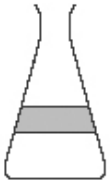
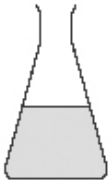
Q1. (a) The diagrams show the results of shaking a vegetable oil with the substances indicated.

Vegetable oil and water	Vegetable oil, water and an additive
 Flask 1	 Flask 2

(i) Give a reason for the result in **Flask 1.**

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(1)

(ii) Explain the result in **Flask 2.**

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(2)

(b) Saturated fats are linked to heart problems. Oils that are unsaturated help to prevent heart disease. A company wants to make a 'healthy' soft margarine.

The company tested the same volume of different vegetable oils by shaking each with three drops of iodine solution. The results are shown in the table.

Vegetable oil	**Time in minutes for the colour of iodine to 'disappear'**
Olive oil	3.5
Peanut oil	3.0
Soya oil	1.5
Sunflower oil	1.0

(i) Why does iodine react with the molecules in these oils?

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(1)

(ii) Use the company results to evaluate which one appears to be the most 'healthy' vegetable oil to use in the soft margarine.

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(2)

(c) The ingredients of soft margarine include hydrogenated vegetable oil.

(i) Why is hydrogenated vegetable oil used in soft margarine?

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(1)

(ii) Describe how vegetable oils are hydrogenated.

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(2)

(Total 9 marks)

Q2. This information was taken from a label on a packet of crisps.

Main ingredients:	
Potatoes, vegetable oil, Worcester sauce flavour,	
colourings, flavourings, salt.	
Nutritional information (per 100 g):	
Energy	2040 kJ
Protein	6.5 g
Carbohydrate	55 g
of which sugars	3 g
Fat	27 g
of which saturates	9 g
unsaturates	18 g
Fibre	4.5 g
Sodium	1.2 g

Saturated fats are linked to heart problems. In order to claim that their crisps are healthy, the manufacturer keeps the proportion of saturated fats low.

(i) What type of fat contains double carbon carbon bonds?

.....

(1)

(ii) The colour of bromine water is orange.

What is seen when bromine water is shaken with:

an unsaturated fat .....

a saturated fat? .....

(2)

(iii) Unsaturated vegetable oils can be hardened to make them useful as spreads. Describe how unsaturated vegetable oils are hardened.

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(2)
(Total 5 marks)

Q3. A company compared the relative 'unsaturation' of five oils. Bromine water was added from a burette to equal amounts of each oil until the bromine water remained orange-yellow.

The volume added was recorded.

Type of oil	**Volume of bromine water added in cm^3**
Maize	25.6
Olive	6.1
Palm	4.9
Soya Bean	29.9
Sunflower	25.1

(i) What would you see when the first few drops of bromine water are added to each oil?

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(1)

(ii) What do these results tell you about sunflower oil compared with the other oils?

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(2)
(Total 3 marks)

Q4. Margarine is manufactured using 'hard' plant oils. A margarine company tested several plant oils to determine their hardness for use in its margarine.

In the test iodine solution was used to find the iodine value. The units are grams of iodine that react with 100 g of oil.

Plant oils with lower iodine values are harder and are less unsaturated.

Plant oil	Melting point in °C	Iodine value
Coconut	25	10
Palm	35	54
Olive	–6	81
Castor	–18	85
Peanut	3	93
Rapeseed	–10	98
Sunflower	–17	125
Soya bean	–16	130

(a) Do the results in the table indicate that there is a relationship between the melting point of a plant oil and its hardness?

Explain your answer.

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(2)

(b) The company stated that some of the plant oils were brown and that this may have affected the results.

Explain why the company considered the colour of plant oils to be a problem with this test.

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(2)

(c) A consumer group stated that the test should not be carried out by the margarine company but by independent scientists.

Explain why.

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(2)

(d) The company intends to use sunflower oil to make its margarine.

Explain how the company could process the sunflower oil to make it suitable for the manufacture of margarine.

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(3)

(Total 9 marks)

Q5. An advert for some crisps claims that they now contain only 30% saturated fat because they are cooked in sunflower oil. The crisp company used bromine water to compare percentage unsaturation of sunflower oil with four other vegetable oils, **A**, **B**, **C** and **D**.

Oil	Volume of bromine water added until the bromine colour just remains (cm^3)				Percentage unsaturation (%)
	Test 1	Test 2	Test 3	Average	
Sunflower	25.4	28.0	27.0	26.8	
A	13.0	14.0	15.0	14.0	35
B	23.2	11.2	24.0	23.6	59
C	19.9	21.1	20.2	20.4	51
D	9.5	8.8	9.3	9.2	23

(i) What is the range of percentage unsaturation for oils **A**, **B**, **C** and **D**?

Range = ... %

(1)

(ii) Describe and explain what happens to the first drops of bromine water that are added to these oils.

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(2)

(iii) The average for oil **B** is given as 23.6 cm^3.

Explain how this average has been calculated.

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(1)

(iv) The results did **not** show that sunflower oil contains 30% saturated fat.

Explain why. (You will need to calculate the percentage unsaturation of sunflower oil.)

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(2)
(Total 6 marks)

Q6. An advert for crisps claimed that they are healthier because they are cooked in sunflower oil.

(a) A student found the following information about four oils that are used to make crisps.

	Rapeseed oil	**Sunflower oil**	**Olive oil**	**Corn oil**
Saturated fat (%)	6.6	12.0	14.3	14.4
Polyunsaturated fat (%)	29.3	63.3	8.2	51.3
Melting point (°C)	+5	–18	–12	–15

One hypothesis is that oils are thought to be healthier if they are:
- low in saturated fat
- high in polyunsaturated fat.

(i) Use the table to decide which oil should be healthiest. Explain your decision by comparing this oil with other oils from the table that you think are less healthy.

Healthiest oil is .....

Explanation .....

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(2)

(ii) These oils can be hardened by reacting them with hydrogen.
A student said that hardening would make sunflower oil healthier.
Is this student's claim correct?

Explain your answer.

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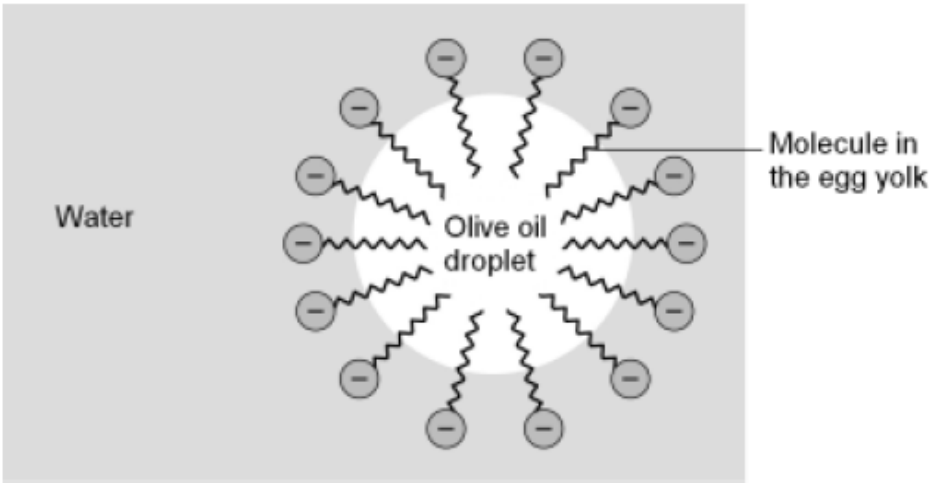
(2)

(b) A mixture of the olive oil, water and egg yolk was shaken and left to stand. The olive oil and water do not separate.

The diagram shows a simple model of how a stable mixture of olive oil and water is produced by the addition of egg yolk.



Use this simple model to explain how the molecules in the egg yolk are able to produce a stable mixture of olive oil and water.

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(3)
(Total 7 marks)

Q7. Medical evidence suggests that eating saturated fats, compared with unsaturated fats, is associated with a higher risk of circulatory and heart problems.

Each of the oils listed in the table contains a mixture of saturated and unsaturated fats.

Oil	Melting point in °C	Iodine number
palm	24	54
olive	-6	85
rapeseed	-10	98
sunflower	-17	127

The iodine number is the mass of iodine in grams that reacts with 100 cm^3 of the oil.
The iodine number shows the amount of unsaturated fat in each oil.

(a) (i) What would be seen if a solution containing 1 g of iodine was added to 100 cm^3 of any of these oils?

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(1)

(ii) What does the word *unsaturated* mean?

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.....

(1)

(iii) Which oil in the table would **probably** cause the highest risk of circulatory and heart problems?

Use the information in the table to give a reason for your answer.

Oil .....

Reason .....

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(2)

(b) Sunflower oil can be hardened so that it can be used to make margarine.

Explain how sunflower oil can be hardened.

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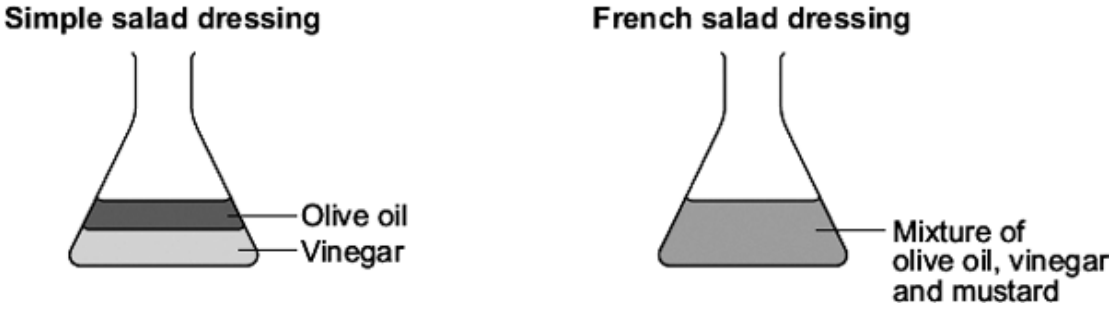
(3)
(Total 7 marks)

Q8. Olive oil is used to make salad dressings and margarine.

(a) Vinegar is often used to make salad dressings.
Vinegar contains 95% water and 5% ethanoic acid.



To make a simple salad dressing add olive oil to vinegar and shake. After a few minutes the mixture separates.
To make a French salad dressing add mustard to the olive oil and vinegar and shake.
After several minutes the mixture does **not** separate.

(i) Why does the mixture in the simple salad dressing separate?

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(1)

(ii) Mustard in the French salad dressing has molecules with hydrophilic properties and hydrophobic properties.

Explain why the French salad dressing does **not** separate.
You may include a diagram to help you to answer this question.

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(3)

(b) Olive oil contains 89% unsaturated fats and 11% saturated fats.

What is the test and the result for unsaturated fats?

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(2)

(c) Olive oil is hardened to make margarine.

Describe the reaction and conditions needed to harden a vegetable oil.

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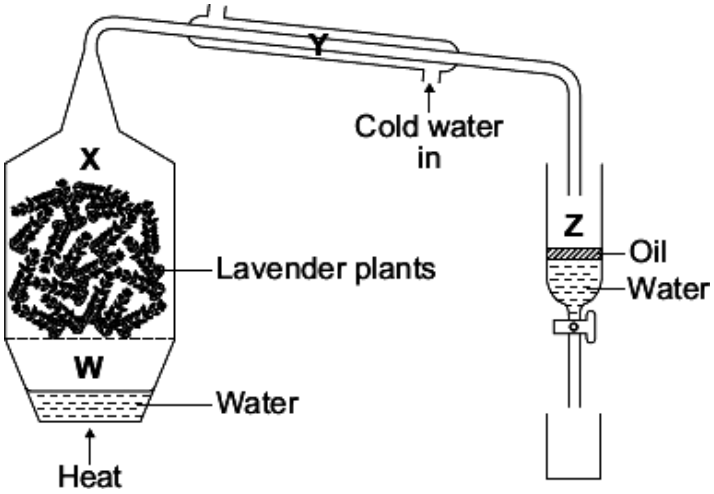
(3)
(Total 9 marks)

Q9. This question is about plant oils.

(a) Steam distillation is used to separate oils from plants.

The diagram shows some apparatus that can be used to separate oil from lavender plants.
Four parts of the apparatus are labelled **W**, **X**, **Y** and **Z.**



Describe how lavender oil is separated from the plant material.

You need to describe what happens in each of the parts, **W**, **X**, **Y** and **Z**, of the apparatus.

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(4)

(b) Olive oil can be used in the manufacture of margarine.
Olive oil has a melting point of – 6 °C and contains about 11% saturated fat and 89% unsaturated fat.

(i) Describe a test to show that olive oil contains unsaturated compounds.

Give the result of the test.

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(2)

(ii) To make margarine from olive oil the percentage of unsaturated fat needs to be decreased.

Give **one** reason why.

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(1)

(iii) Describe how to decrease the percentage of unsaturated fat in olive oil.

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(3)
(Total 10 marks)

Q10. Olive oil has a melting point of −6°C and a boiling point of 300°C.
Olive oil has a high content of healthy, unsaturated fats.

(a) Olive oil can be hardened by reacting it with hydrogen.

(i) State the conditions needed for this reaction.

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(2)

(ii) A student said that hardening would make olive oil healthier.

Is this student's hypothesis correct?

Explain your answer in terms of what happens in the hardening process.

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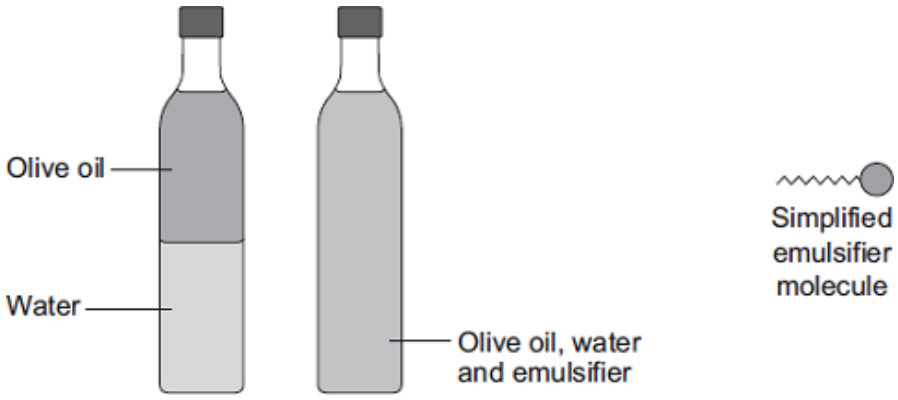
(2)

(b) Olive oil and water do not mix.
A salad dressing is made by shaking olive oil and water with an emulsifier.



Explain how these emulsifier molecules are able to produce a stable mixture after shaking olive oil and water.

Use the diagram of the simplified emulsifier molecule to help you to answer this question.

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(3)
(Total 7 marks)