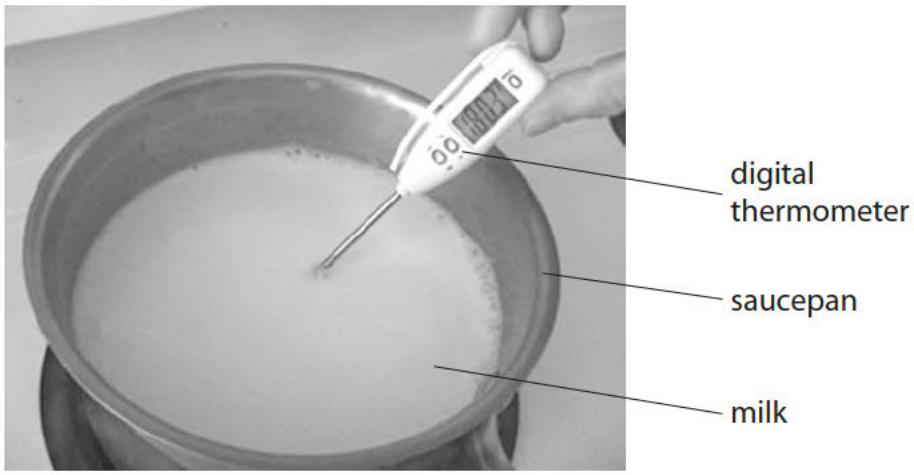
1 A student found the following instructions for making yoghurt on the internet.



- put milk in a saucepan and heat the milk to 80 °C
- pour the hot milk into a bowl and leave to cool to 46 °C
- add the organisms needed to change the milk into yoghurt
- pour the yoghurt into glass jars and put them into a warm place for 8 hours
- pour the yoghurt into a sterile, airtight container and put it in the fridge

(a) Name an organism added to change the milk into yoghurt.

(1)

.....

(b) Explain why the milk is heated to 80 °C.

(2)

.....

.....

.....

.....

(c) Explain why the milk must be cooled to 46 °C.

(2)

(d) Explain why the yoghurt is kept in a warm place for 8 hours.

(2)

(e) Changes take place to the pH of the yoghurt when it is kept warm for 8 hours.

Describe and explain how the change in pH helps to preserve the yoghurt.

(3)

(Total for Question = 10 marks)

2 (a) Describe how the process of nitrification affects the availability of nitrates to plants.

(2)

(b) Some farmers grow legume plants such as clover in their fields. They then plough them into the soil before growing their cereal crops.

Suggest why they do this.

(4)

(c) Explain why only about 10% of the energy in the cereal crop is transferred to organisms that eat the crop.

(2)

(Total for Question = 8 marks)

3 The table gives information about what happens to energy in food eaten by a mammal and in food eaten by a fish.

	Percentage of energy in the food that is absorbed	Percentage of absorbed energy released by respiration	Percentage of absorbed energy assimilated into biomass
Mammal (cow)	37.5	89.1	10.9
Fish (trout)	86.0	65.0	35.0

(a) Suggest why the cow absorbs a lower percentage of energy from the food it eats than the fish.

(2)

.....

.....

.....

.....

(b) Suggest why the cow releases more of the absorbed energy by respiration than the fish.

(1)

.....

.....

(c) The data suggests that fish farming is more productive than farming cows.

Using your knowledge of energy transfer, suggest two ways in which the productivity of cows could be improved.

(4)

1 .....

.....

.....

.....

.....

.....

2 .....

.....

.....

.....

.....

.....

(Total for Question = 7 marks)

4 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Snail Farming

The photograph shows a snail that is farmed for its meat.



Farming snails has many benefits. Economically, there are many people prepared to pay for the luxury of eating snail meat. The meat itself is high in protein. It is also low in fat, so snail meat is healthy to eat. Also, farming snails helps to conserve natural snail populations which are at risk due to being collected in large numbers in many places.

In the wild, snails grow fastest in warm temperatures and a humid atmosphere. Maintaining these conditions on a snail farm creates problems with insect pests and bacterial infections. Natural predators of the insect pests, such as spiders, are encouraged on farms, as is the constant use of fly swatters and sticky fly traps. To prevent bacterial infections, disinfectant is added to the water used to clean the cages.

Snails are herbivores but on a snail farm they are not fed with green vegetables as might be expected. Green vegetables are not assimilated very well by many organisms. The assimilation efficiency (AE) of an organism is the percentage of total food eaten that is absorbed into the blood after digestion, and not lost as faeces. Carnivores tend to have an AE of 80%, while most leaf-eating herbivores have an AE of about 50%. However, snails have symbiotic microorganisms in their gut that release the enzyme, cellulase, to digest cellulose into glucose. This boosts their AE to about 75%. Nevertheless, snails on a farm are fed with high quality food containing a mixture of amino acids, carbohydrates, vitamins and mineral ions.

The production efficiency (PE) of an animal is the proportion of assimilated food that is turned into new biomass rather than being metabolised. Birds and mammals have a very low PE of 1 to 2%, but snails have a much higher PE. This is because the metabolic use of assimilated food, particularly glucose, is much reduced in snails.

Selective breeding is used on a snail farm to produce fast-growing snails that have thin shells and lay lots of eggs. The eggs are put on damp, sterilised soil and incubated. The young snails that hatch are put in plastic trays that are easy to clean.

(a) Explain why snail meat is healthy to eat (line 4).

(2)

(b) Suggest a reason why conservationists are pleased that snail farming exists.

(1)

(c) Name the organism used in biological control on snail farms.

(1)

(d) The shell of a snail is called an exoskeleton.

Use this information to suggest **one** mineral ion in the diet of farmed snails that would help them to make their shell.

(1)

(e) (i) Suggest why many organisms cannot assimilate green vegetables very well (lines 14 and 15).

(2)

(ii) Calculate the assimilation efficiency (AE) of a snail that ate 4.0 g of food and produced 1.2 g of faeces.
Show your working.

(2)

Answer ..... %

(f) Suggest why the production efficiency (PE) of birds and mammals is much less than the PE of snails (lines 23 and 24).

(2)

.....

.....

.....

.....

.....

(g) What is meant by the term **selective breeding** (line 26)?

(1)

.....

.....

.....

(h) Suggest why snail eggs are put on soil that has been sterilised (line 27).

(1)

.....

.....

.....

(Total for Question = 13 marks)