



**Exampro A-level Biology
(7401/7402)**

Name:

Class:

Lipids MS

Author:

Date:

Time: **34**

Marks: **27**

Comments:

Q1.(a) Some seeds contain lipids. Describe how you could use the emulsion test to show that a seed contains lipids.

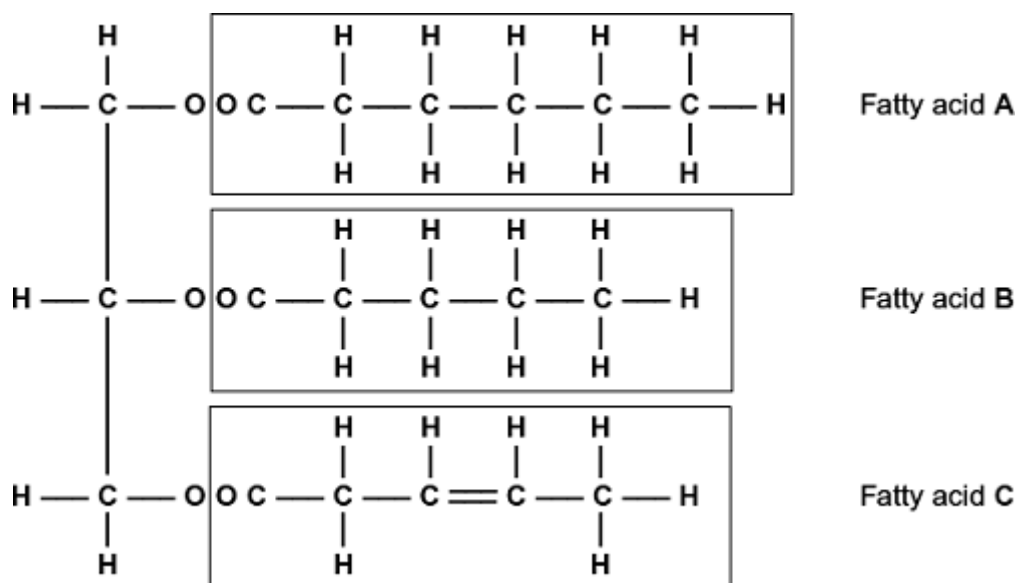
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(3)

(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)

Q2. S In an investigation, the effects of caffeine on performance during exercise were measured. One group of athletes (**A**) was given a drink of decaffeinated coffee. Another group (**B**) was given a drink of decaffeinated coffee with caffeine added. One hour later the athletes started riding an exercise bike and continued until too exhausted to carry on. Three days later the same athletes repeated the experiment, with the drinks exchanged.

- (a) (i) The researchers added caffeine to decaffeinated coffee. Explain why they did not just use normal coffee.

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(1)

- (ii) The performance of the athletes might have been influenced by how they expected the caffeine to affect them. How could the researchers avoid this possibility?

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(1)

During the exercise the concentrations of glycerol and fatty acids in the blood plasma were measured. The results are shown in the table.

Drink	Mean time to exhaustion /minutes	Mean concentration of blood glycerol/ mmol dm ⁻³	Mean concentration of blood fatty acids/ mmol dm ⁻³
With caffeine	90.2	0.20	0.53
Without caffeine	75.5	0.09	0.31

- (b) (i) Describe the effect of caffeine on exercise performance.

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(1)

- (ii) Suggest **one** explanation for the higher glycerol and fatty acid concentrations in the blood plasma of the athletes after they were given caffeine.

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(2)

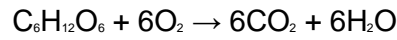
- (c) The researchers measured the volumes of carbon dioxide exhaled and oxygen inhaled during the exercise. From the results they calculated the respiratory quotient (RQ), using the formula

$$RQ = \frac{\text{volume of carbon dioxide exhaled per minute}}{\text{volume of oxygen inhaled per minute}}$$

When a person is respiring carbohydrate only, RQ = 1.0

When a person is respiring fatty acids only, RQ = 0.7

(i) The basic equation for the respiration of glucose is



Explain why the RQ for glucose is 1.0.

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(2)

(ii) The researchers found that, when the athletes were given the drink containing caffeine, their mean RQ was 0.85. When given the drink without caffeine their mean RQ was 0.92.

The researchers concluded that when the athletes had caffeine they used glycogen more slowly than when they did not have caffeine, and that the store of glycogen in their muscles was used up less quickly during the exercise.

Explain the evidence from the information above and from the table which supports these conclusions.

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(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)

- (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.

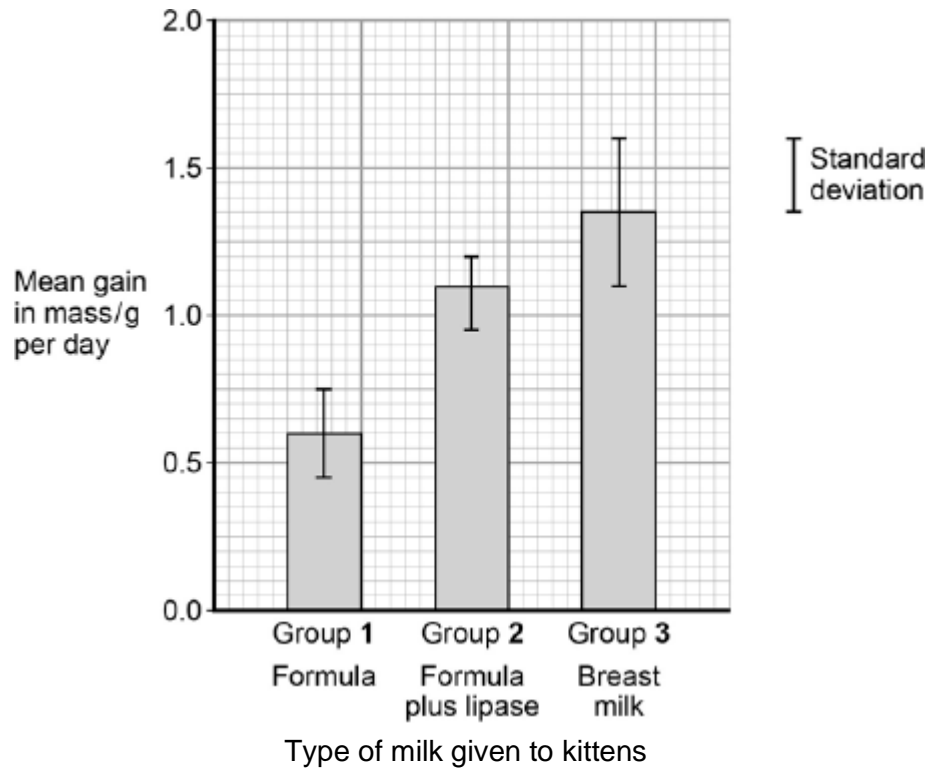
The scientists divided the kittens randomly into three groups of six.

- 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 cm³ 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.



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

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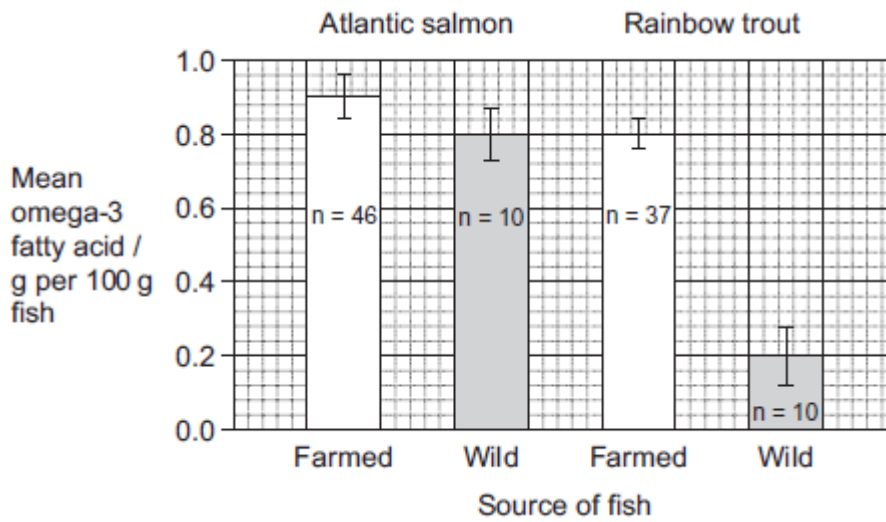
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(3)
(Total 7 marks)

Q4. Omega-3 fatty acids are also found in fish. Scientists investigated the concentration of omega-3 fatty acids from wild-caught and farmed fish. Their results are shown in the figure below.



The bars show standard deviation; n is the sample size.

It is **not** possible to conclude from the data that the concentration of omega-3 fatty acids in the farmed salmon is higher than that of the wild salmon. Use the data to explain why.

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(Total 2 marks)