**Qualitative testing for biological molecules – lipids (emulsion test) STUDENT**

**Introduction**

A qualitative test just gives us a positive or negative result to tell us whether a particular substance is present. It does not tell us how much of the substance is present (or at what concentration). Lipids are soluble in ethanol but not water. The emulsion test exploits this by dissolving any lipid present in the sample using ethanol and then causing the lipid to precipitate out and form an emulsion by adding water.

**Aim**

To test qualitatively for the presence of lipids.

**Intended class time**

* 30 minutes

**Chemicals**

|  |  |
| --- | --- |
| Ethanol | HSE warning symbol Highly flammableHarmful if swallowed |
| Water, vegetable oil, 1% albumen, 0.5 mol dm-3 sucrose solution, cheese, pasta, bread, apple | No known hazard  |

**Equipment**

* Distilled water
* Ethanol
* 12 test tubes
* 2 x 5 cm3 syringes
* 8 dropping pipettes
* Liquid samples to be provided in labelled beakers:
	+ Tap water
	+ Vegetable oil
	+ 0.5 mol dm-3 sucrose solution [Note: To make 100 cm3 of 0.5 mol dm-3 sucrose solution dissolve 17.12 g sucrose in distilled water to a final volume of 100 cm3]
	+ Protein suspension [see note below]
* Solid samples to be provided in labelled beakers:
	+ Cheese
	+ Pasta softened by pre-soaking
	+ Bread
	+ Apple
* Glass rod
* Paper towels
* Black paper

**Health and Safety**

* Ethanol is highly flammable. Ensure there are no naked flames in the room throughout this activity.

**Method**

1. Put a few drops of each liquid sample into its own labelled test tube.
2. Add 2 cm3 ethanol to each of the four samples and shake thoroughly.
3. Next, add 2 cm3 distilled water to each sample and shake gently to mix.
4. Observe the appearance of each sample. You may find it helpful to place a piece of black paper behind the sample when viewing it.
5. Record your observations and your conclusions about the presence or absence of lipids in these samples.
6. Next, place a small piece of each solid sample into its own labelled test tube.
7. Add 2 cm3 ethanol to each of the four samples.
8. Using the glass rod gently mash each sample. Ensure you clean the rod between samples to avoid cross-contamination.
9. Shake each tube thoroughly.
10. Allow the solid to settle to the bottom of the tube.
11. Carefully pipette the ethanol from each sample into a fresh, labelled tube, leaving the solid sediment behind.
12. Add 2 cm3 distilled water and shake gently to mix.
13. Observe the appearance of each sample. You may find it helpful to place a piece of black paper behind the sample when viewing it.
14. Record your observations and your conclusions about the presence or absence of lipids in these samples.

**Extension questions**

1. An effective qualitative test must give a clear positive result whenever the substance being tested for is present. This means it avoids ‘false negatives’. It must also not give a positive result due to the presence of some other substance (this would be a false positive).
Explain, in terms of their solubility in different solvents and your knowledge of the emulsion test, why you do not see false positives due to:
- Monosaccharides and disaccharides
- Starch
- Nucleic acid
- Protein
2. The emulsion test is qualitative. How could it be made the basis for a semi-quantitative test (giving an indication of whether lipids are present at high, medium or low concentration) or even a fully quantitative test for lipids?

**To submit**

For this piece of work to count towards Practical Activity Group 9 of the GCE Biology Practical Endorsement, you need to have evidence of your results of the emulsion tests as described above. You also need to have considered the above questions as the answers to these will aid you in preparation for your written examinations.