1.2 Nutrition and Digestion: 1-hour Pack

Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A 100 g slice of bread contains 50 g carbohydrate and 5 g fat. Calculate how many grams of the slice are neither carbohydrate nor fat. State your working.

(a) Calculate grams not carbohydrate or fat. **(2)**

.....

2 Describe what is meant by a balanced diet and give two examples of foods that would help make a diet balanced. One example must supply protein and the other must supply fibre.

(a) Describe a balanced diet. **(1)**

(b) Give one food that supplies protein. **(1)**

(c) Give one food that supplies fibre. **(1)**

3 Name the nutrient group that is the main source of energy for the body.

(1)

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

(1)

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5 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. Finally, state the temperature the mixture should be kept at and explain why.

(5)

6 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)

7 Describe how enzymes help digestion. Give two examples of digestive enzymes and the nutrient each one breaks down, say where in the body one of them works, and state how temperature or pH affects enzyme activity.

(6)

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8 Design a simple table for recording the results of a class test for sugar in five fruit juices using Benedict's 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)

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9 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)

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10 Complete the table by matching each organ to its main role in digestion.
Roles: absorbs water, breaks down protein with acid, starts digestion by chewing and enzymes in saliva, absorbs nutrients into the blood.

Organ	Main role in digestion
Mouth	?
Stomach	?
Small intestine	?
Large intestine	?

(4)

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11 A student wants to investigate which of three cereal brands has the most fibre. Give a simple experimental method using the fibre per 100 g shown on each cereal's nutrition label, and state one variable that must be controlled and one suitable way to present the results.

(3)

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

(2)

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13 Which nutrient is the body's main, quickly-used source of energy?

- ☐ A) Protein
- ☐ B) Carbohydrate
- ☐ C) Vitamin
- ☐ D) Mineral

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14 Enzymes are described as being specific to one substrate. Using the lock and key model, explain what this means.

(3)

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15 Bile is produced by the liver and stored in the gall bladder before being released into the small intestine. Explain why bile is important in digestion, even though it is not an enzyme.

(3)

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16 The table shows the rate of reaction of amylase breaking down starch at different temperatures.

Temperature (°C)	**Rate (arbitrary units)**
10	2
20	5
30	9
40	14
50	4
60	0

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10	2
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(a) State the optimum temperature for this enzyme, as shown by the data. **(1)**

(b) Explain, in terms of the enzyme's structure, why the rate of reaction decreases sharply above the optimum temperature. **(3)**

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Mark scheme · 1.2 Nutrition and Digestion: 1-hour Pack

Question 1

(a) calculate 100 - (50 + 5) or equivalent **M1**

(a) 45 g cao **A1**

(a) Answer: **45 g**

Question 2

(a) contains the right types and amounts of nutrients for health (e.g. carbohydrates, proteins, fats, vitamins, minerals, fibre, water) oe **B1**

(a) Answer: **A diet with the right types and amounts of different nutrients needed for health, including carbohydrates, proteins, fats, vitamins, minerals, fibre and water.**

(b) one correct example supplying protein (e.g. chicken, beans, eggs) oe **B1**

(b) Answer: **Chicken**

(c) one correct example supplying fibre (e.g. wholemeal bread, oats, vegetables) oe **B1**

(c) Answer: **Wholemeal bread**

Question 3

carbohydrates cao **B1**

Answer: **Carbohydrates**

Question 4

mechanical digestion (accept physical digestion), chewing or mastication cao **B1**

Answer: **Mechanical digestion (also called chewing or mastication)**

Question 5

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) **M1**

explain: different pH and enzymes in body act at different stages so using them reproduces chemical digestion stages **A1**

temperature: 37°C (body temperature) and a reason (keeps enzyme activity similar to the human body) **B1**

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°C to keep enzyme activity similar to the body.**

Question 6

Level 3 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. **5-6**

Level 2 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. **3-4**

Level 1 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. **1-2**

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 7

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**

first example of an enzyme and the nutrient it breaks down, eg amylase breaks down starch into sugars **M1**

second, different example, eg protease breaks down proteins into amino acids or lipase breaks fats into fatty acids and glycerol **M1**

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) **A1**

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, and protease breaks protein into amino acids. Enzyme activity is affected by temperature and pH and extremes can denature enzymes.**

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Question 8

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	M1
example row: Orange juice | blue | green | small amount of reducing sugar	A1

Answer: **Example table row: Orange juice | initial colour with Benedict's: blue | final colour after heating: green | conclusion: small amount of reducing sugar**

Question 9

identify Biscuit B (oats and wholemeal first) as better for slow release	M1
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	A1

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 10

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	B1

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 11

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)	M1
present results in a bar chart or table to compare fibre values	A1

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 12

liver produces bile	B1
gall bladder stores bile	B1

Answer: **Liver produces bile; gall bladder stores bile**

Question 13

Correct answer selected: B (Carbohydrate)	B1

Answer: **B - Carbohydrate**

Question 14

an enzyme has an active site with a specific shape	B1
only a substrate with a complementary (matching) shape can bind to the active site, like a key fitting a lock	B1
this forms an enzyme-substrate complex, allowing the reaction to take place; a substrate with a different shape will not fit or react	B1

Answer: **The enzyme's active site has a specific shape that only fits a substrate with a matching (complementary) shape, like a key fitting a lock, so each enzyme only works on one type of substrate.**

Question 15

bile emulsifies fats, breaking large fat droplets into many smaller droplets	B1
this increases the surface area of the fat exposed to lipase	B1
bile is alkaline and neutralises stomach acid, giving the correct (alkaline) pH for intestinal enzymes to work	B1

Answer: **Bile emulsifies fat into smaller droplets, increasing the surface area for lipase to act on, and it neutralises stomach acid so intestinal enzymes work at their optimum (alkaline) pH.**

Question 16

(a) 40°C (cao)	B1
(b) above the optimum temperature the enzyme (protein) structure, including the active site, changes shape (denatures)	B1
(b) the substrate (starch) can no longer fit/bind to the active site	B1
(b) so enzyme-substrate complexes cannot form and the rate of reaction decreases, eventually to zero	B1

(a) Answer: **40°C**

(b) Answer: **Above the optimum temperature, the enzyme denatures (its active site changes shape), so the substrate no longer fits and the reaction rate falls, eventually to zero.**

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