Food tests

Answers, marking points and revision notes | AQA Combined Science 8464 and AQA GCSE Biology 8461

GCSE science required practicals

This practical online

Answers

1 a. Name the independent variable in Sofia's investigation.

b. Sofia added 10 drops of Benedict's solution to 2 cm^3 of each food solution. Explain why she used the same volumes each time. (3 marks)

a. The type of food being tested.

b. Changing the volume of food solution or reagent could change the colour seen. Keeping them the same means differences in colour are only due to how much sugar each food contains, so the foods can be compared fairly.

Marking points

- (a) the type of food
- (b) different volumes could change the colour / intensity
- (b) so colour differences show only differences in sugar content (fair comparison)

2 Describe how to test a food solution for reducing sugar. Include the colour of a positive result. (3 marks)

Put 2 cm^3 of the food solution in a test tube and add about 10 drops of Benedict's solution. Stand the tube in a water bath at about 80 °C for a few minutes. If a reducing sugar is present the blue colour changes to green, yellow, orange or brick red.

Marking points

- add Benedict's solution to the food solution
- heat in a (hot) water bath for a few minutes
- positive: blue changes to green / yellow / orange / brick red

3 Give the reagent used to test for protein and the colour change for a positive result. (2 marks)

Biuret reagent. It changes from blue to purple.

Marking points

- biuret reagent (or copper sulfate and sodium hydroxide)
- blue to purple / lilac

4 Sofia's teacher told her not to use a Bunsen burner to heat the Benedict's test while anyone was doing the lipid test. Explain why, and give the safer choice. (2 marks)

The lipid test uses ethanol, which is highly flammable and could catch fire near a flame. An electric water bath should be used to heat the Benedict's tests instead.

Marking points

- ethanol is (highly) flammable so could catch fire
- use an electric water bath / keep ethanol away from flames

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

5 Sofia also tested a tube of distilled water with each reagent. Explain why. (2 marks)

It is a control. It shows the colour of a negative result, so she can tell whether any colour change in a food is really caused by the food.

Marking points

- it acts as a control
- shows what a negative result looks like, to compare the foods with

6 Use the table to answer these questions.

a. Which food contained starch?

b. Which **two** foods contained both protein and lipid?

c. Which food contained the most reducing sugar? (3 marks)

a. Boiled potato.
b. Milk and crushed peanut.
c. Apple juice.

Marking points

- (a) boiled potato
- (b) milk and crushed peanut (both needed)
- (c) apple juice

7 Sofia said: "Milk contains more reducing sugar than boiled potato." Use the Benedict's results to explain whether she is right. (2 marks)

Yes. Milk turned orange and the potato only turned green. Orange is further along the colour sequence than green, so milk contains more reducing sugar.

Marking points

- milk orange, potato green
- orange shows more reducing sugar than green (colour order explained)

8 Sofia wants to make 20 cm^3 of 0.5% glucose solution to compare with her foods. She has a 2% glucose solution and distilled water.

Calculate the volume of 2% glucose solution and the volume of water she should mix. (2 marks)

0.5% is a quarter of 2%, so she needs 20 ÷ 4 = 5 cm^3 of 2% glucose and 20 - 5 = 15 cm^3 of water.

dilution needed = 2 ÷ 0.5 = 4 times

volume of 2% glucose = 20 cm^3 ÷ 4 = 5 cm^3

volume of water = 20 cm^3 - 5 cm^3 = 15 cm^3

Marking points

- 5 cm^3 of 2% glucose solution
- 15 cm^3 of water

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

9 The label on Sofia's apple juice says it contains 10.2 g of sugar in every 100 cm^3. Calculate the mass of sugar in a 250 cm^3 glass of the juice. (2 marks)

10.2 × 250 ÷ 100 = 25.5 g

number of 100 cm^3 portions = 250 ÷ 100 = 2.5

mass of sugar = 10.2 g × 2.5

mass of sugar = 25.5 g

Marking points

- 10.2 × 2.5 or 10.2 × 250 ÷ 100
- 25.5 g

10 **Higher tier**

Sofia carried out the Benedict's test on glucose solutions of known concentration. 0.1% gave green, 0.5% gave yellow, 1.0% gave orange and 2.0% gave brick red. A sports drink gave a colour between yellow and orange.

Estimate the glucose concentration of the drink and explain why this test can only give an estimate. (3 marks)

The drink contains between 0.5% and 1.0% glucose. The test can only give an estimate because the colours are judged by eye, which is subjective, and the colours change gradually, so only a range can be given, not an exact value.

Marking points

- between 0.5% and 1.0%
- colours are judged by eye / subjective
- colours form a gradual range so only a range (not an exact value) can be found

11 **Higher tier**

In the lipid test the food is shaken with ethanol, then the ethanol is poured into water. Explain why a cloudy white emulsion forms if lipids are present. (2 marks)

Lipids dissolve in ethanol but not in water. When the ethanol is added to water, the lipid comes out of solution as tiny droplets spread through the water, which scatter light and look cloudy white.

Marking points

- lipids dissolve in ethanol but not in water
- they form tiny droplets in the water, which look cloudy / scatter light

12 Kwame repeated Sofia's tests and got the same colours.

a. Does this show the results are repeatable or reproducible? Explain your answer.

b. Suggest how the Benedict's test could be made to give a number for the amount of sugar, and why this is better. (3 marks)

a. Reproducible, because a different person got the same results.

b. Use a colorimeter to measure how much light passes through each tube after the test. This gives a number instead of a colour judged by eye, so the result is not subjective and foods can be compared more accurately.

Marking points

- (a) reproducible, because a different person did it
- (b) use a colorimeter (or compare against a set of known standards)
- (b) gives a numerical value rather than relying on judging colour by eye

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

13 A pupil has an unlabelled breakfast cereal. Describe how to find out which of the following it contains: starch, reducing sugar and protein.

(6 marks)

Grind a spoonful of the cereal with a little distilled water using a pestle and mortar, then filter it to get a food solution, keeping a little solid for the starch test. For starch, put a few drops of the solution or some crushed cereal on a spotting tile and add iodine solution: if it turns from orange-brown to blue-black, starch is present. For reducing sugar, put 2 cm^3 of the solution in a test tube, add about 10 drops of Benedict's solution and heat it in a water bath at about 80 °C for 5 minutes: green, yellow, orange or brick red shows reducing sugar, and the colour gives an idea of how much. For protein, mix 2 cm^3 of the solution with 2 cm^3 of biuret reagent: purple shows protein, while staying blue means none. Carry out each test on distilled water as well, so the colour of a negative result is known. Use the same volumes each time, wear eye protection because biuret reagent is corrosive and iodine is an irritant, and move hot tubes with a holder.

Marking points (any 6, with the method in a logical order)

- grind the cereal with water and filter to make a solution
- iodine test: add iodine, orange-brown to blue-black means starch
- Benedict's added to the solution
- heated in a water bath
- Benedict's positive colours: green / yellow / orange / brick red
- biuret reagent added, blue to purple means protein
- a control tube of water for each test
- a safety point, e.g. eye protection with biuret, holder for hot tubes

How it is marked

- 5-6 marks: all three tests described correctly with the reagent, the heating step for Benedict's, the colour of a positive result for each, how the sample is prepared and a control or safety point.
- 3-4 marks: two tests described correctly, or all three with a reagent or colour wrong or missing, or the heating step left out.
- 1-2 marks: one test named or partly described, such as adding iodine to look for starch, with little detail.

Revision notes: the method

Aim: To use chemical tests to find out whether foods contain reducing sugars, starch, protein and lipids.

Equipment

- food samples
- pestle and mortar
- distilled water
- test tubes and a test tube rack
- measuring cylinder or graduated pipettes
- filter funnel and filter paper
- Benedict's solution
- iodine solution
- biuret reagent (or copper sulfate and sodium hydroxide solutions)
- ethanol
- water bath at about 80 °C
- spotting tile and dropping pipettes

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

Method

1. Grind a small amount of the food with a little distilled water using a pestle and mortar, then filter it to give a food solution.
2. Reducing sugars: put 2 cm^3 of food solution in a test tube, add about 10 drops of Benedict's solution and stand the tube in a water bath at about 80 °C for 5 minutes. A colour change from blue to green, yellow, orange or brick red shows a reducing sugar; the further along that list, the more sugar.
3. Starch: put a few drops of food solution (or a small piece of solid food) on a spotting tile and add a few drops of iodine solution. A change from orange-brown to blue-black shows starch.
4. Protein: put 2 cm^3 of food solution in a test tube and add 2 cm^3 of biuret reagent, then shake gently. A change from blue to purple (lilac) shows protein.
5. Lipids: put a small amount of the food in a dry test tube, add 2 cm^3 of ethanol and shake well. Pour the ethanol into a tube of 2 cm^3 of distilled water. A cloudy white layer (an emulsion) shows lipids.
6. Test a tube of distilled water alone with each reagent as a control, so you know what a negative result looks like.
7. Record the colour at the start and the end of each test in a table.

Variables

- **Independent:** The type of food being tested
- **Dependent:** The colour seen at the end of each test (whether the test is positive or negative)
- **Control:** the same volume of food solution in each test; the same volume of each reagent; the same water bath temperature and heating time for the Benedict's test; the same amount of food ground with the same volume of water

Hazards

Hazard	What could happen	How to reduce the risk
Ethanol is highly flammable	it could catch fire if near a flame	keep ethanol well away from any flame and use an electric water bath rather than a Bunsen burner
Biuret reagent contains sodium hydroxide, which is corrosive	can damage the skin and eyes	wear eye protection and wash any splashes off with plenty of water
Hot water bath	scalds from hot water or a hot tube	use a test tube holder to move tubes and keep the water bath away from the edge of the bench

Key points

- Benedict's needs heating in a water bath; the other three tests do not
- Benedict's is semi-quantitative: green means a little sugar, brick red means a lot
- Iodine is orange-brown to start with and only turns blue-black if starch is there
- Biuret stays blue with no protein and turns purple (lilac) with protein
- Ethanol test: the cloudy white emulsion forms when the ethanol is added to water
- Keep ethanol away from flames, and always test water alone as a control

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.