymes or muscles
- Answer: **Growth and repair of tissues; making enzymes or forming muscles**

Question 3

- **M1** identify Biscuit B (oats and wholemeal first) as better for slow release
- **A1** reason: whole grains and oats have more fibre so they release energy more slowly
- **A1** additional reason: refined sugar/flour cause quicker spike in blood sugar, so Biscuit A gives quicker release
- Answer: **Biscuit B; oats and wholemeal contain more fibre which slows digestion and gives a slower release of energy, whereas sugar and refined flour give a quick spike.**

Question 4

- **B1** Mouth - starts digestion by chewing and enzymes in saliva
- **B1** Stomach - breaks down protein with acid
- **B1** Small intestine - absorbs nutrients into the blood
- **B1** Large intestine - absorbs water
- Answer: **Mouth: starts digestion by chewing and enzymes in saliva; Stomach: breaks down protein with acid; Small intestine: absorbs nutrients into the blood; Large intestine: absorbs water**

Question 5

- **B1** villi cao
- **B1** accept villus for single, or mention increased surface area
- Answer: **Villi**

Question 6

- **M1** method: place a small amount of each sample in separate clean wells or on spotting tiles
- **M1** add a few drops of iodine solution to each sample and observe colour change
- **A1** observation and control: starch present = blue-black, no starch = orange/brown; precaution: use same volume of each sample and same number of iodine drops (fair test)
- Answer: **Put equal amounts of mashed banana and apple juice in separate clean wells, add the same number of drops of iodine to each and observe colour change; blue-black shows starch, orange-brown shows no starch; use same volumes and clean apparatus to keep test fair.**

Question 7

- **B1** glucose or fructose or sucrose cao
- Answer: **Glucose**

Question 8

- **M1** method: record fibre per 100 g from the labels for each cereal brand
- **M1** control variable: control mass used or use per 100 g values (eg always compare per 100 g)
- **A1** present results in a bar chart or table to compare fibre values
- Answer: **Record fibre per 100 g from each cereal label, compare the per 100 g values (control mass by using per 100 g) and present results in a bar chart or table.**

Question 9

- **B1** liver produces bile
- **B1** gall bladder stores bile
- Answer: **Liver produces bile; gall bladder stores bile**

Question 10

- **M1** method: calculate energy per g then multiply by 120 ($450 / 50 \times 120$)
- **M1** intermediate numerical step correct ($450 / 50 = 9$ kJ per g)
- **A1** $9 \times 120 = 1080$ kJ cao
- **A1** correct unit kJ
- **B1** final answer clearly stated as 1080 kJ
- Answer: **1080 kJ**

Question 11

- **B1** cloudy or milky emulsion appears (white cloudy layer) cao
- Answer: **A cloudy or milky emulsion appears**

Question 12

- **M1** state that fibre adds bulk to the gut contents
- **M1** describe effect: helps food move through the gut and prevents constipation
- **A1** link to health: reduces risk of bowel problems and can aid healthy digestion or slow absorption of sugars
- Answer: **Fibre adds bulk to gut contents, helping food move through the intestine and preventing constipation; this supports healthy digestion and can reduce bowel problems and slow sugar absorption.**

Question 13

- **M1** correct method: $12 / 100 \times 75$ or 12×0.75
- **A1** 9 g cao
- Answer: **9 g**

Question 14

- **B1** mechanical digestion or mastication cao
- Answer: **Mechanical digestion (mastication)**

Question 15

- **M1** improvement: include chewing or mechanical stirring to simulate mouth and gut movement
- **M1** explain: mechanical action increases surface area and mixes food with enzymes so digestion is more realistic
- **M1** improvement: use a sequence of fluids with different pH and enzymes (saliva, stomach acid with pepsin, small intestine enzymes)
- **A1** explain: different pH and enzymes in body act at different stages so using them reproduces chemical digestion stages
- **B1** extra precision: control temperature at 37 degrees C and state why (keeps enzyme activity similar to human body)
- Answer: **Include chewing or mechanical stirring to simulate mouth and gut movement so food is mixed and surface area increases; use a sequence of fluids with correct pH and enzymes (saliva, stomach acid with pepsin, intestinal enzymes) to model chemical stages; control temperature at 37 degrees C to keep enzyme activity similar to the body.**

Question 16

- **Level 3** (5-6): Answers select and organise a range of relevant points about balanced diet, digestion and presentation; explanations are clear and linked; practical suggestion is specific and practical; writing is coherent with few errors.
- **Level 2** (3-4): Answers include some relevant points about diet and digestion with basic explanation; presentation suggestions are reasonable; practical suggestion present but not fully developed; writing mostly clear.
- **Level 1** (1-2): Answers include a limited number of basic facts about diet or digestion; little or no explanation; practical suggestion missing or vague; writing may be disorganised.
- **Indicative content:**
 - Choose a balanced diet: explain portions of carbohydrates, protein, fats, fibre, fruits and vegetables, and water; emphasise variety and portion control.
 - Explain digestion briefly: mouth starts mechanical and chemical digestion, stomach breaks down protein, small intestine absorbs nutrients, large intestine absorbs water.
 - Give health links: fibre prevents constipation, water helps digestion, too much sugar/fat linked to poor health and energy crashes.
 - Presentation tips: use short bullet points, clear headings, colourful images, icons for food groups, simple examples of meals, and avoid long paragraphs.
 - Practical suggestion: try adding one extra portion of vegetables each day, swap a sugary snack for fruit, chew food slowly or drink water with meals.
 - Communication: use clear language suitable for 12 to 14 year olds, include a short takeaway message and a simple action to try this week.

Question 17

- **M1** method: $2200 - (820 + 420)$
- **M1** intermediate calculation: $820 + 420 = 1240$
- **A1** $2200 - 1240 = 960$ kcal remaining
- **M1** evaluation: compare 250 kcal to remaining 960 kcal
- **A1** conclude: 250 kcal is sensible as it leaves 710 kcal for other meals, or state it could be too high if meals planned are large
- **B1** explain nutritional advice: sensible if snack is healthy and balanced; not sensible if it is high sugar and causes exceeding energy needs
- **Answer: 960 kcal remaining; a 250 kcal snack is sensible because it leaves 710 kcal for other meals, provided the snack is a healthy choice rather than high sugar.**

Question 18

- **M1** state that enzymes are biological catalysts that speed up chemical reactions in digestion
- **M1** explain that enzymes work by breaking large molecules into smaller ones which can be absorbed
- **M1** give one example: amylase breaks down starch into sugars
- **M1** or another example: protease breaks down proteins into amino acids or lipase breaks fats into fatty acids and glycerol
- **A1** link to where the enzyme acts eg amylase in saliva and small intestine, protease in stomach and small intestine
- **A1** state effect of temperature or pH on enzyme activity in brief (eg extremes denature enzymes)
- **Answer: Enzymes are biological catalysts that speed up digestion by breaking large molecules into smaller ones that can be absorbed; for example, amylase breaks starch into sugars and acts in saliva and the small intestine. Enzyme activity is affected by temperature and pH and extremes can denature enzymes.**

Question 19

- **M1** table includes column for juice name
- **M1** table includes column for initial colour with reagent and column for final colour after heating
- **M1** table includes column for conclusion about reducing sugar presence
- **A1** example row: Orange juice | blue | green | small amount of reducing sugar
- **Answer: Example table row: Orange juice | initial colour with Benedicts: blue | final colour after heating: green | conclusion: small amount of reducing sugar**