IGCSE and O Level Biology food tests

Notes, practice questions and answers for Cambridge IGCSE Biology 0610 and O Level Biology 5090. Free from numrahedu.com.

Food test results table

Nutrient	Test	What to do	Heat?	Negative	Positive
Starch	Iodine test	Add a few drops of iodine solution to the sample.	No	Stays orange-brown	**Blue-black**
Reducing sugars	Benedict's test	Add an equal volume of Benedict's solution, then heat in a hot water bath.	Yes	Stays blue	**Green, yellow, orange or brick-red**
Protein	Biuret test	Add biuret reagent and shake gently. Do not heat.	No	Stays blue	**Purple (lilac)**
Fats and oils (lipids)	Ethanol emulsion test	Shake the sample with ethanol, then add water.	No	Stays clear	**Cloudy white emulsion**
Vitamin C	DCPIP test	Add the food solution drop by drop to DCPIP and shake.	No	Stays blue	**Blue to colourless**

How to prepare a food sample

1. Cut or crush a solid food. A pestle and mortar works well.
2. Mix it with a little distilled water to make a solution or suspension.
3. Filter it, or let the solids settle, so that a colour change is easy to see.
4. Divide the sample between clean test-tubes, one for each test.

How to write your results

Give the starting colour and the final colour. For a negative result, name the colour that stayed. Then write what the result shows.

Avoid	Write
It went black.	It turned blue-black.
It went red.	It changed from blue to brick-red.
Benedict's test: add Benedict's solution and look at the colour.	Add Benedict's solution and heat in a hot water bath.
Sugar is present.	A reducing sugar is present.
It stayed the same.	It stayed blue. Name the colour, even for a negative result.
It went clear (DCPIP).	It changed from blue to colourless.
It went milky, so protein is present.	A cloudy white emulsion formed, so a fat or oil is present.

How to do each food test

Iodine test for starch

1. Put the sample in a test-tube or on a spotting tile.
2. Add a few drops of iodine solution.
3. Do not heat. Record the colour straight away.

Why it works. Starch molecules hold iodine and this produces the dark colour. No starch means the iodine solution simply keeps its own orange-brown colour.

Write this. The sample turned from orange-brown to blue-black, so starch is present.

Watch out. Blue-black is a very dark blue. In a real tube it can look almost black, especially with a lot of starch. Hold the tube up to the light, or look at a thin layer on a white tile, and you can often see the blue. Always write blue-black, not black. Iodine solution is orange-brown at the start, not clear and not yellow.

Benedict's test for reducing sugars

1. Put about 2 cm^3 of the sample in a test-tube.
2. Add an equal volume of Benedict's solution.
3. Heat the tube in a hot water bath for a few minutes, usually above 60 °C. Use the temperature in the question if one is given.
4. Record the final colour.

Why it works. Reducing sugars such as glucose and maltose change the blue copper ions in the solution, and an insoluble coloured solid forms. More reducing sugar gives a colour further along the order: blue, green, yellow, orange, brick-red.

Write this. After heating, the mixture changed from blue to brick-red, so a reducing sugar is present.

Watch out. Always say that you heated the mixture. Say reducing sugar, not just sugar: table sugar (sucrose) gives a negative result.

Biuret test for protein

1. Put about 2 cm^3 of the sample in a test-tube.
2. Add an equal volume of biuret reagent. Some schools add dilute sodium hydroxide first and then a few drops of dilute copper(II) sulfate.
3. Shake gently and do not heat.
4. Record the colour.

Why it works. The copper ions in the alkaline reagent react with the bonds that join amino acids in a protein, and this makes the purple colour.

Write this. The mixture changed from blue to purple, so protein is present.

Watch out. Do not heat this test. Biuret shows protein in a food sample, so do not write amino acids in your conclusion.

Ethanol emulsion test for fats and oils (lipids)

1. Put the sample in a clean, dry test-tube.
2. Add about 2 cm^3 of ethanol and shake well.
3. Add an equal volume of distilled water and shake gently.
4. Look for a cloudy white layer or mixture.

Why it works. Fats and oils dissolve in ethanol but not in water. When water is added, the fat comes out of solution as tiny droplets, and these droplets make the mixture look cloudy. That mixture is called an emulsion.

Write this. A cloudy white emulsion formed after water was added, so a fat or oil is present.

Watch out. Clear means you can see through it. Do not write colourless when you mean clear, and keep ethanol away from any flame.

DCPIP test for vitamin C

1. Put about 1 cm^3 of DCPIP solution in a test-tube.
2. Add the food solution drop by drop, shaking after each drop.
3. Stop when the blue colour disappears, and record how much you used.
4. Compare foods: the less solution needed, the more vitamin C it contains.

Why it works. Vitamin C changes DCPIP from its blue form to a colourless form. Each drop of a stronger vitamin C solution changes more DCPIP, so fewer drops are needed.

Write this. The DCPIP changed from blue to colourless, so vitamin C is present.

Watch out. This test is named in the 0610 syllabus but not in the 5090 syllabus for 2026 to 2028. Lemon juice can turn DCPIP pink for a moment because it is acidic. Keep adding drops until the colour goes. Heat destroys vitamin C, so do not heat this test.

Controls and evaluation

- **Use a control.** Run the same test on distilled water. It shows what a negative looks like and shows that the reagent is not the cause of the change.
- **Keep the tubes clean.** Use a clean tube and pipette for each sample, because a small amount of another food can give a false positive.
- **Keep volumes the same.** When comparing foods, use the same volumes of sample and reagent. In the Benedict's test, also keep the temperature and heating time the same.
- **Know the limit of colour.** Colours are judged by eye, and these tests show roughly how much is present, not an exact amount. Comparing with tubes of known concentration makes the result more reliable.
- **Watch out for coloured foods.** A strongly coloured food can hide the result. Dilute it, filter it and compare it with a control.

Hazards and precautions

What	Hazard	Precaution
Ethanol	Flammable	Keep it away from flames. Heat nothing with a naked flame in this test.
Hot water bath	Can scald skin	Use a test-tube holder and handle the tube with care.
Biuret reagent or sodium hydroxide	Alkali can harm skin and eyes	Wear eye protection and rinse any spill with water.
Iodine solution	Stains and can irritate skin	Avoid contact with skin and wash off any spill.
Heating in a test-tube	The mixture can spit out	Use a water bath, and point the tube away from people.

Food tests questions

12 original questions, 41 marks. Answer on paper, then mark your work with the answers at the end.

Q1. Starch [2 marks]

Describe how you would test a sample of rice water for starch, and state the result you would see if starch is present.

Q2. Reducing sugars [4 marks]

A student wants to know whether a fruit drink contains a reducing sugar. Describe the test and the positive result.

Q3. Reading a results table [4 marks]

Four samples were tested. **P:** iodine blue-black, Benedict's blue, biuret blue, emulsion clear. **Q:** iodine orange-brown, Benedict's brick-red, biuret purple, emulsion clear. **R:** iodine orange-brown, Benedict's blue, biuret blue, emulsion cloudy white. **S:** iodine orange-brown, Benedict's blue, biuret blue, emulsion clear. State what each result shows.

Q4. Explaining the emulsion test [3 marks]

Ghee is shaken with ethanol, and water is then added. Explain why a cloudy white mixture forms.

Q5. Hazards [4 marks]

Give one hazard and one safety precaution for the ethanol emulsion test, and one hazard and one safety precaution for the Benedict's test.

Q6. Vitamin C calculation (0610) [4 marks]

The volume of juice needed to decolourise 1 cm^3 of DCPIP was measured. Fresh juice: 2.0 cm^3. Stored juice: 5.0 cm^3. Boiled juice: 8.0 cm^3. (a) Which juice has the highest concentration of vitamin C? Explain your answer. [2] (b) How many times more concentrated is the vitamin C in the fresh juice than in the boiled juice? [1] (c) Suggest why the boiled juice needed the largest volume. [1]

Q7. Comparing with Benedict's [4 marks]

Four glucose solutions were heated with Benedict's solution. Final colours: A green, B brick-red, C blue, D orange. (a) Put the solutions in order, from lowest to highest glucose concentration. [1] (b) Name two variables that must be kept the same. [2] (c) Explain why this method cannot give an exact concentration. [1]

Q8. Using a control [2 marks]

A student also heats distilled water with Benedict's solution. Explain why this is useful.

Q9. Spot the mistakes [3 marks]

Read this student's account: "I added biuret reagent to egg white and heated it over a flame. It went purple, so egg white contains amino acids." Give three ways to improve it.

Q10. A false positive [2 marks]

A water control turned green in a Benedict's test. Suggest a cause and how to prevent it.

Q11. A hard result to read [3 marks]

Explain why the ethanol emulsion test is hard to read when testing whole milk, and suggest one way to make the result easier to judge.

Q12. Planning [6 marks]

Plan an experiment to find out how long amylase takes to break down starch at 37 °C. Use the iodine test in your plan.

Answers

Q1. Starch

- One mark for adding iodine solution to the sample.
- One mark for the change from orange-brown to blue-black.

Q2. Reducing sugars

- One mark for adding Benedict's solution to the drink.
- One mark for heating in a hot water bath.
- One mark for stating that the solution starts blue.
- One mark for any end colour from green, yellow, orange or brick-red.

Q3. Reading a results table

- One mark for P: starch only.
- One mark for Q: reducing sugar and protein.
- One mark for R: fat or oil only.
- One mark for S: none of the four nutrients tested for.

Q4. Explaining the emulsion test

- One mark for the fat dissolving in ethanol.
- One mark for the fat not dissolving in water.
- One mark for tiny fat droplets forming, which make the mixture cloudy (an emulsion).

Q5. Hazards

- One mark for ethanol being flammable.
- One mark for keeping it away from flames.
- One mark for hot water, or a hot mixture, being able to scald.
- One mark for using a test-tube holder or handling the tube with care.

Q6. Vitamin C calculation (0610)

- (a) One mark for fresh juice.
- (a) One mark because the smallest volume was needed to decolourise the DCPIP.
- (b) One mark for 8.0 ÷ 2.0 = 4 times.
- (c) One mark for heat destroying some of the vitamin C.

Q7. Comparing with Benedict's

- (a) One mark for C, A, D, B.
- (b) One mark each, up to two, for the volume of solution, volume of Benedict's solution, temperature or heating time.
- (c) One mark because the colour is judged by eye, which only gives an estimate.

Q8. Using a control

- One mark for showing what a negative result looks like, so results can be compared.
- One mark for showing that the colour change is caused by the sample and not by the reagent or apparatus.

Q9. Spot the mistakes

- One mark for removing the heating, because the biuret test needs no heat.
- One mark for giving the starting colour: blue to purple.
- One mark for the correct conclusion: protein is present.

Q10. A false positive

- One mark for contamination, such as a tube or pipette that still held some reducing sugar.
- One mark for using clean apparatus, or a separate pipette, for each sample.

Q11. A hard result to read

- One mark because milk is already white and cloudy.
- One mark because a new cloudy white layer is therefore hard to see.
- One mark for comparing with a tube of milk mixed with water and no ethanol.

Q12. Planning

- Any six of these, one mark each:
- Mix a starch solution with amylase solution in a test-tube.
- Keep the tube in a water bath at 37 °C.
- Take a sample at regular intervals, for example every minute.
- Add each sample to a drop of iodine solution on a spotting tile.
- Record the time when the iodine stays orange-brown, which shows that the starch has gone.
- Keep the volumes and concentrations of starch and amylase the same in repeats.
- Use a control with boiled amylase or water in place of the amylase.
- Repeat and calculate a mean time.

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