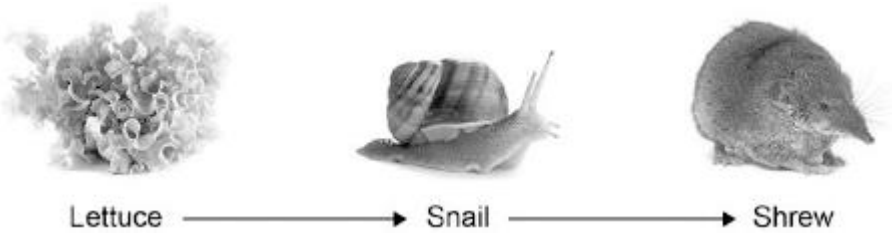
Q1. The diagram below shows a food chain in a garden.



Lettuce © destillat/iStock/Thinkstock; Snail ©Valengilda/iStock/Thinkstock; Shrew © GlobalT/iStock/Thinkstock

(a) Name **one consumer** shown in the diagram above.

.....

(1)

(b) Name **one carnivore** shown in the diagram above.

.....

(1)

(c) A disease kills most of the shrews in the garden.

Suggest why the number of snails in the garden may then increase.

.....

.....

(1)

(d) What is the name given to all the snails in the garden shown in the diagram above?

Tick **one** box.

Community ☐

Ecosystem ☐

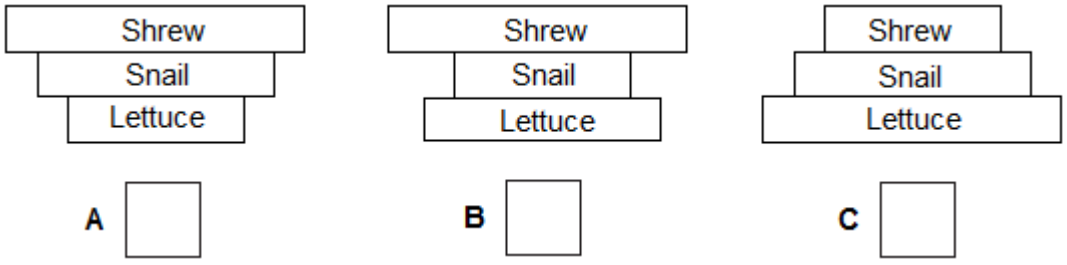
Population ☐

Territory ☐

(1)

(e) Which pyramid of biomass is correct for the food chain shown in the diagram above?

Tick **one** box.



(1)

(f) Some snails ate some lettuces.

The lettuces contained 11 000 kJ of energy.

Only 10% of this energy was transferred to the snails.

Calculate the energy transferred to the snails from the lettuces.

.....

Energy = ... kJ

(1)

(g) Give **one** reason why only 10% of the energy in the lettuces is transferred to the snails.

Tick **one** box.

The lettuces carry out photosynthesis ☐

The snails do not eat the roots of the lettuces ☐

Not all parts of a snail can be eaten ☐

(1)

(h) **Abiotic** factors can affect the food chain.

Wind direction is one abiotic factor.

Name **one other** abiotic factor.

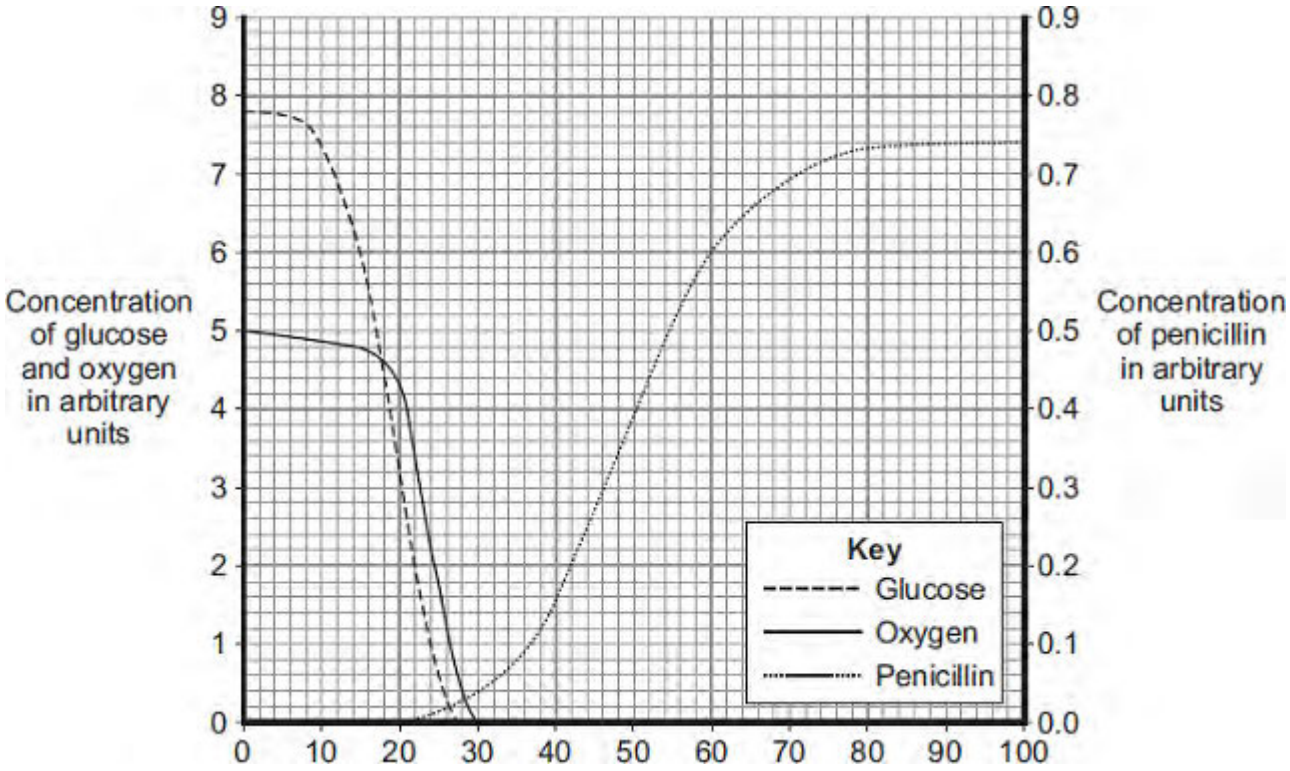
.....

(1)

(Total 8 marks)

Q2. The mould *Penicillium* can be grown in a fermenter. *Penicillium* produces the antibiotic penicillin.

The graph shows changes that occurred in a fermenter during the production of penicillin.



(a) During which time period was penicillin produced most quickly?

Draw a ring around **one** answer.

0 – 20 hours **40 – 60 hours** **80 – 100 hours**

(1)

(b) (i) Describe how the concentration of glucose in the fermenter changes between 0 and 30 hours.

.....

.....

.....

.....

(2)

(ii) How does the change in the concentration of oxygen in the fermenter compare with the change in concentration of glucose between 0 and 30 hours?

Tick (✓) **two** boxes.

The oxygen concentration changes after the glucose concentration.	☐
The oxygen concentration changes before the glucose concentration.	☐
The oxygen concentration changes less than the glucose concentration.	☐
The oxygen concentration changes more than the glucose concentration.	☐

(2)

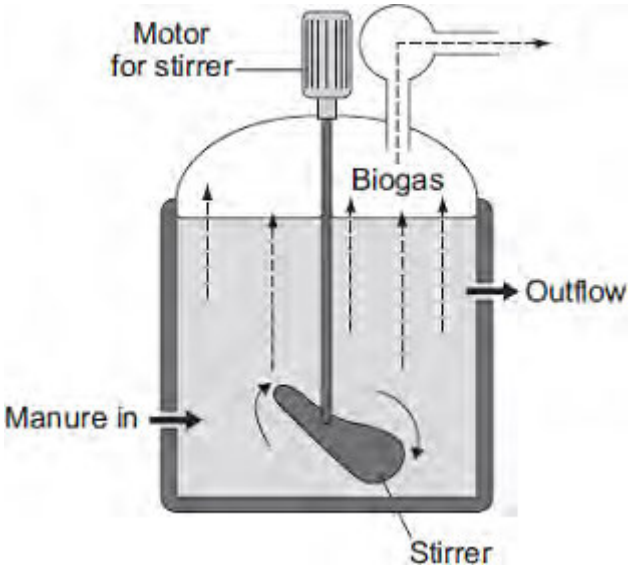
(iii) What is the name of the process that uses glucose?

Draw a ring around **one** answer.

distillation **filtration** **respiration**

(1)
(Total 6 marks)

Q3. The diagram shows one type of biogas generator.



(a) With this type of biogas generator, the concentration of solids that are fed into the reactor must be kept very low.

Suggest **one** reason for this.

Tick (✓) **one** box.

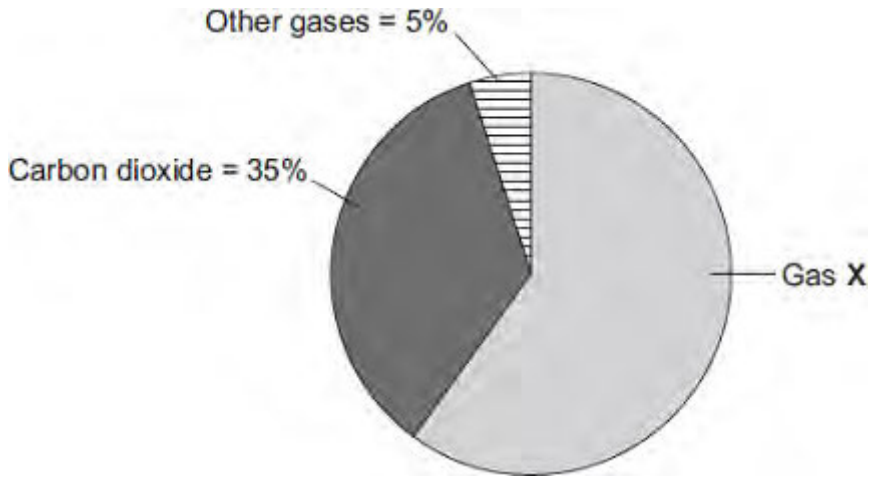
A higher concentration contains too little oxygen. ☐

A higher concentration would be difficult to stir. ☐

A higher concentration contains too much carbon dioxide. ☐

(1)

(b) The pie chart shows the percentages of the different gases found in the biogas.



Gas **X** is the main fuel gas found in the biogas.

(i) What is the name of gas **X**?

Draw a ring around **one** answer.

methane **nitrogen** **oxygen**

(1)

(ii) What is the percentage of gas **X** in the biogas?

Show clearly how you work out your answer.

.....

.....

Percentage of gas **X** = ...

(2)

(c) If the biogas generator is not airtight, the biogas contains a much higher percentage of carbon dioxide.

Draw a ring around **one** answer in each part of this question.

(i) The air that leaks in will increase the rate of

aerobic respiration.
anaerobic respiration.

fermentation.

(1)

(ii) The process in part (c)(i) occurs because the air contains

ammonia.
nitrogen.
oxygen.

(1)
(Total 6 marks)

Q4. Some students wanted to find the number of thistle plants growing on a lawn.
The students placed 10 quadrats at different positions on the lawn.
Each quadrat measured 1 metre × 1 metre.
The students counted the number of thistle plants in each quadrat.

(a) Which method should the students use to decide where to place the 10 quadrats?

Tick (✓) **one** box.

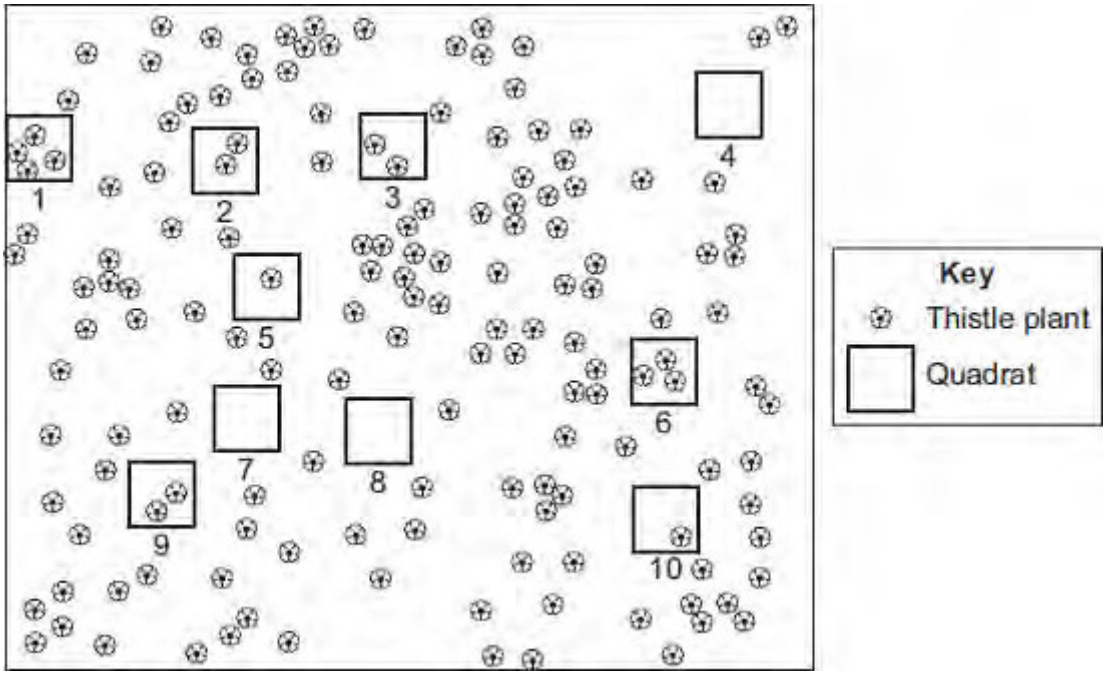
Place the quadrats as evenly as possible around the lawn. ☐

Place 5 quadrats in areas with many thistle plants and 5 quadrats in areas with only a few thistle plants. ☐

Place all the quadrats randomly on the lawn. ☐

(1)

(b) The diagram shows the lawn with the positions of the thistle plants and the students' 10 quadrats.



(i) Complete the table to show:

- how many thistle plants the students found in each of the first four quadrats

- the total number of thistle plants found in all 10 quadrats.

Quadrat number	Number of thistle plants in each quadrat
1	
2	
3	
4	
5	1
6	3
7	0
8	0
9	2
10	1
Total	

(2)

(ii) Calculate the mean number of thistle plants in one quadrat.

.....

Mean = ...

(1)

(iii) The lawn measured 12 metres long and 10 metres wide.

Use your answer from part (b)(ii) to estimate the number of thistle plants on the lawn.

.....

.....

Estimated number of thistle plants = ...

(2)

(c) How could the students make their estimate more accurate?

.....

.....

(1)

(Total 7 marks)

Q5. Gardeners often collect fallen leaves in autumn and place them on compost heaps.



(a) Over the next year the leaves decay.

Which living things cause decay?

.....

(1)

(b) The leaves decay more quickly in summer than in winter.

Give **one** reason why.

.....

.....

(1)

(c) The compost heap has holes in its sides to let gases enter.

Which gas is needed for decay?

Tick (✓) **one** box.

Carbon dioxide ☐

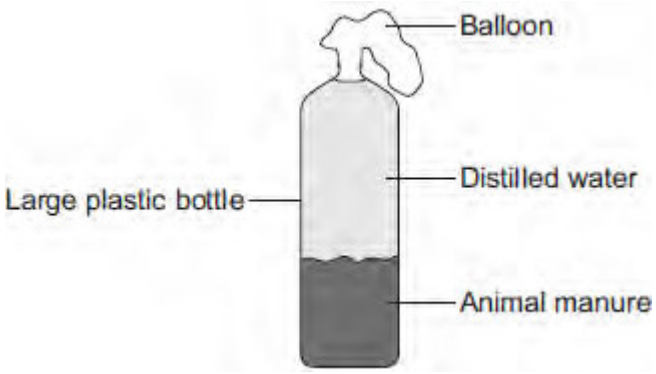
Nitrogen ☐

Oxygen 

(1)
(Total 3 marks)

Q6. Some students set up biogas generators to find out which type of animal manure produced the most biogas.

The diagram shows the apparatus they used.



The students:
Step 1: Put some cow manure into the plastic bottle
Step 2: Filled the bottle with distilled water
Step 3: Attached a balloon over the top of the bottle
Step 4: Put the bottle in a warm room for 10 days
Step 5: Measured the diameter of the balloon on day 10
Step 6: Repeated steps 1 to 5 using each type of animal manure.

The students' results are shown in the table.

Type of animal manure	**Diameter of balloon on day 10 in cm**
Cow	29
Horse	26
Sheep	34
Pig	32

(a) What is the main gas found in biogas?

.....

(1)

(b) The students concluded that sheep manure is the best type of manure to use in a biogas generator.

A teacher told the students that the design of their investigation meant that their

conclusion might **not** be correct.

Suggest **two** reasons why.

1.....

.....

2.....

.....

(2)

(c) Another student suggested that adding potato to the manure would increase the amount of biogas produced.

Why would adding potato increase the amount of biogas produced?

Tick (✓) **one** box.

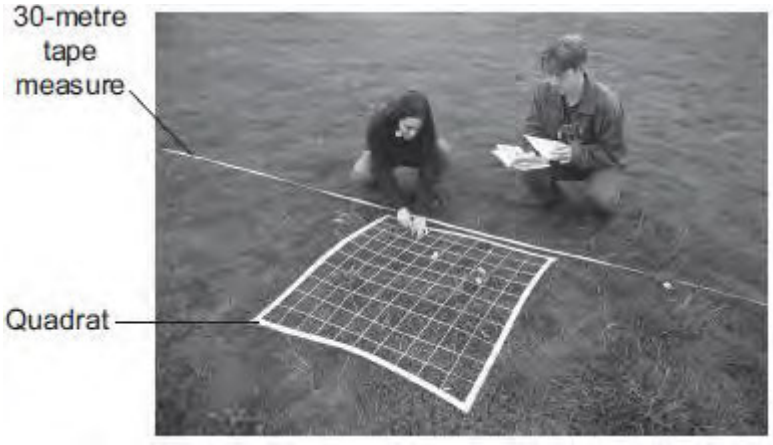
The potato contains a lot of carbohydrate.	☐
The potato contains a lot of protein.	☐
The potato contains a lot of water.	☐

(1)
(Total 4 marks)

Q7. Some students investigated the distribution of dandelion plants in a grassy field. The grassy field was between two areas of woodland.

Figure 1 shows two students recording how many dandelion plants there are in a 1 metre x 1 metre quadrat.

Figure 1



© Science Photo Library

Figure 2 shows a section across the area studied and **Figure 3** shows a bar chart of the students' results.

Figure 2

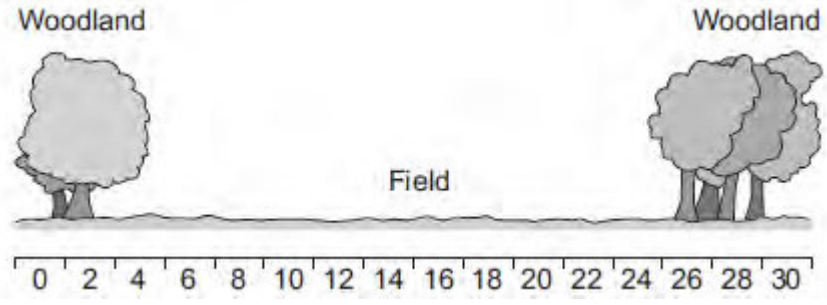
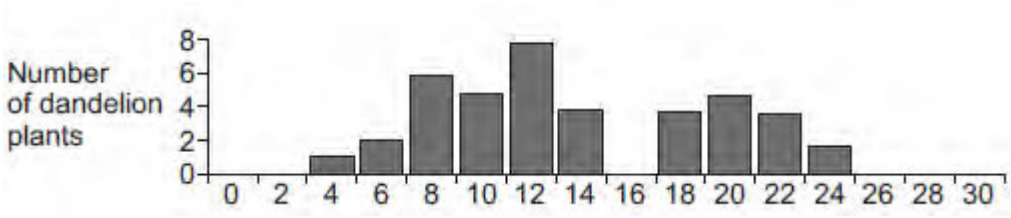


Figure 3



(a) How did the students use the quadrat and the 30-metre tape measure to get the results in **Figure 3**?

Use information from **Figure 1**.

.....

.....

.....

.....

.....

.....

(3)

(b) (i) Suggest **one** reason why the students found no dandelion plants under the trees.

.....

.....

(1)

(ii) Suggest **one** reason why the students found no dandelion plants at 16 metres.

.....

.....

(1)

(c) The teacher suggested that it was **not** possible to make a valid conclusion from these results.

Describe how the students could improve the investigation so that they could make a valid conclusion.

.....

.....

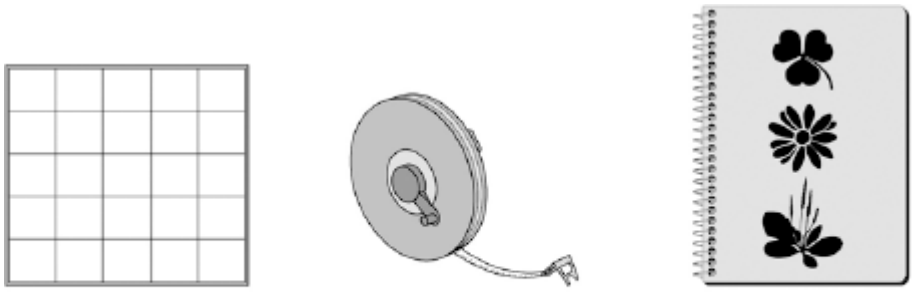
.....

.....

(2)
(Total 7 marks)

Q8.A student was asked to estimate how many clover plants there are in the school field.

The image below shows the equipment used.



Quadrat Tape Identification key

Not drawn to scale

This is the method used.

1. Throw a quadrat over your shoulder.
2. Count the number of clover plants inside the quadrat.
3. Repeat step **1** and step **2** four more times.
4. Estimate the number of clover plants in the whole field.

(a) What is the tape in the image above used for in this investigation?

.....

.....

(1)

(b) The teacher told the student that throwing the quadrat over his shoulder was **not** random.

The method could be improved to make sure the quadrats were placed randomly.

Suggest **one** change the student could make to ensure the quadrats were placed randomly.

.....

.....

(1)

(c) How could the student improve the investigation so that a valid estimate can be

made?

Tick **two** boxes.

- Weigh the clover plants ☐
- Compare their results with another student's results ☐
- Count the leaves of the clover plants ☐
- Place more quadrats ☐
- Place the quadrats in a line across the field ☐

(2)

(d) The table below shows the student's results.

Quadrat number	Number of clover plants counted
1	11
2	8
3	11
4	9
5	1
Total	40

The area of the school field was 500 m^2.

The quadrat used in the table above had an area of 0.25 m^2.

Calculate the estimated number of clover plants in the school field.

.....

.....

.....

Estimated number of clover plants = ...

(3)

(e) What was the mode for the results in the table above?

Tick **one** box.

1 ☐

8 ☐

11 ☐

40 ☐

(1)

(f) Suggest which quadrat could have been placed under the shade of a large tree.

Give **one** reason for your answer.

Quadrat number .....

Reason .....

.....

(1)

(Total 9 marks)

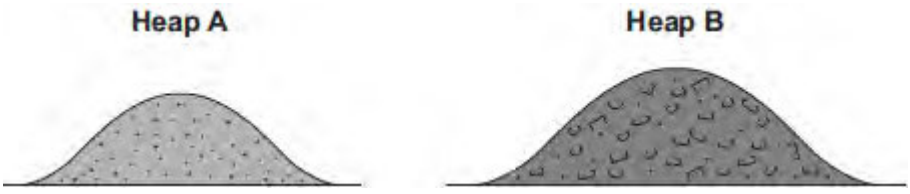
s

Q9. A gardener investigates if turning over the waste in a compost heap makes the waste decay more quickly.

The gardener:

- makes two separate heaps of garden waste, heap **A** and heap **B**
- turns over the material in heap **A** every 2 weeks
- does **not** turn over the material in heap **B**
- estimates the amount of decay in the two heaps after 6 months.

The diagram shows the two heaps of garden waste at the beginning of the investigation.



(a) Suggest **two** factors, other than time, the gardener should control to make the investigation fair.

1.....

.....

2.....

.....

(2)

(b) Name **one** type of living thing that causes decay.

.....

(1)

(c) The gardener's results are shown in the table.

Compost heap	Estimated amount of decay
A	A lot
B	Very little

(i) Why does turning over the material in heap **A** make the material decay more quickly?

.....

.....

(1)

(ii) The gardener puts decayed material around his plants to help them grow.

Suggest why the plants in a woodland grow well each year **without** material from compost heaps being added.

.....

.....

.....

.....

(2)
(Total 6 marks)