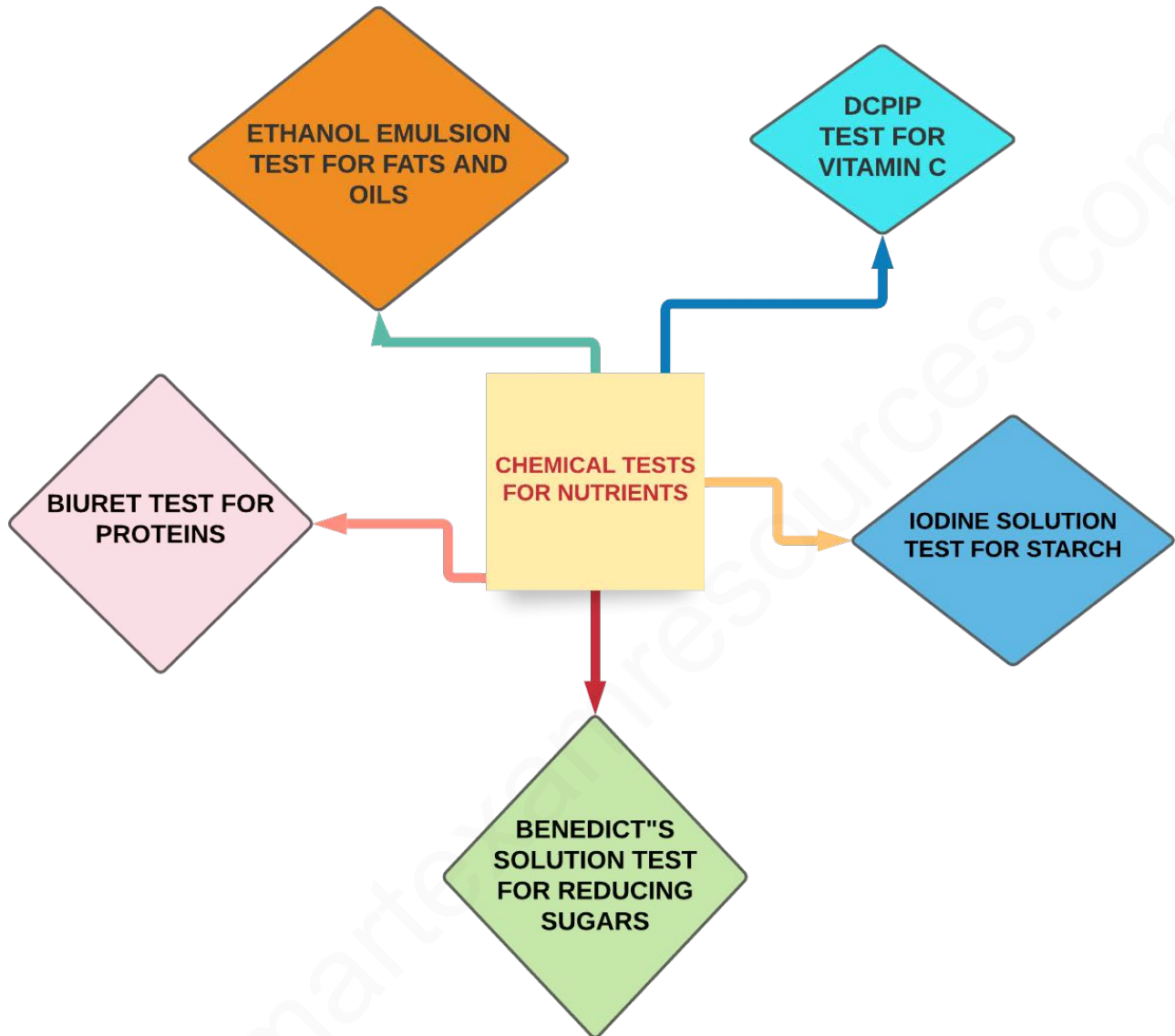


CHEMICAL TEST FOR NUTRIENTS

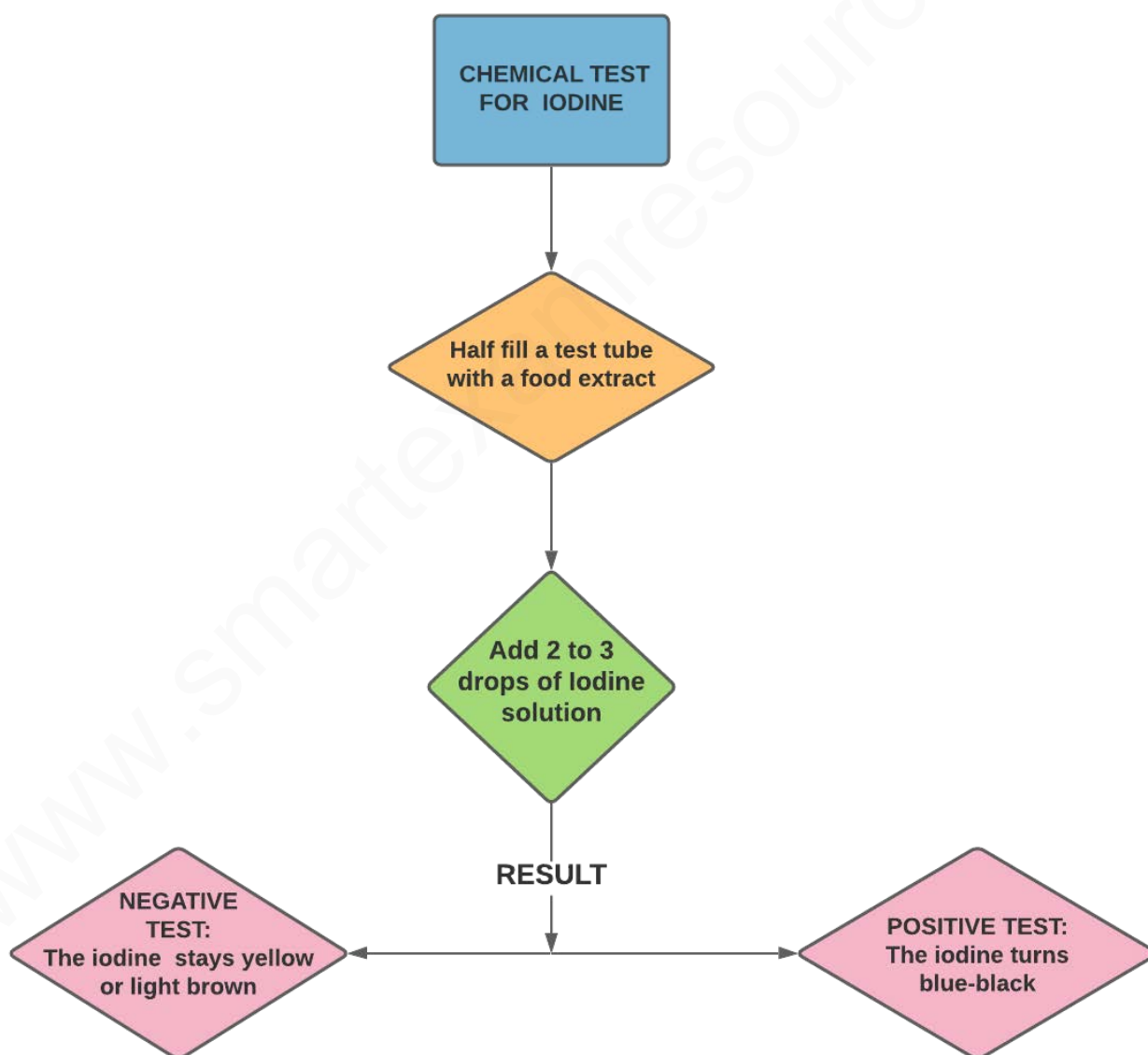


Food tests:

Safety: some of the chemicals used in these tests are corrosive, so always wear eye protection.

Testing for starch

- Half fill a test-tube with the food extract you wish to test for starch.
- Add two or three drops of iodine solution.
Loading solution usually looks yellow or light brown.
A positive result for starch is if the iodine solution turns **blue-black**.
If the extract remains a yellow or light brown colour it does not contain starch.

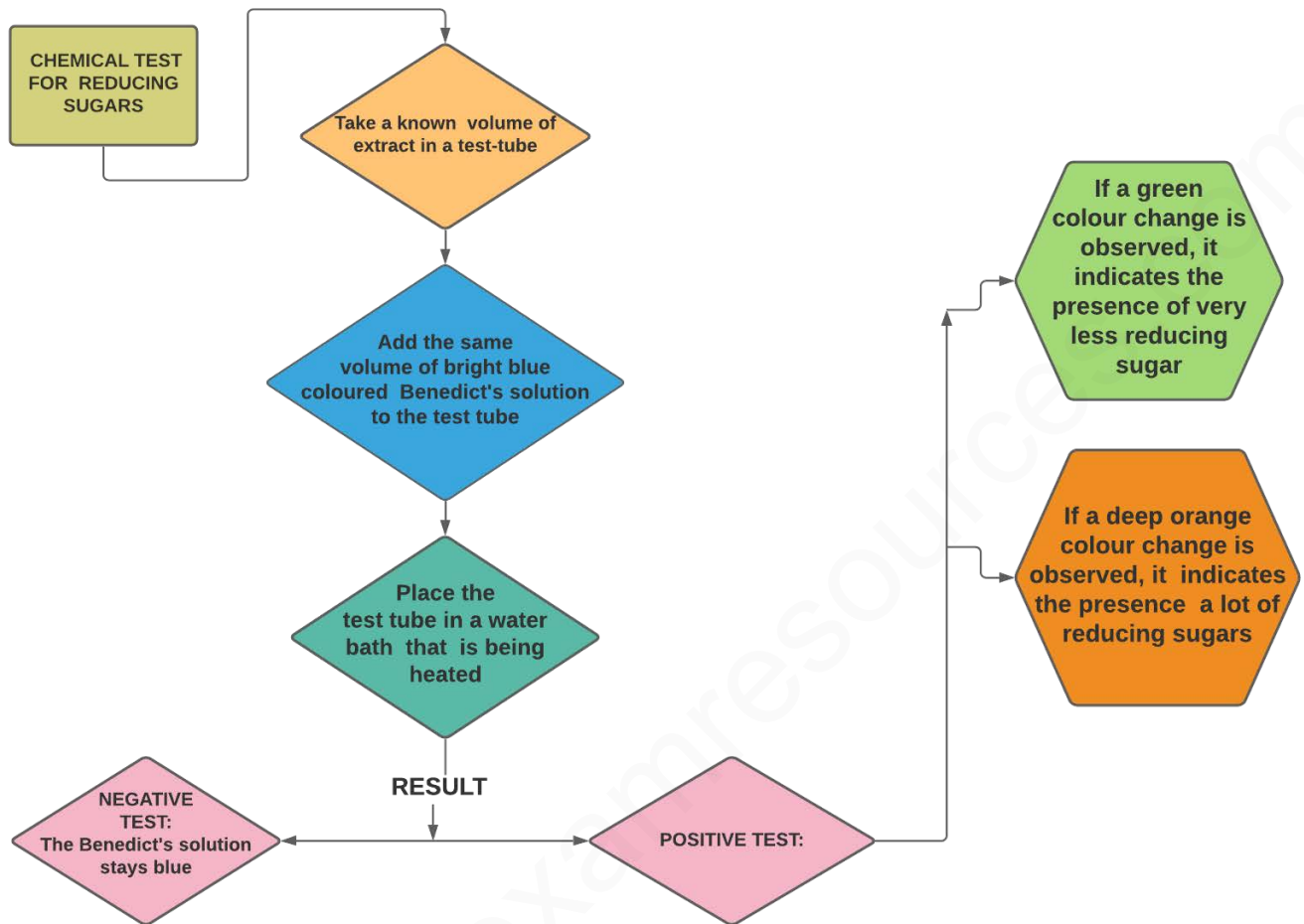


Testing for reducing sugars

- Put a known volume of the extract you wish to test for reducing sugars in a test-tube.
- Place a beaker on a heat-proof mat.
- Carefully half fill the breaker with boiling water from a kettle (or place the beaker on a tripod and gauze and boil the water with a Bunsen burner).
- Add the same volume of Benedict's solution to the test-tube containing the food extract and a put it into the hot water.
- Benedict's solution is bright blue.
- A positive test for simple sugars is when Benedict's solution turns red or orange (if you look carefully you can see it turn green and then yellow before turning orange). If you leave the test-tube to cool you will also see a precipitate.
- You can us Benedict's test to tell you have much simple sugar is present. If the colour changes to green, the extract only contains a little of the reducing sugars. If it goes deep orange colour then it contains a lot of reducing sugars.
- If the colour remains blue then the extract does not contain any reducing sugars.

The sugars that give a positive result change the copper ions in the Benedict's solution when the mixture he heated. The type of reaction that occurs is a reduction reaction that you will learn about in chemistry. Reducing sugars are simple sugars, such as glucose, and some complex sugars, such as maltose and lactose. Sucrose is not a reducing sugars and gives a negative result.

TEST FOR REDUCING SUGAR



BOARD QUESTION:

- (b) Potato crops are grown for their carbohydrate content.

Describe how you could safely test the two species of potato to compare their carbohydrate content.

test for starch

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test for reducing sugar

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[8]

[Total: 11]

MARKSCHEME:

(b)	1. <i>starch</i> equal sample size of each potato; ONCE iodine <u>solution</u> / iodine in KI / iodine reagent; same concentration / volume of iodine solution; expected colour change; (yellow / orange / red brown to blue / blue black / purple) compare colour change; (how fast / darker) (using colorimeters) <i>Safety – one from:</i> Tie back hair / tie; ONCE Safety goggles / spectacles; ONCE Lab coat; ONCE 2. equal samples – same volume of water / same preparation / grinding; ONCE Benedict's reagent; same volume / amount of Benedict's solution; heating; expected colour change; (blue → green / orange / red) compare colours; (intensity of colour – or timing of colour change) (use of colorimeters) <i>Safety – one from:</i> water bath; test-tube holders; same as above	[max 3] [max 5] [8 marks]	A. drops of iodine if stated number of drops but ignore vague references such as few or several. 'same volume of iodine solution' = 2. I. using ethanol. Need original and final colours for expected change. A. chemical components / Fehling's / Clinistix. (pink → dark blue) Not just warm but heat – maybe used a boiling water bath = 2 marks. Need original and final colours for expected change. I. repeats. If describe biuret ignore description of test but allow safety point.
[Total: 11]			

Testing for protein

- Half fill a test-tube with the extract you wish to test for protein.
- Add five to six drops of **biuret solution** (this solution contains copper sulfate solution and sodium hydroxide solution)

Safety: take care as sodium hydroxide solution is corrosive.

- Biuret solution usually looks blue in colour.
- A positive test for protein is if the biuret solution turns **purple violet** or **lilac**.
- If the colour remains blue, then the extract does not contain protein.

BOARD QUESTION:

1 (d) Describe a test that could be used to determine if the fruits contained protein.

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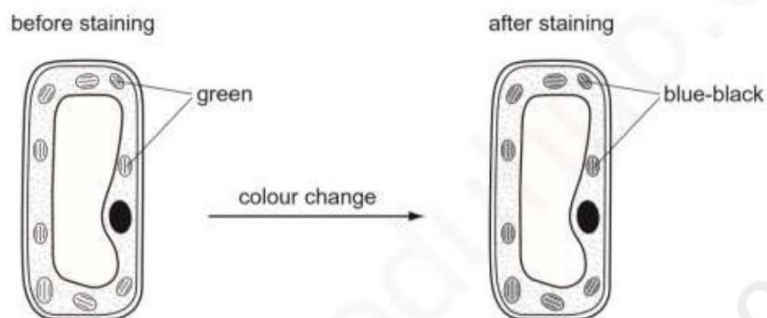
Testing for fats

Fats will not dissolve in water but they will dissolve in **ethanol**. If a solution of fat in ethanol is added to water a cloudy white emulsion is formed.

- Chop up grind a small amount of material you wish to test for fats. (Do not add water to make the extract this time.)
- Put the extract into a clean test-tube and add enough ethanol to cover it.
- Put a stopper over the open end of the test-tube and shake up the contents.
- Add some distilled water to make the test-tube half full.
- Shake the contents of the test-tube once more.
- A white emulsion that looks cloudy white or a milky colour is a positive test for fats.
- If this does not happen the extract does not contain fats.

BOARD QUESTION:

The diagrams show a leaf cell before and after staining with iodine solution.



Which substance causes the iodine solution to change colour?

- A chlorophyll
- B protein
- C reducing sugar
- ☒ D starch

A student set up a test-tube containing starch, water and amylase.

How could the student test whether the amylase had digested all the starch?

- A Add Biuret solution.
- B Add dilute hydrochloric acid.
- ☒ C Add iodine solution.
- D Weigh the test-tubes and contents before and after the experiment.

BOARD QUESTION:

Maize is used as a food source for humans and livestock. It contains mainly starch but also other nutrients including proteins and fat.

(b) Describe how to test maize grains for the presence of protein and fat.

protein

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fat

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[5]

MARKING SCHEME:

(b)	any 5 from: crushing grain in preparation ONCE only for either test ; <i>protein test:</i> reagent: biuret (solution) ; colour change observed: – blue to purple ; <i>fat test:</i> add alcohol/ethanol ; water is added to alcohol ; emulsion formed/clear to cloudy/milky/white ;	max [5]	R heating
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Test for vitamin C

The test for vitamin C is to utilize the reducing power of vitamin C.

In this test, the oxidizing agent is called DCPIP (dichlorophenol indophenol).

DCPIP is a dye. It is blue color when in oxidizing form and colorless in reduction form.

When DCPIP is added into vitamin C solution, the vitamin C reduces the dye, then, decolorizes the dye. Therefore, the decolorization of DCPIP indicates the presence of vitamin C.

BOARD QUESTIONS:

- 1 Starch is broken down into reducing sugars in the alimentary canal. The digested products are absorbed into the blood.

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Some students investigated the action of enzymes on the digestion of starch.

- (a) Describe how you would carry out a test for starch.

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- (b) Describe how you would safely carry out a test for reducing sugars.

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