

### Saturated and unsaturated oils

1. This question is about vegetable oils.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

**A** catalysed

**B** emulsified

**C** unsaturated

**D** hardened

The amount of double carbon carbon bonds in an oil can be estimated by reacting the oil with bromine. If the bromine reacts, this shows the oil to be . . . **1** . . . .

The double carbon carbon bonds in the oil can be removed by heating with hydrogen in the presence of nickel. This is an example of a reaction that has been . . . **2** . . . .

As a result of this reaction with hydrogen, the oil is . . . **3** . . . .

A vegetable oil can be . . . **4** . . . by shaking the oil with water.

2. This question is about four vegetable oils.

	Type of oil	Melting point in °C	Iodine number	Cetane number
<b>A</b>	Palm	35	63	65
<b>B</b>	Rapeseed	5	100	45
<b>C</b>	Sunflower	-18	120	60
<b>D</b>	Corn	-15	125	53

The higher the iodine number, the more unsaturated the oil is.

The higher the cetane number, the easier it is to set the oil alight with a flame.

Match oils, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

<b>1</b>	the oil that is most difficult to ignite
<b>2</b>	the oil with the lowest melting point
<b>3</b>	the oil that will be first to solidify if cooled from 100 °C
<b>4</b>	the oil with the highest number of double bonds in each molecule

3. In each part choose only **one** answer.

Read the passage below about cooking with oils.

Cooking at high temperatures can damage oils. The more omega 3 fatty acids in the oil, the less suitable it is for cooking. The heat not only damages the fatty acids, but it can also change them into harmful substances. Hydrogenated oils are often used for cooking. Since these oils have already been “damaged” by chemical processing, they are less likely to be further damaged by heat. The oils that are higher in saturated fats are the most stable when heated. These include peanut oil and olive oil. The more fragile oils are best used at room temperature, like salad dressings.

To preserve the nutritious properties and the flavour of unrefined oils, try the “wet-sauté”. Pour around one-fourth of a cup of water in the stir-fry pan and heat just below boiling. Then add the food and cook it a little before adding the oil. Wet-sauté shortens the time oil is in contact with a hot pan. Stir frequently to further reduce the time the oil is in contact with the hot metal. Never heat oils to the smoking point, as this not only damages their fatty acid content but also their taste.

- A** Heating oils to smoking point . . .
- 1 damages their fatty acid content.
  - 2 is best for cooking chips.
  - 3 is best for making salad oil.
  - 4 turns them into margarine.
- B** Wet-sauté . . .
- 1 damages oils.
  - 2 is best for cooking chips.
  - 3 is best for saturated oils.
  - 4 is best for unsaturated oils.
- C** A hydrogenated oil . . .
- 1 contains hydrogen.
  - 2 contains only carbon.
  - 3 has a better taste.
  - 4 is saturated.
- D** Hydrogenated oils have been .damaged. by chemical processing.  
In this processing, . . .
- 1 unsaturated oils are frozen to make them solid.
  - 2 unsaturated oils are gently heated with hydrogen in the presence of a catalyst.
  - 3 unsaturated oils are heated to a high temperature.
  - 4 vapour from unsaturated oils is passed over a hot catalyst.

Unit C1, C1.6.3

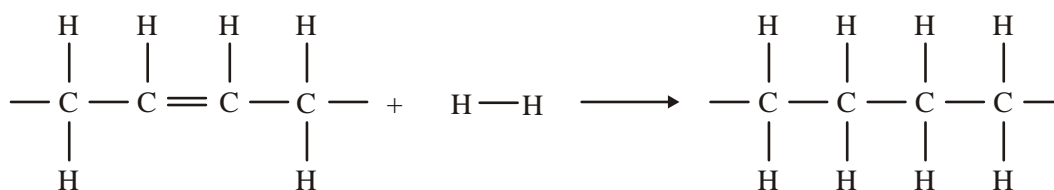
4. In each part choose only **one** answer.

Palm oil and sunflower oil are vegetable oils. The iodine number of an oil indicates its level of unsaturation. The higher the iodine number, the more unsaturated the oil.

	Iodine number
Palm oil	54
Sunflower oil	125

- A** Sunflower oil is more unsaturated than palm oil. This results in . . .
- 1 sunflower oil being thicker than palm oil at the same temperature.
  - 2 palm oil not reacting with bromine water.
  - 3 1 cm<sup>3</sup> of sunflower oil decolourising a larger volume of bromine water than 1 cm<sup>3</sup> of palm oil.
  - 4 1 cm<sup>3</sup> of palm oil decolourising a larger volume of bromine water than 1 cm<sup>3</sup> of sunflower oil.

Sunflower oil reacts with hydrogen in the following way.



Part of the sunflower  
oil molecule

- B** What is the process shown in this reaction?
- 1 cracking
  - 2 hydrogenation
  - 3 polymerisation
  - 4 saturation
- C** This reaction is usually carried out . . .
- 1 at high temperature and pressure.
  - 2 with a nickel catalyst at about 60 °C.
  - 3 by mixing with an emulsifier.
  - 4 by cooling the oil to -5 °C.
- D** When compared with the sunflower oil, the product of this reaction . . .
- 1 is harder.
  - 2 has a lower melting point.
  - 3 is softer.
  - 4 is more unsaturated.