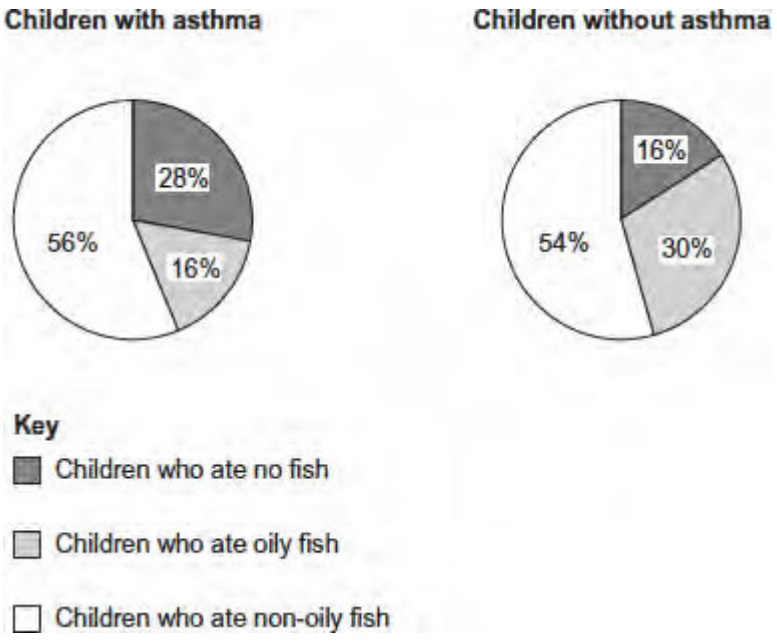
Q1. Nutritionists investigated the relationship between eating oily and non-oily fish and the incidence of asthma. They analysed the diets of children with asthma and the diets of children without asthma.

The pie charts show the results.



(a) What conclusions can you make from the data?

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[Extra space] .....

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(3)

(b) Describe how you could use the emulsion test to show the presence of oil in a sample of fish.

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(3)
(Total 6 marks)

Q2.(a) Describe how you would test a piece of food for the presence of lipid.

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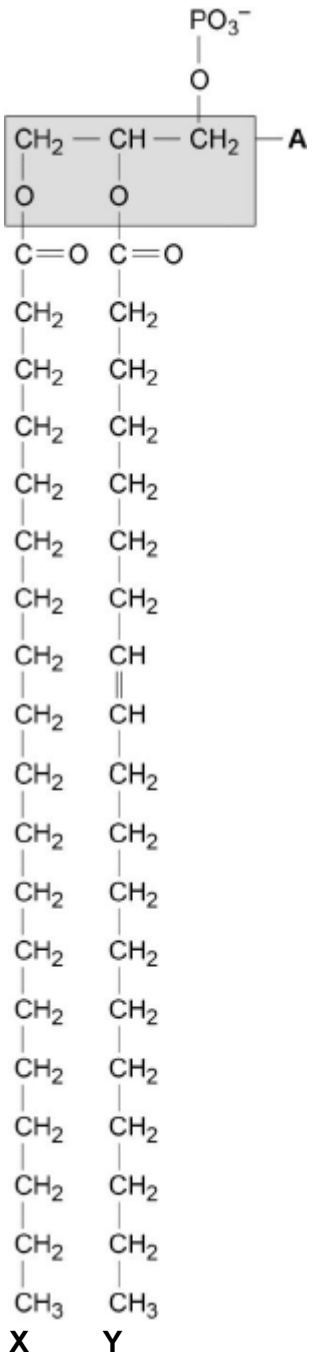
(2)

The figure below shows a phospholipid.



(b) The part of the phospholipid labelled **A** is formed from a particular molecule. Name this molecule.

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(1)

(c) Name the type of bond between **A** and fatty acid **X**.

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(1)

(d) Which of the fatty acids, **X** or **Y**, in the figure above is unsaturated? Explain your answer.

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(1)

Scientists investigated the percentages of different types of lipid in plasma membranes from different types of cell. The table shows some of their results.

Type of lipid	**Percentage of lipid in plasma membrane by mass**		
	Cell lining ileum of mammal	**Red blood cell of mammal**	**The bacterium *Escherichia coli***
Cholesterol	17	23	0
Glycolipid	7	3	0
Phospholipid	54	60	70
Others	22	14	30

(e) The scientists expressed their results as **Percentage of lipid in plasma membrane by mass**. Explain how they would find these values.

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(2)

Cholesterol increases the stability of plasma membranes. Cholesterol does this by making membranes less flexible.

(f) Suggest **one** advantage of the different percentage of cholesterol in red blood cells compared with cells lining the ileum.

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(1)

(g) *E. coli* has no cholesterol in its cell-surface membrane. Despite this, the cell maintains a constant shape. Explain why.

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(2)
(Total 10 marks)

Q3. Newborn babies can be fed with breast milk or with formula milk. Both types of milk contain carbohydrates, lipids and proteins.

- Human breast milk also contains a bile-activated lipase. This enzyme is thought to be inactive in milk but activated by bile in the small intestine of the newborn baby.
- Formula milk does not contain a bile-activated lipase.

Scientists investigated the benefits of breast milk compared with formula milk.

(a) The scientists used kittens (newborn cats) as model organisms in their laboratory investigation.

Other than ethical reasons, suggest **two** reasons why they chose to use cats as model organisms.

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2 .....

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(2)

(b) Before starting their experiments, the scientists confirmed that, like human breast milk, cat's milk also contained bile-activated lipase.

To do this, they added bile to cat's milk and monitored the pH of the mixture.

Explain why monitoring the pH of the mixture could show whether the cat's milk contained lipase.

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(2)

The scientists then took 18 kittens. Each kitten had been breastfed by its mother for the previous 48 hours.

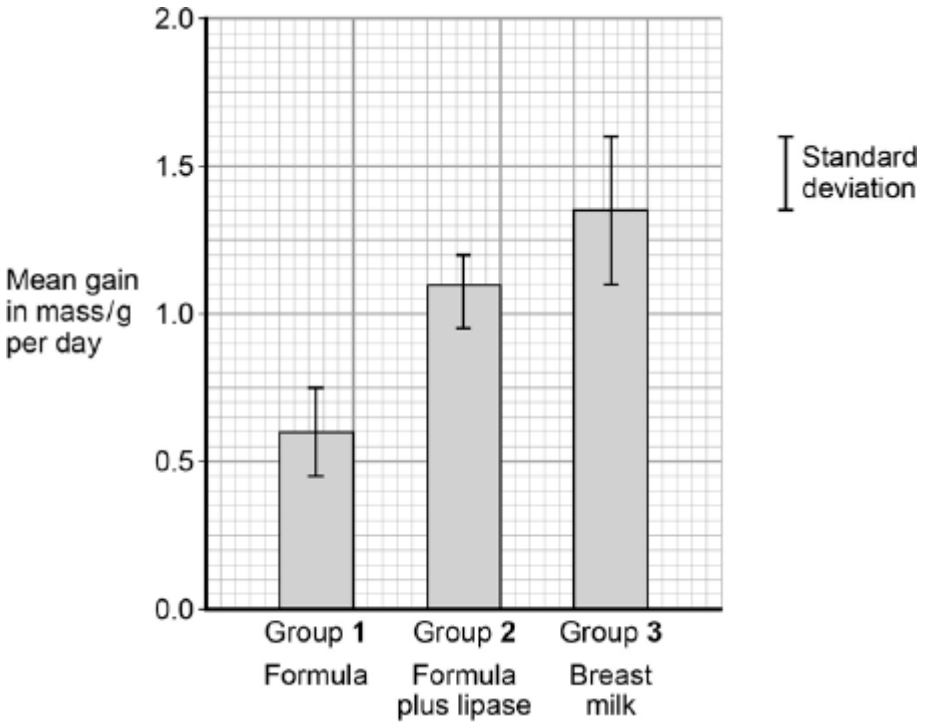
The scientists divided the kittens randomly into three groups of six.

- The kittens in group **1** were fed formula milk.
- The kittens in group **2** were fed formula milk plus a supplement containing bile-activated lipase.
- The kittens in group **3** were fed breast milk taken from their mothers.

Each kitten was fed 2 cm^3 of milk each hour for 5 days.

The scientists weighed the kittens at the start of the investigation and on each day for 5 days.

The figure below shows the scientists' results.



Type of milk given to kittens

(c) What can you conclude from the figure about the importance of bile-activated lipase in breast milk?

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(Extra space) .....

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(3)
(Total 7 marks)

Q4.(a) Some seeds contain lipids. Describe how you could use the emulsion test to show that a seed contains lipids.

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(*Extra space*) .....

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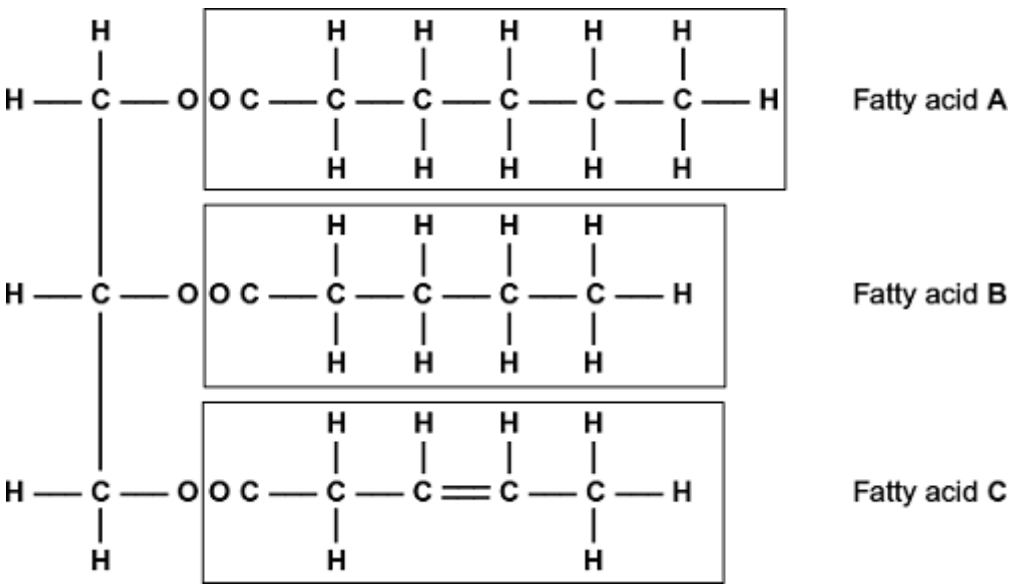
(3)

(b) A triglyceride is one type of lipid. The diagram shows the structure of a triglyceride molecule.



(i) A triglyceride molecule is formed by condensation. From how many molecules is this triglyceride formed?

(1)

(ii) The structure of a phospholipid molecule is different from that of a triglyceride. Describe how a phospholipid is different.

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(2)

(iii) Use the diagram to explain what is meant by an unsaturated fatty acid.

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(2)
(Total 8 marks)

Q5. (a) Omega-3 fatty acids are unsaturated. What is an unsaturated fatty acid?

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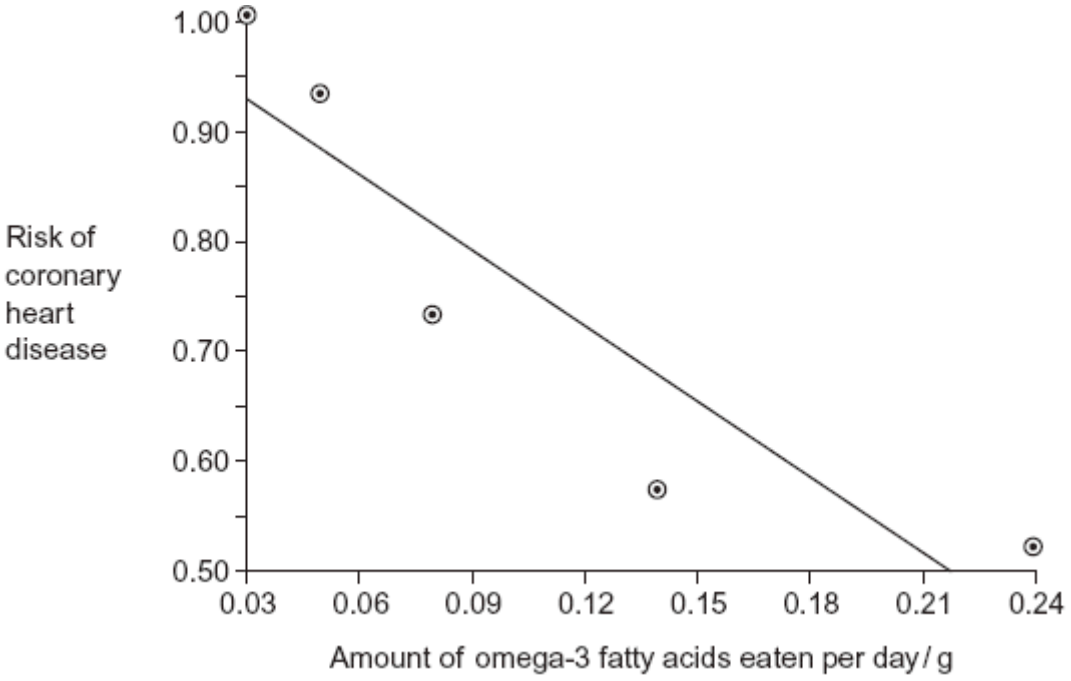
(2)

(b) Scientists investigated the relationship between the amount of omega-3 fatty acids

eaten per day and the risk of coronary heart disease. The graph shows their results.



Do the data show that eating omega-3 fatty acids prevents coronary heart disease? Explain your answer.

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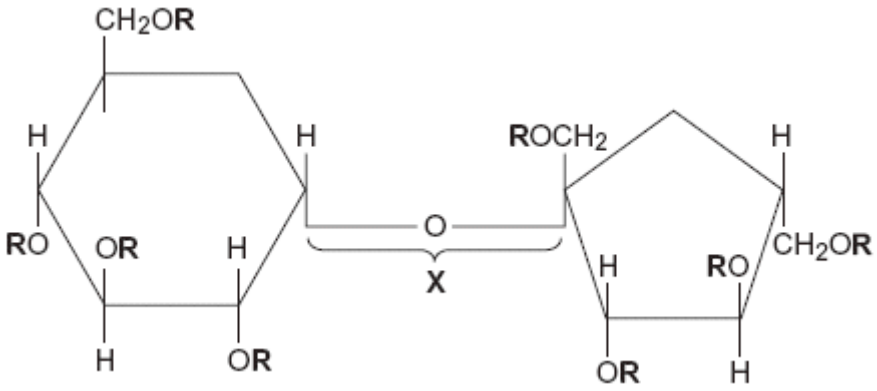
(3)

(c) Olestra is an artificial lipid. It is made by attaching fatty acids, by condensation, to a sucrose molecule. The diagram shows the structure of olestra. The letter **R** shows where a fatty acid molecule has attached.



(i) Name bond **X**.

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(1)

(ii) A triglyceride does **not** contain sucrose or bond **X**. Give **one** other way in which the structure of a triglyceride is different to olestra.

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(1)

(iii) Starting with separate molecules of glucose, fructose and fatty acids, how many molecules of water would be produced when one molecule of olestra is formed?

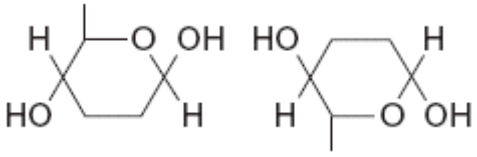
(1)
(Total 8 marks)

Q6.(a) The table shows some substances found in cells. Complete the table to show the properties of these substances. Put a tick in the box if the statement is correct.

Statement	Substance			
	Starch	Glycogen	Deoxyribose	DNA helicase
Substance contains only the elements carbon, hydrogen and oxygen				
Substance is made from amino acid monomers				
Substance is found in both animal cells and plant cells				

(4)

(b) The diagram shows two molecules of β-glucose.



On the diagram, draw a box around the atoms that are removed when the two β-glucose molecules are joined by condensation.

(2)

(c) (i) Hydrogen bonds are important in cellulose molecules. Explain why.

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(2)

(ii) A starch molecule has a spiral shape. Explain why this shape is important to its function in cells.

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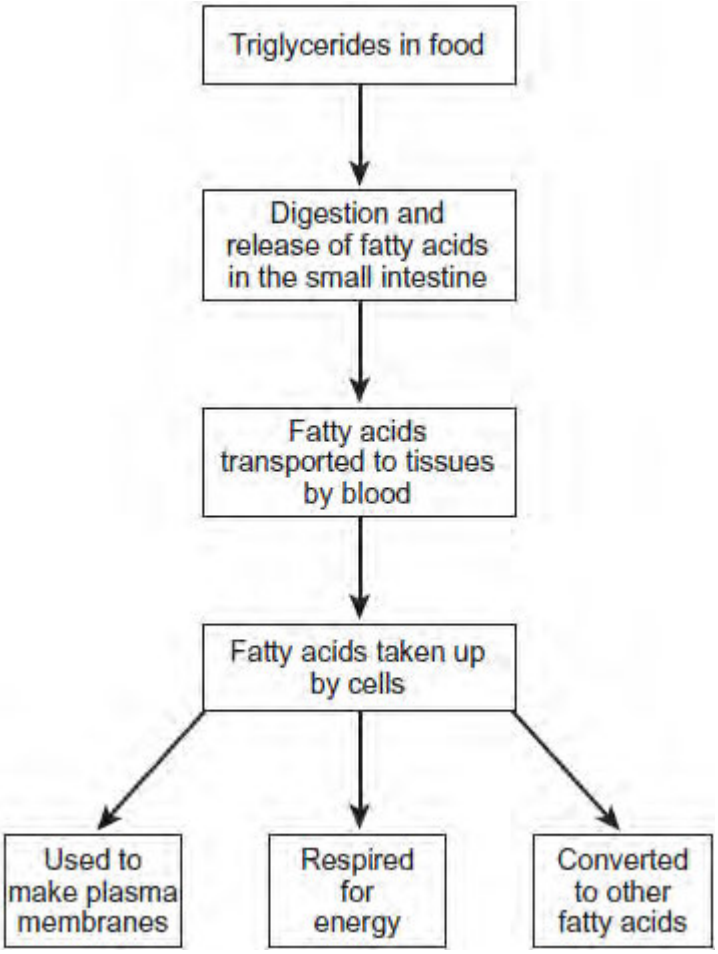
(1)
(Total 9 marks)

Q7. Triglycerides are taken into the body as part of a balanced diet. These triglycerides contain fatty acids including omega-3 fatty acids. It has been discovered that omega-3 fatty acids are associated with health benefits. The benefits include faster development of nerve cells and clearer vision. Omega-3 fatty acids are also associated with protection from heart disease, arthritis and cancer.

The following figure shows how omega-3 and other fatty acids are taken in and used by the bodies of animals including humans.



Use the information in the figure to explain **two** ways in which fatty acids are important in the formation of new cells.

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2. .....

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(Total 4 marks)