WJEC (Wales) Biology GCSE
Topic 2.1 Classification and Biodiversity
Questions by Topic

1. Organisms are divided into major groups.

(a) Use a ruler to draw a line from each of the organisms in the list below to their correct group. [3]

organism			group
insect	•	•	non-flowering plant
hedgehog	•	•	invertebrate
moss	•	•	microorganism
bacterium	•	•	vertebrate

(b) The photograph shows a bunch of daffodils *(Narcissus pseudonarcissus).*

State the major group of organisms that includes daffodils. [1]

....

2. A population of sheep lives on the Scottish island of St. Kilda.
The photograph below shows a sheep.

© soyaandboreraysheep.com

(a) Sheep are vertebrate animals.
State **one** feature common to all vertebrate animals. [1]

....

(b) The scientific name for sheep is *Ovis aries*. <u>Underline</u> the correct word to complete sentences (i) and (ii) below.

In the name *Ovis aries*:

(i) *Ovis* is the **order** / **family** / **genus** / **species** [1]

(ii) *aries* is the **order** / **family** / **genus** / **species** [1]

(d) The sheep on the island are either pale or dark in colour.

The table below gives the percentage (%) of dark sheep on St. Kilda between 1985 and 2005.

Year	Percentage (%) of dark sheep
1985	76
1990	74
1995	71
2000	70
2005	69

(i) Using the data above, plot a line graph on the grid below by:

    I.   Labelling the vertical axis. [1]

    II.   Plotting the points. [2]

    III. Joining the points with a ruler. [1]

....

....

....
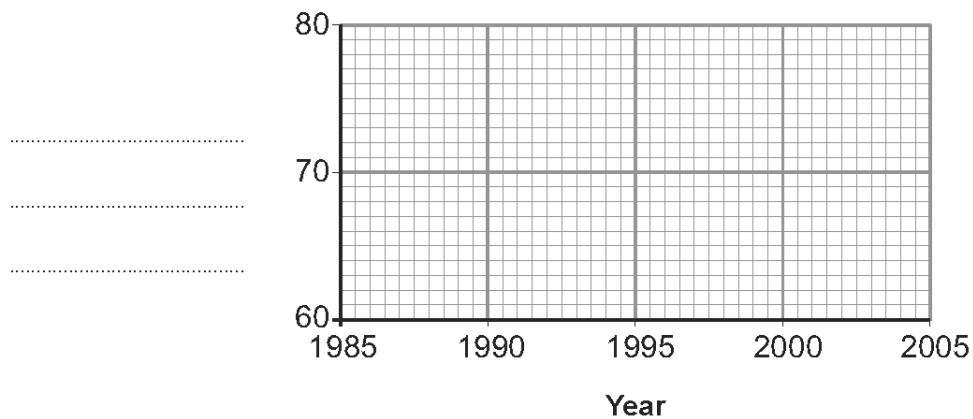
(ii) The graph below shows the mean air temperature on the island over the same period.

Mean air temperature (°C)
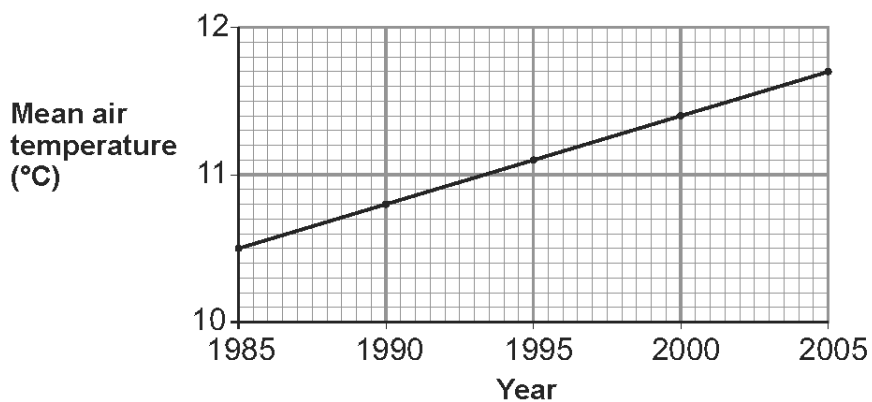
Some scientists have the opinion that the change in the percentage of dark sheep on the island is due to a change in the mean air temperature.

    I.   Using **both** of the graphs opposite, describe the evidence that supports the scientists' opinion. [1]

....

....

....

    II.   It is not possible to be sure that the change in the percentage of dark sheep on the island is due to the change in the mean air temperature.

        State **two** *other* factors that could cause the change in the percentage of dark sheep. [2]

....

....

....

11

3. Six types of whales are listed below. They were given their scientific names in the 18th century.

common name	scientific name
fin whale	*Balaenoptera physalus*
sperm whale	*Physeter catodon*
blue whale	*Balaenoptera musculus*
humpback whale	*Megaptera novaeangliae*
sei whale	*Balaenoptera borealis*
killer whale	*Orcinus orca*

(a) State which **three** of the whales were considered, in the 18th century, to be the least closely related to the fin whale. Give a reason, based on the list to support your choice.

[2]

Whales ....

....

....

Reason

....

(b) As a result of the invention of DNA profiling in the 1980s, the scientific names of many organisms have been updated. This is because the comparison of the DNA of organisms is more reliable than the comparison of external features when classifying them.
A sample of DNA from a humpback whale was compared with a sample of DNA from a fin whale, a killer whale and a sperm whale. The sequences of 100 codes for amino acids from the same section of their DNA were compared.

The results are shown in the table.

whales compared to humpback whale	similarity of DNA (%)
fin whale	92
killer whale	18
sperm whale	21

(i) In the 21st century some scientists suggested that the name of the genus of the humpback whale should be updated. Use the data given in the whole of this question to suggest a new name for the genus of the humpback whale. [1]

Suggested new genus for the humpback whale is

....

(ii) State the evidence that you used in naming the genus. [1]

....

....
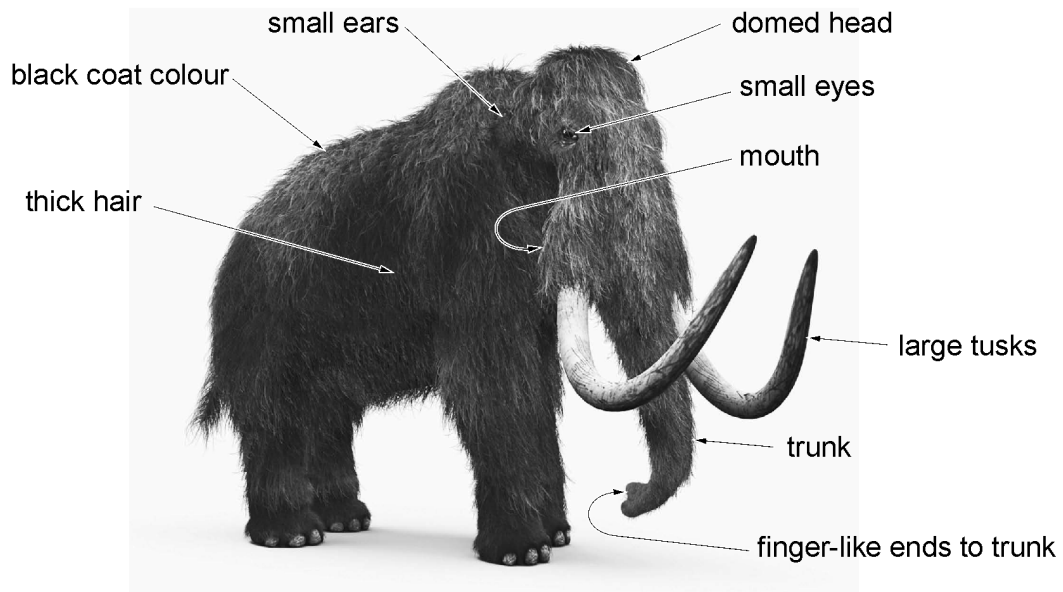
(c) State why the comparison of a sequence of 100 codes from DNA would give you more confidence in your results than using a sequence of 20 codes. [1]

....

....

4. The drawing shows an extinct mammal called the woolly mammoth *(Mammuthus primigenius).*

(a) (i) Woolly mammoths lived at a time when the climate was very cold.

Some of the labelled adaptations helped woolly mammoths keep warm.

Choose **two** of the adaptations and state how each one helped woolly mammoths keep warm. [4]

I. ....

....

....

II. ....

....

....

(ii) Woolly mammoths ate plants.

Suggest how the trunk is adapted to help woolly mammoths pick up their food. [1]

....

5.

Read the information about the palm trees.

Xaté Palm Tree   Preparing Xaté leaves for sale   Bouquet

- Xaté Palm trees grow in rain forests in Belize, Central America. Many trees are dying.
- Every year millions of palm leaves are cut and sold to florists, in Europe, for making bouquets.
- Palm trees grow slowly, producing only two leaves each year. If too many leaves are cut the tree cannot survive.
- The International Union for the Conservation of Nature (IUCN) is concerned about this endangered species and the animal species that feed on it.
- Conservationists at Bangor University have set up Project Darwin. Through this project, farmers in Belize will grow palm trees in special areas to provide leaves for the floral industry.

(a)

....

(b) How will biodiversity in rainforests be affected in the future if palm trees continue to die? Give a reason for your answer. [1]

Answer ....

....

Reason ....

6.

- Sheep and cattle can be infected with a disease caused by the bluetongue virus.
- The bluetongue virus is carried by biting insects called midges.
- Midges can be killed by insecticides.
- Researchers at Swansea University have discovered a fungus *(Metarhizium anisopliae)* that can kill midges under laboratory conditions.
- In 2011 field trials began to investigate if midges can be controlled by the fungus.

(c) What term is used to describe the use of a fungus to kill midges? [1]

....

7.

Read the information about cocoa.

- Chocolate is made from cocoa obtained from the pods of the cocoa tree.

- Many trees are killed by disease, pests and climate change.

- Every year 3.7 million tons of cocoa are produced. 70% is produced in Africa. The rest is produced equally in South America and Asia.

- By 2015 four million tons of cocoa will be needed to meet the demands of the chocolate industry.

- A mould causes the pods to rot. Farmers use either chemical pesticides or the fungus, *Trichoderma,* to kill the mould.

healthy cocoa pods

cocoa pods with pod rot

Use the information and your own knowledge to answer the following questions.

(a)   (i)   State **two** factors which can cause cocoa trees to die.   [1]

1. ....

2. ....

(c)

(ii)   What term is used for the process which uses a living organism to kill a pest?   [1]

....
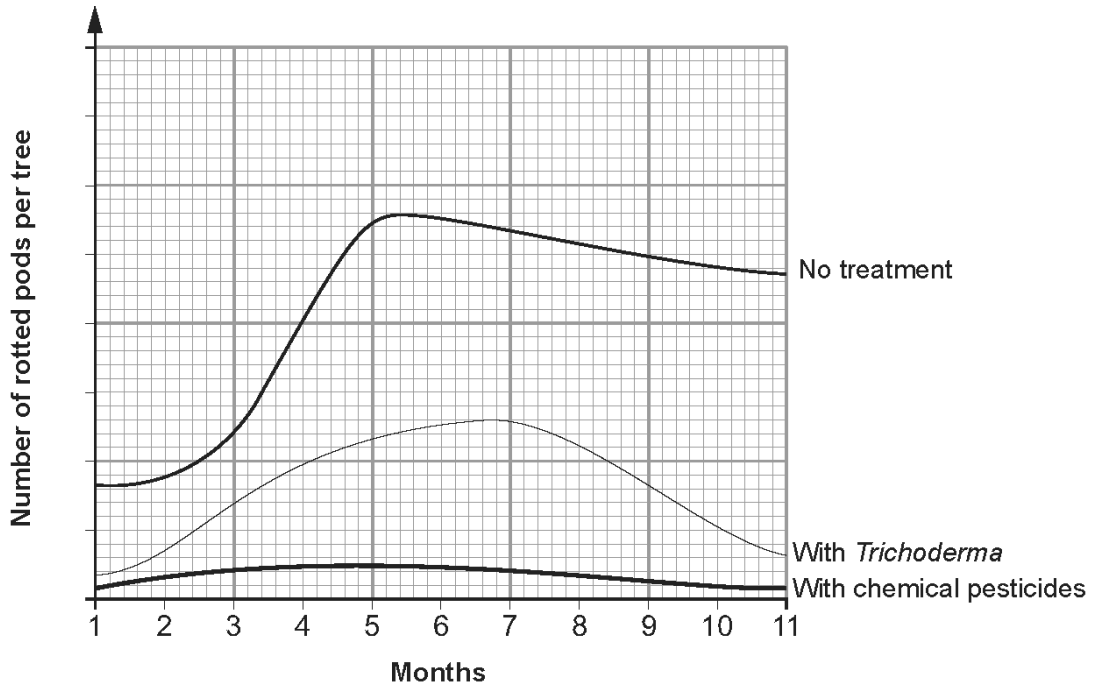
(d)   (i)   From the graph above, what is the evidence that *Trichoderma* can control pod rot?
[1]

....

....

(ii)   State **one** advantage of this type of pest control compared with using chemicals.
[1]

8.

Bats are small mammals which fly and feed at night. They roost (sleep) in trees during the day. Throughout the winter they hibernate in caves and other dark, quiet places.
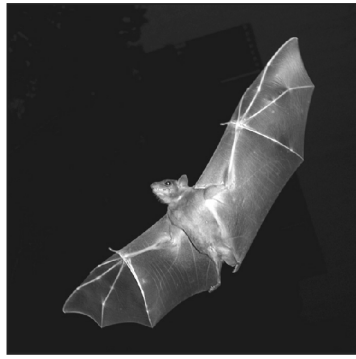
Bat flying at night
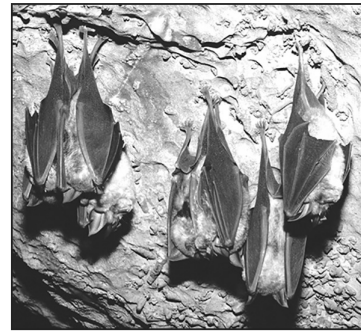
Bats roosting during the day

In the UK the number of bats decreased greatly between 1950 and 1980 because of the loss of habitat caused by agriculture and other human activities.

Since 1985 annual surveys have recorded numbers of bats. Some of the results are shown below.

Species	Survey Method	Number of days on which counts were made	Population in 1990	Population in 2014	Percentage change
Greater Horseshoe bat (*Rhinolophus ferrumequinum*)	Roost study (one count per day)	30	300 000	600 000	100
Natterer's bat (*Myotis nattereri*)	Hibernation study (three counts per day)	344	500 000	750 000	....
Common Pipistrelle bat (*Pipistrellus pipistrellus*)	Field study (three counts per day)	288	1 100 000	1 760 000	60

(a)   **Complete the table** by calculating the percentage change for the Natterer's bat.   [2]

Space for working.

(b)   (i)   What general population trend is shown in the table of results?   [1]

....

(ii)   From the table which species has shown the greatest   [2]

I.   percentage change;   ....

II.   difference in population.   ....

(e)   The population of another species of UK bat decreased steadily from 1999 to 2014. State what will happen to this species if this trend continues and describe how this will affect biodiversity in the local area.   [2]

....

....

9. Farmed salmon are kept in large numbers in sea cages. They are often infested by small invertebrate pests called fish lice.

fish louse

Fish lice damage the skin of the salmon and sometimes kill them by affecting the gills and brain. Fish farmers add pesticides to the sea cages to kill the fish lice.
The graph shows the concentration of pesticide in cages and the average number of fish lice per salmon over a period of four weeks.
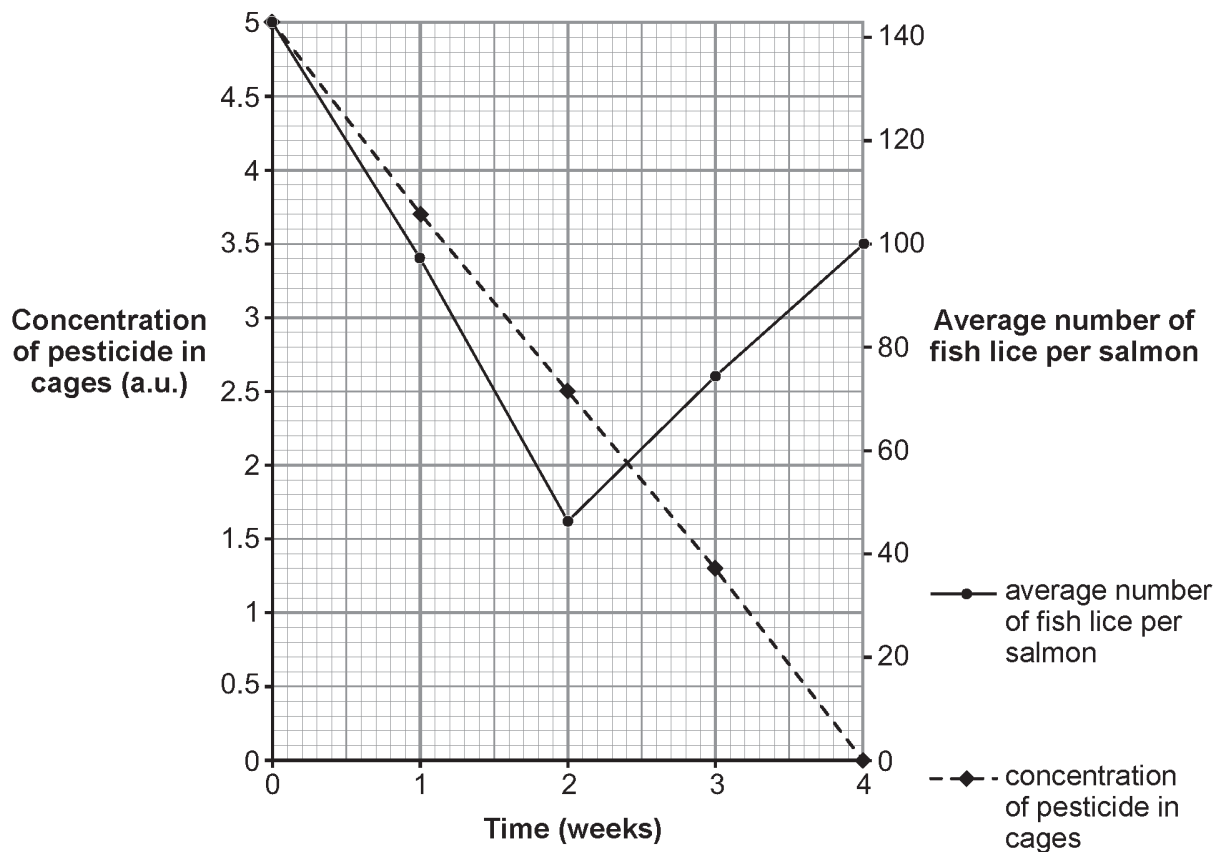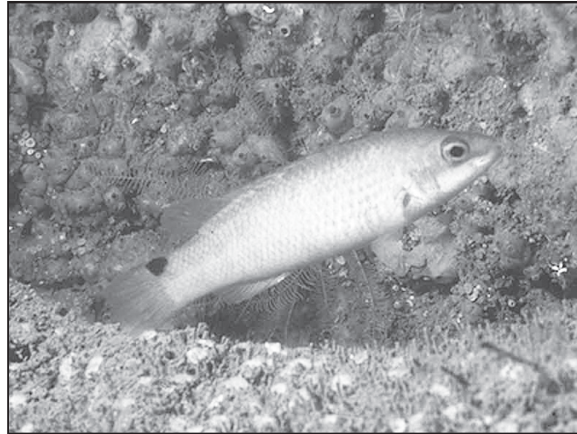
(a)　　What conclusions can be drawn from this graph?　　　　　　　　　　　　[2]

....

....

*(b)*　　The goldsinny wrasse, *Centrolabrus rupestris* eats fish lice.

In the 1980s, trials called the Ecofish Project took place in some fish farms in Norway and Scotland. 600 goldsinny wrasse were added to sea cages containing 26 000 salmon. Over a four week period, these salmon did not need any treatment with pesticides but a control group had to be treated several times.

(i)　　What is the name given to this method of control using living organisms to kill a pest?　　　　　　　　　　　　　　　　　　　　　　　　　　　　[1]
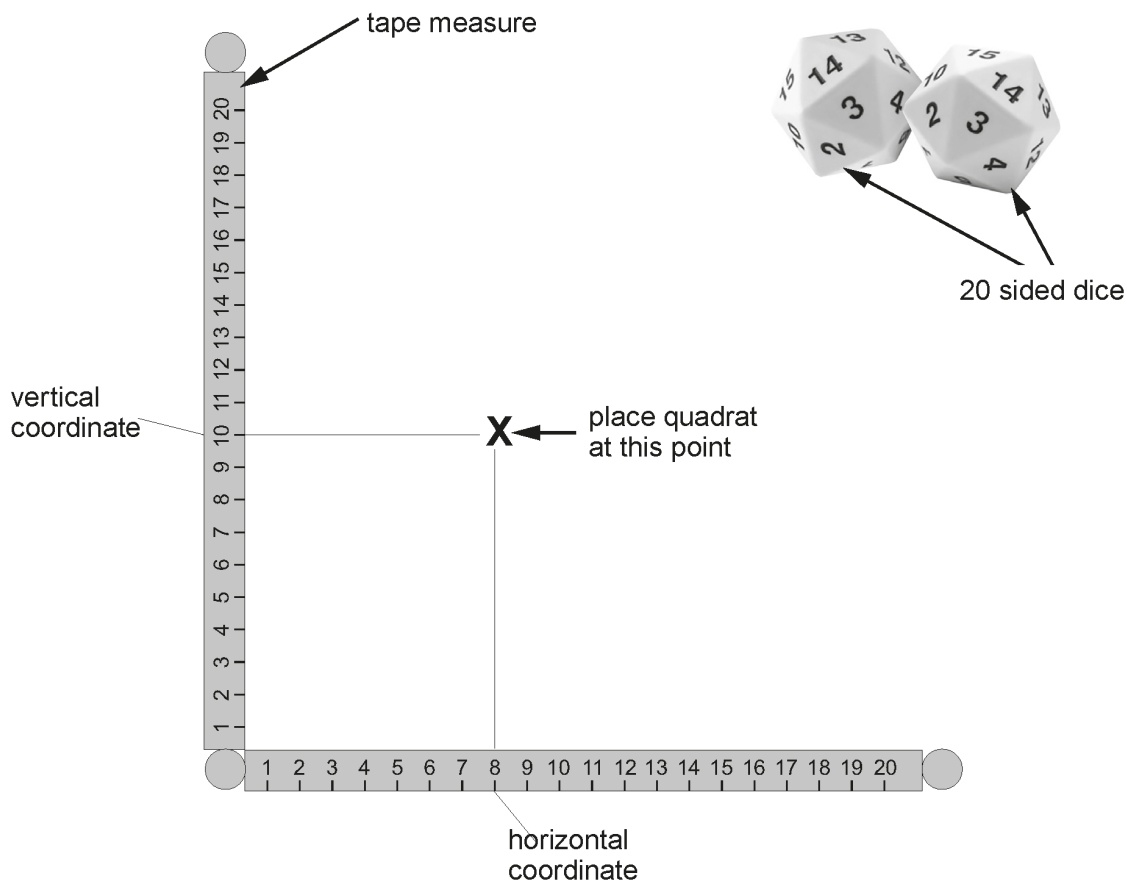
....

10.

Mair and Gavin investigated the abundance of barnacles *(Semibalanus balanoides)* using a 0.5 m × 0.5 m quadrat on a 20 m × 20 m section of rocky shore.
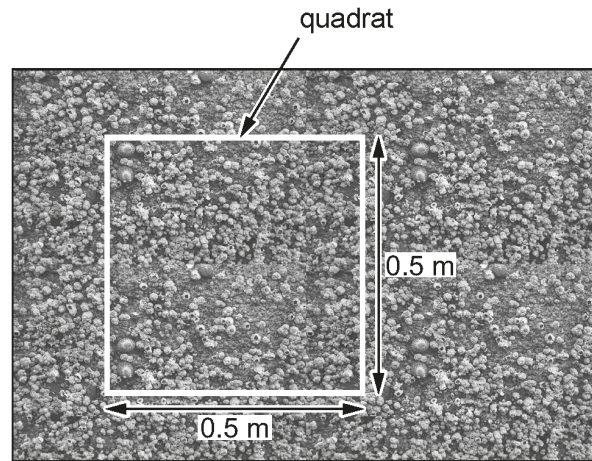
quadrat

The photograph shows a 0.5 m × 0.5 m quadrat placed on a part of the rocky shore. The barnacles are attached to rocks.

Initially Mair and Gavin marked out the section of rocky shore with two 20 m tape measures placed at right angles to one another. This is shown below.


tape measure

20 sided dice

vertical coordinate

X ← place quadrat at this point

horizontal coordinate

They threw two 20 sided dice in order to select the placement of the quadrat.

(b) Mair and Gavin wanted to sample at least 2% of their chosen area of rocky shore for barnacles. How many quadrats would they have to place? Show your working. [2]

Number of quadrats required ....

(c) Mair and Gavin's teacher gave them the following illustration about counting species using a quadrat.
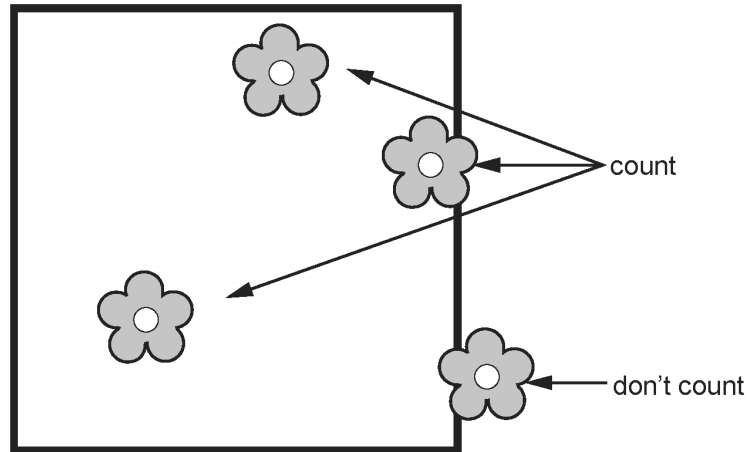
Suggest what rule of counting, using a quadrat, the illustration shows. [1]

....

....

....

(d) State **one** other method that could be used to measure the changes in abundance and distribution of species on a rocky shore. [1]

....

11. A fruit grower needs to control an insect pest in his orchard. Before deciding on a method of pest control to be used, it was necessary to estimate the size of the population of the insect pest in the orchard. This was done as follows:

- A large number of the insect pest was captured in the orchard, then marked and released there.
- A few days later the population was again sampled and the captured insect pests were found to include some marked ones.

(a) The formula which is used to estimate the total number of insect pests is given as:

$$P = \frac{Q \times R}{S}$$

where:
- P is the total number of insect pests in a population
- Q is the number of insect pests in the first sample
- R is the number of insect pests in the second sample
- S is the number of marked insect pests in the second sample

(i) Give a possible source of error in this method of estimating the size of a population. [1]

....

....

(ii) How would you improve the method to increase your confidence in the result? [1]

....

....

(b) In 2012, the European Union passed a law which required the use of both predators and specific pesticides to control pests.

(i) What term describes the use of natural predators to kill pests? [1]

....

(c) State **one** advantage and **one** disadvantage of using natural predators to control pests. [2]

Advantage: ....

....

Disadvantage: ....

....
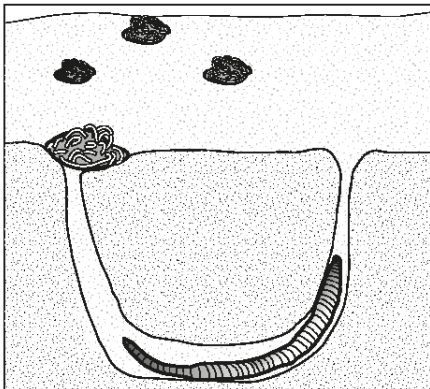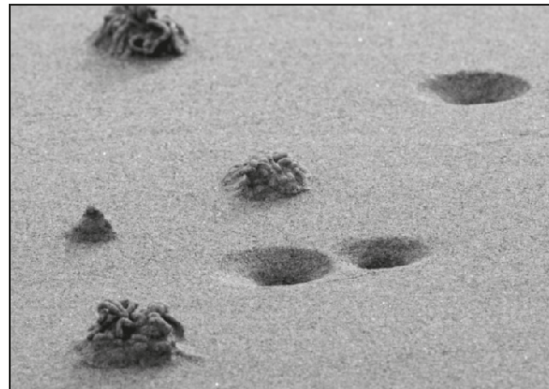
12. Lugworms *(Arenicola marina)* live in burrows in the sand on beaches. At one end of the burrow is a hole and at the other end is a mound of sand, called the cast, which the lugworm has removed from the burrow. Each burrow is occupied by one lugworm only.

Burrow in section   Surface view

© Alan Gravell

Owen was asked by his teacher to estimate the number of lugworms, on a section of Whiteford Beach on Gower, by counting the number of casts.

Owen decided to use $1\,m^2$ quadrats to estimate the number of lugworms present in an area of the beach measuring $80\,m \times 40\,m$.

(a) Which of the following methods would be the correct way for Owen to use the quadrats to sample the number of lugworms? [1]

Tick (✓) the correct answer.

method	tick (✓)
Place the quadrats where there are lots of casts	
Place the quadrats randomly within the sample area	
Place the quadrats carefully so as not to damage the casts	

(b) Owen counted the number of casts in 10 quadrat samples.
The table below shows his results.

quadrat number	number of casts
1	5
2	7
3	1
4	11
5	4
6	6
7	9
8	4
9	13
10	2
Mean	....

(i) Complete the table above by calculating the mean number of casts per quadrat of Owen's samples. [1]

(ii) Estimate the number of lugworms in the section of the beach by using the following equation: [2]

Estimated number of lugworms	=	Mean number of casts per quadrat	×	Area of section of beach

Estimated number of lugworms ....

(c) Suggest why this method of sampling would **not** be suitable for estimating the population of earthworms in an area of grassland. [1]

....

....

5

13. The Rose-bay willow-herb, *Epilobium angustifolium* is a plant that produces wind dispersed seeds.

The survival of this plant in its natural habitat was studied by counting the number of

- seeds found on the ground,
- seedlings,
- fully grown plants.

The counts were completed every 2 metres away from the parent population.

All counts were taken in the direction of the prevailing wind (direction in which the wind mainly blows).

The results are shown in the table:

distance from parent population (m)	seeds (per m^2)	seedlings (per m^2)	fully grown plants (per m^2)
2	22	20	0
4	30	25	0
6	31	30	0
8	28	25	1
10	25	20	2
12	18	15	3
14	9	9	5
16	8	5	5
18	4	3	3

(b) Calculate the percentage of seeds that survived to produce fully grown plants at 10 m from the parent plants. Show your working. [2]

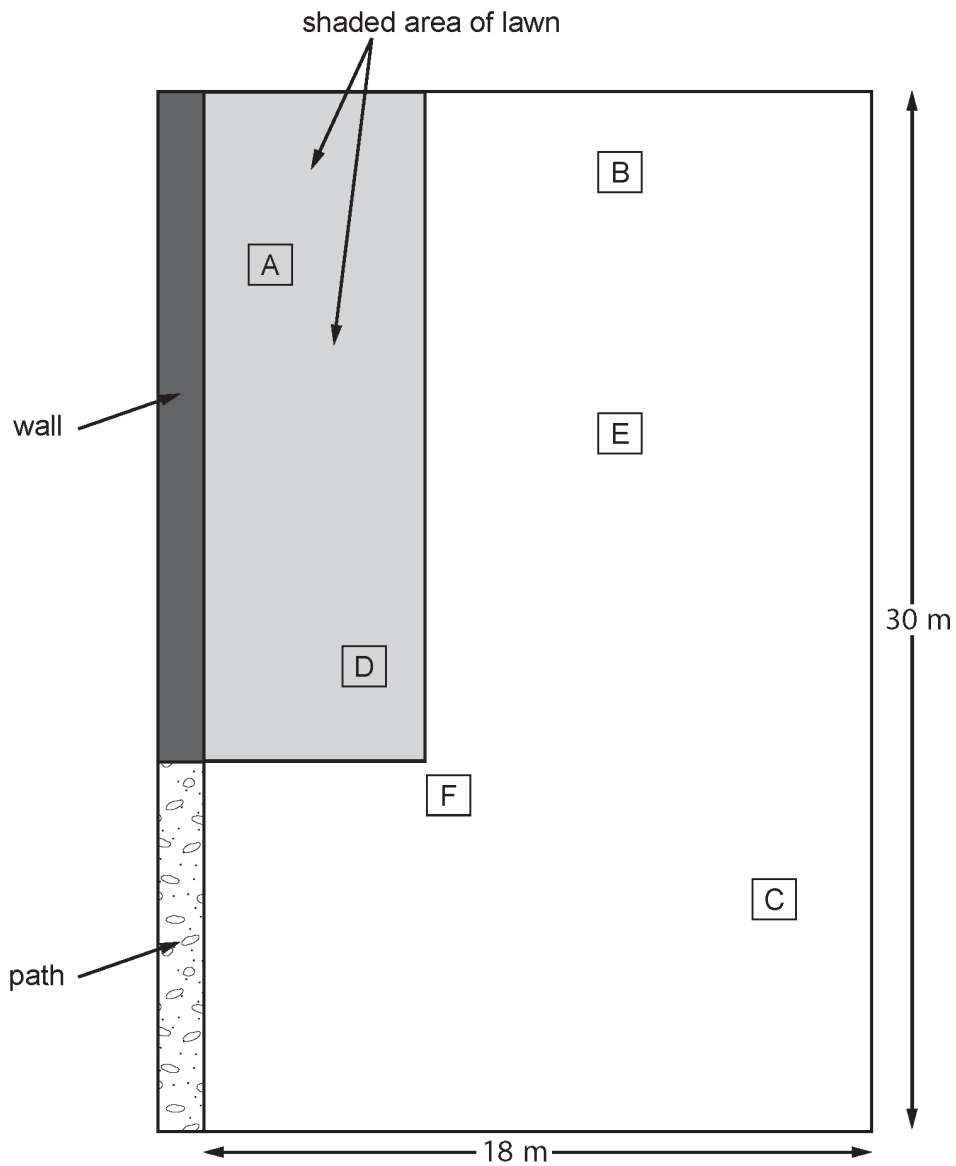Percentage of fully grown plants surviving = ... %

(c) Explain why no fully grown plants are found within 6 m of the parent population. [2]

....

....

....

....

7

14.

Some students investigated the number of dandelion plants on a lawn. The diagram shows the lawn and the location of 6 quadrats (A to F) which the students had placed at random on the lawn.

shaded area of lawn

wall

path

30 m

18 m

Key: ☐ quadrat

The students counted the number of dandelions in each quadrat and recorded their results in the table below.

quadrat	number of dandelions
A	7
B	2
C	1
D	6
E	2
F	0

(a)   Each quadrat measured $1\,m^2$.
       Calculate the mean number of dandelions per square metre for the 6 quadrats.   [1]

                                    Mean number of dandelions = ...

(b)   Calculate the area of the lawn.   [1]

                                    Area of lawn = ...

(c)   Use your answers from parts (a) and (b) to estimate the total number of dandelions on the lawn.   [1]

                        Estimated total number of dandelions = ...

(d)   In fact, the **actual** number of dandelions on the lawn is 1 250.
       Use the formula below to calculate the percentage error of the estimate in part (c) above.   [1]

$$\text{percentage error} = \frac{\text{estimated number of dandelions} - \text{actual number of dandelions}}{\text{actual number of dandelions}} \times 100$$
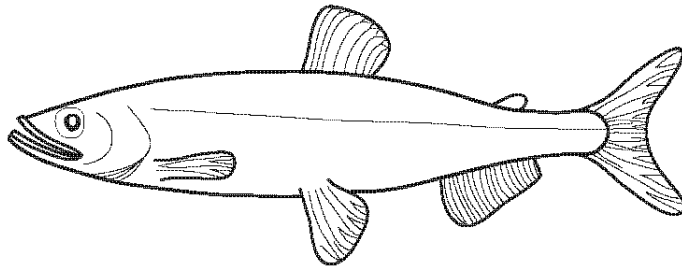
                        percentage error = ... %

(e)   How could the strength of evidence in the investigation be improved?   [1]

....

....

15. In South Wales, a population of fish called smelt *(Osmerus eperlanus)* live in a lake, into which runs a stream.

Smelt, *Osmerus eperlanus*

An estimation of the population size of the smelt in the lake was made using a capture/recapture technique.

200 smelt were captured from one part of the lake and their tails were marked with a harmless blue dye. The marked smelt were then returned to the lake.

The next day, 200 smelt were again captured in the same part of the lake. 20 of these were found to have been marked with the dye and 180 were unmarked.

(a) Estimate the size of the population of smelt in the lake by using the formula [2]

$$\text{Population size} = \frac{\text{Number captured on first day} \times \text{number captured on the second day}}{\text{Number of marked smelt recaptured on second day}}$$

Show your working

Answer ....

(b) Which number, used in the formula, would be directly affected by emigration from the lake? [1]

....

16.

White clawed crayfish

The population of the British white clawed crayfish, *Potamobius pallipes*, has been decreasing in Wales.

In order to conserve the species, scientists from the Environment Agency Wales (EAW) released 50 white clawed crayfish into the river Rhymney in South Wales in 2010.

Two years later, the population of *Potamobius pallipes* was estimated at the place where they were released using the following method:

56 were captured, marked and released. The next day, a total of 48 were captured, of which 16 had been marked on the previous day.

The size of the population for the area sampled can be calculated using the formula:

$$\mathbf{P = \frac{a \times b}{r}}$$

Where   **P** = population
                             a = number captured, marked and released in the first sample
                             b = number captured in second sample
                             r = number recaptured

(a)   Calculate the population of *Potamobius pallipes* in the area sampled.   [2]
        Show your working.

Answer = ...

(b)   What could the scientists do to be more confident of the results?   [1]

....

(d)   Suggest **three** ways in which an introduced alien species of crayfish could increase the
death rate of *Potamobius pallipes* in the river Rhymney.   [3]

    I.   ....

....

   II.   ....

....

 III.   ....

....

17. A group of students were asked to calculate the population size of garden snails *(Helix aspersa)* in 5 different areas of similar size in the school grounds. They sampled the five areas of the school grounds early in the morning on a damp day. The students sampled each area once only and counted the number of snails they found. The shell of each snail was marked with a small spot of white ink. The snails were then released.

Garden snail marked with white ink

Approximately one week later, on a damp morning, the students sampled the same areas of the school grounds a second time. This time they recorded the number of recaptured snails (the ones that had been marked with white ink a week earlier) and the number of snails which had not been marked with white ink.

CAPTURE

↓

MARK - RELEASE

↓

RECAPTURE

The table below shows the capture – recapture results obtained by the students.

Area of school grounds	No. of snails captured and marked in 1st sample	No. of snails in 2nd sample	No. of snails in 2nd sample previously marked	Population size
playing field	3	2	1	6
hedgerow	9	4	3	12
flowerbed	7	4	2	14
boundary wall	11	9	5	20
vegetable garden	23	17	10	....

(a) Use the equation below to calculate the population size for the snails living in the vegetable garden. **Write your answer in the table above.** [2]

$$\text{population size} = \frac{\text{number in 1st sample x number in 2nd sample}}{\text{number in 2nd sample previously marked}}$$

Space for working

(b) State **one** way in which the students kept their investigation fair. [1]

....

(c) The song thrush *(Turdus philomelos)* feeds on snails. During the week after marking the snails with white ink some of the students noticed that the number of song thrushes in the five areas of the school grounds had increased. This increase may have been due to a problem resulting from the students' method. Suggest why the number of song thrushes increased and how the students could overcome the problem. [2]

Song thrush eating garden snail

....

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....

18. In 1825, plant collectors brought Japanese knotweed *(Fallopia japonica)* into the UK. It spread into many habitats, mostly near rivers. It is now out of control in most areas, eliminating other plant species and damaging roads and buildings.

Japanese knotweed in summer

sap-sucking louse

Japanese knotweed grows rapidly in summer. Plants reach 4 metres in height and underground stems grow to 25 metres in length.

Scientists working for the Welsh government investigated the use of a sap-sucking louse *(Aphalara itadori)*, to destroy Japanese knotweed in a number of trials in parts of the UK.

In the trials, the louse reduced the growth of Japanese knotweed by 60%. The louse did not harm any other species and reproduced quickly in summer. Most of the lice, however, died in the winter.

(a) (i) Which of the following describes Japanese knotweed in the UK? Write the correct letter in the box. [1]

    A   an endangered alien species

    B   an alien invasive species

    C   an endangered native species

    D   a native invasive species

answer ☐

    (ii) How does Japanese knotweed affect biodiversity in the areas where it grows in the UK? Give a reason for your answer. [1]

....

....

(b) (i) State the scientific term used when an organism is used to destroy a pest species.
[1]

....

(ii) Calculate the length of underground stems produced in Japanese knotweed when the sap-sucking louse is present. [2]

length = ... m

(c) (i) Following the trials, the scientists concluded that the sap-sucking louse was effective against Japanese knotweed as it reduced growth by 60%.

They also decided that it would be suitable to use this method on a wider scale throughout the UK. Give **one** piece of evidence which supports this decision. [1]

....

....

(ii) How could these scientists check that the results were reproducible? [1]

....

19. Control of Red Spider Mite

- Red spider mites are pests on crops, such as tomatoes, growing in greenhouses in the UK.
- They feed on the leaves and destroy the plants.
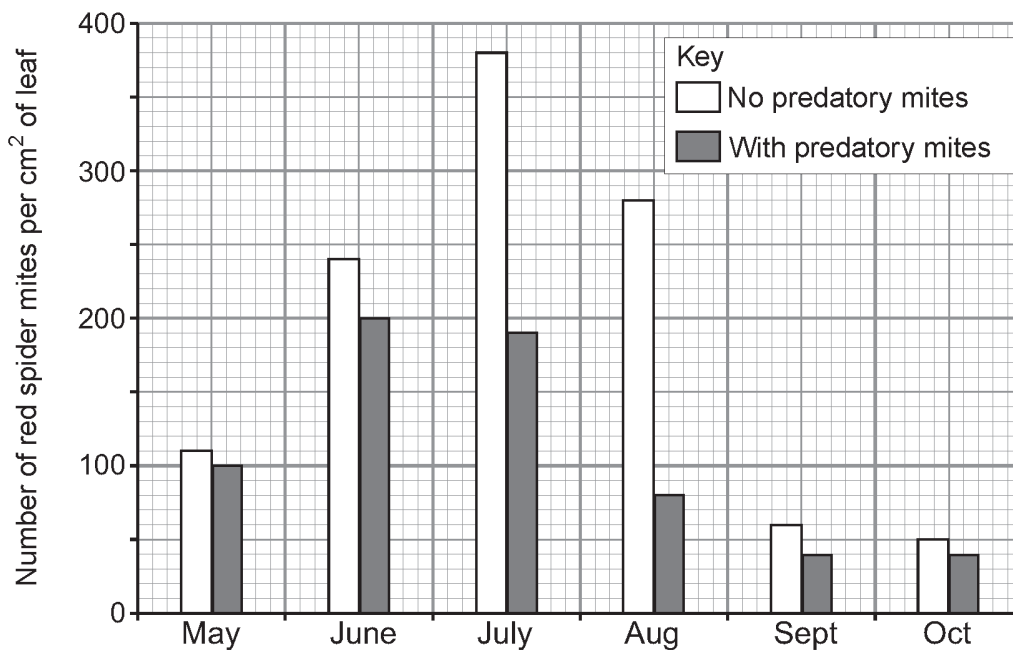- Predatory mites feed on red spider mites.

Tomato plants in a greenhouse

red spider mite   predatory mite

Photographs not to scale

Scientists investigated the use of predatory mites to control red spider mites on tomato plants in a greenhouse. The bar chart below shows their results.

(a)   What term is used for this type of pest control?   [1]

....

(b)   Use the bar chart opposite to answer the following questions.

(ii)   What is the effect of predatory mites on numbers of red spider mites?   [1]

....

(iii)   During which month does the predatory mite have the greatest effect on numbers of red spider mite? State the reason why you chose this month.   [1]

Month ....

Reason ....

....

(c)   (i)   Suggest **one** fact about the predatory mites that the scientists would have to check before using them to protect tomato plants.   [1]

.

20.
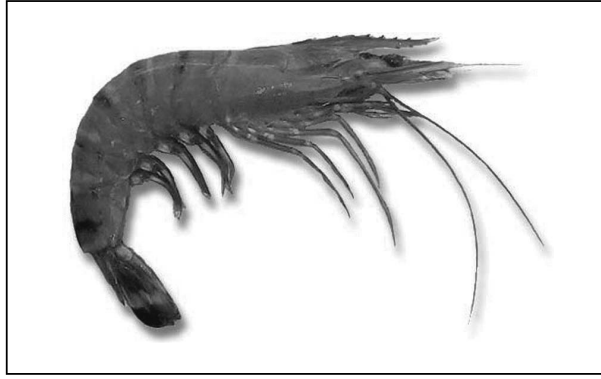
In 1989, fishermen in the English Channel caught specimens of a species of prawn which they could not identify. They sent the prawns to a marine biologist who said that the species had not been recorded in British waters before. He identified the species by comparing its genetic profile with those of known species of prawn. The results are shown below.
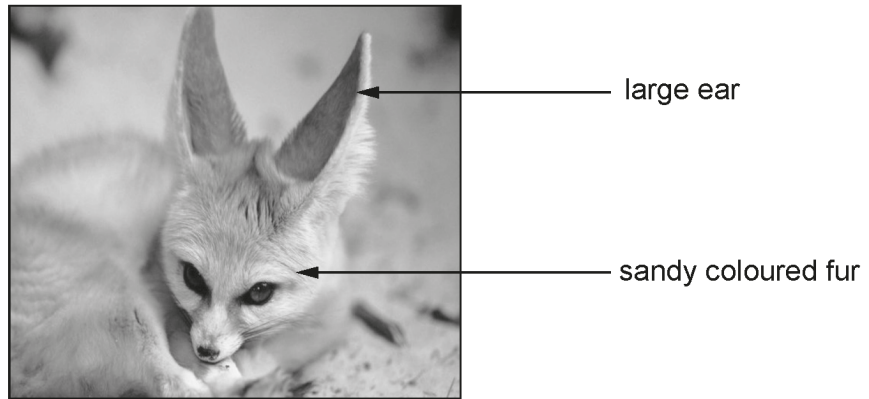
Unknown species	*Palaemon serratus*	*Penaeus kerathurus*	*Penaeus japonicus*	*Palaemon elegans*
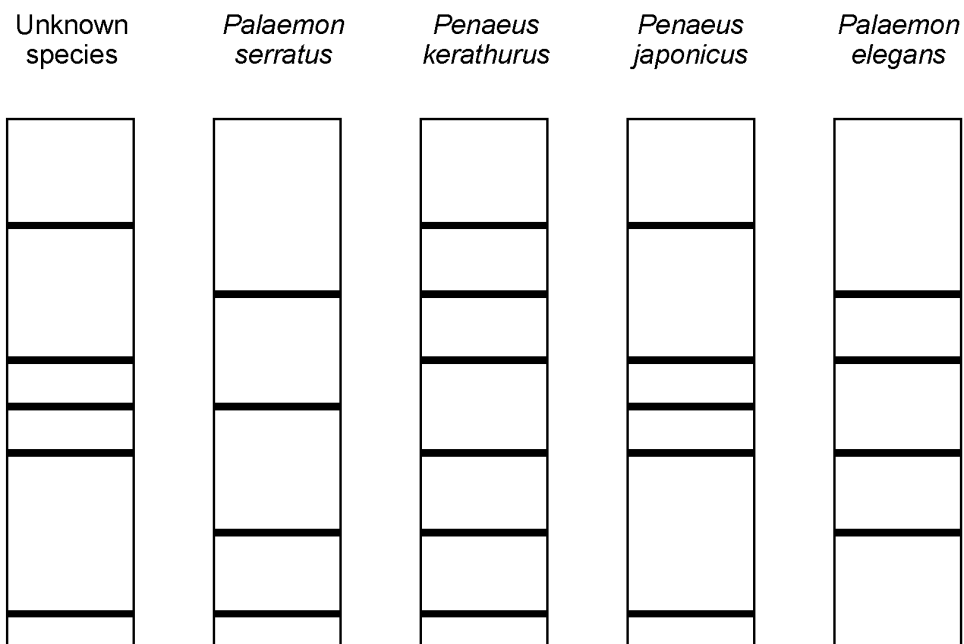
(c) Prawns have different names in different languages. For example: Italian – gamberi and French – crevette. State precisely, how marine biologists avoid confusing the names of the organisms that they study. [1]

....

....

21. The photograph shows a fennec.

large ear

sandy coloured fur

(a) Fennecs are also known as *Vulpes zerda*.

Underline the correct word in each of the following sentences. [3]

(i) Fennec is the **genus / common / species** name.

(ii) *Vulpes* is the **genus / common / species** name.
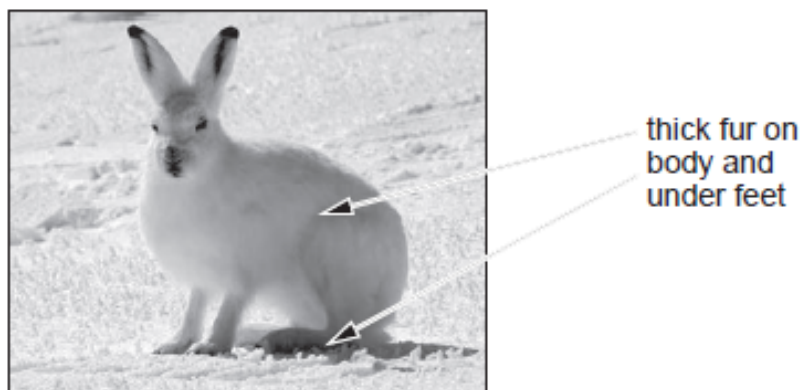
(iii) *zerda* is the **genus / common / species** name.

(b) Fennecs live in hot, sandy deserts.

(i) The ears have a large surface area.
How does this help fennecs keep cool? [1]

....

....

22. The photograph shows an arctic hare *(Lepus arcticus)*.

thick fur on body and under feet

(a) The table below shows some classes of vertebrate animals.

Class	Features of animals	Examples
fish	skin with scales	goldfish, cod
reptiles	skin with scales	crocodiles, snakes
birds	skin with feathers	eagle, pigeon
mammals	skin with hair	horse, cat

(i) Use the information above and your own knowledge to complete the classification of the arctic hare. [3]

Kingdom   animal

Phylum   vertebrate

Class   ....

Genus   ....

Species   ....

(ii) Why do scientists use scientific names for living organisms? [1]

....

(b) Read the information about the arctic hare and use it to answer the questions which follow.

The arctic hare lives in northern countries where the climate is very cold. The average life expectancy is five years. Each has a body mass of 5 – 7 kg and 20% of this is a layer of fat under the skin, which helps to reduce heat loss. They live in large groups of about 200 individuals and huddle together while sleeping, to retain heat.

Arctic hares feed on berries, twigs and moss which they can dig out of snow with their strong feet. Only a few other species eat the same food as the hares but many others, such as foxes, wolves and lynx kill and eat large numbers of hares.

(i) Complete the table below by writing 'true' or 'false' for each of the statements about the arctic hare. [3]

Statement	True or False
All arctic hares live for at least five years.	
Arctic hares have little inter-specific competition for food.	
The population size of arctic hares is affected by predation.	
The layer of fat under the skin raises the body temperature.	

(c) Give **two** reasons why the arctic hare's coat increases its chances of survival. [2]

....

....

23. Scientists investigated how crop yields (mass of crops produced per m^2) vary when plants are grown at different densities in a field. The results are shown in the table below.

Density (number of plants per m^2)	Crop yield (kg per m^2)
1	20
5	85
10	92
15	90
20	90
25	80

(b) Complete the table below by calculating the yield per plant. The first four have been done for you. [2]

Density (number of plants per m^2)	Crop yield (kg per m^2)	Yield per plant (kg)
1	20	20.0
5	85	17.0
10	92	9.2
15	90	6.0
20	90	
25	80	

(c) Suggest **two** reasons why the yield per plant decreases as the number of plants per m^2 increases. [2]

1. ....

2. ....

5

WJEC (Wales) Biology GCSE

24. Waders are species of birds which feed in shallow water and nest on land. The table below shows numbers of breeding pairs of four species of waders on two Scottish islands, Islay and Arran, in 1983 and 2000.

	number of breeding pairs of waders			
	Islay		Arran	
wader	1983	2000	1983	2000
Lapwing	1869	1287	1104	1364
Redshank	1288	760	486	733
Dunlin	2016	884	803	558
Snipe	655	280	172	154

(a) Calculate the percentage decrease in the number of breeding pairs of snipe on Islay between 1983 and 2000. [2]

Percentage decrease .... %

(b) Four hedgehogs were introduced to Islay in 1974. No other carnivorous mammals live on the island. By 1983, the population of hedgehogs on the island was very large.

In the 1980s, a species of flatworm from New Zealand, was accidentally introduced to Islay.
Arran has remained free of hedgehogs and flatworms.

flatworm

Islay

Arran

Scotland invaded by NZ flatworm
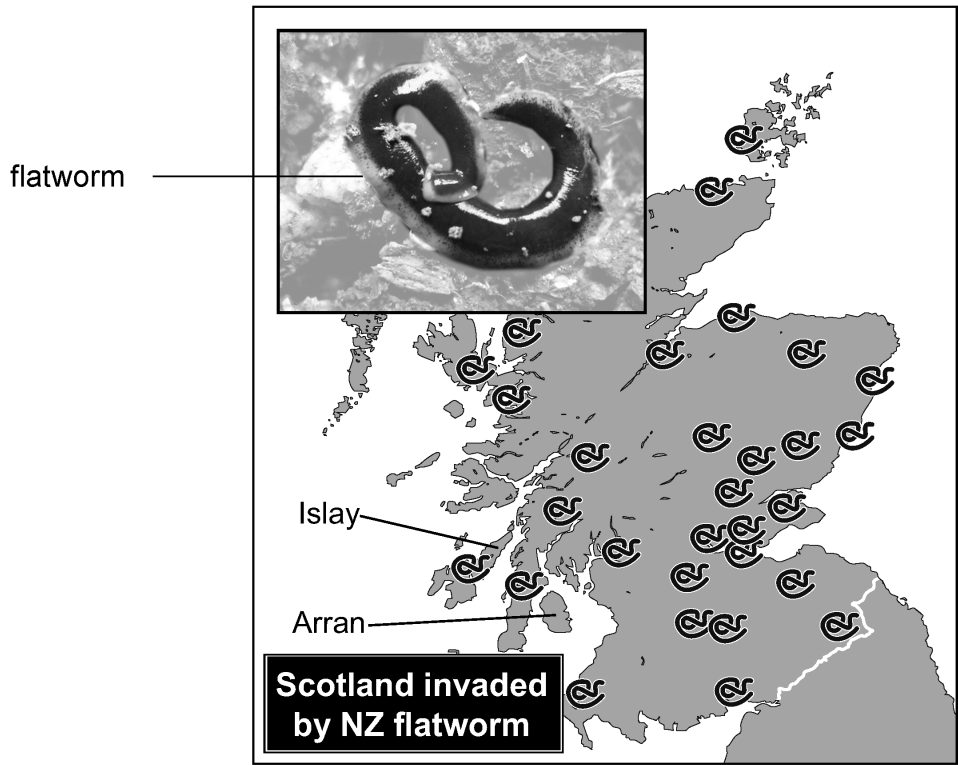
- Hedgehogs eat invertebrates and the eggs of waders.
- Flatworms do not eat birds' eggs, but eat the same types of invertebrates as hedgehogs.
- Hedgehogs do not eat flatworms.

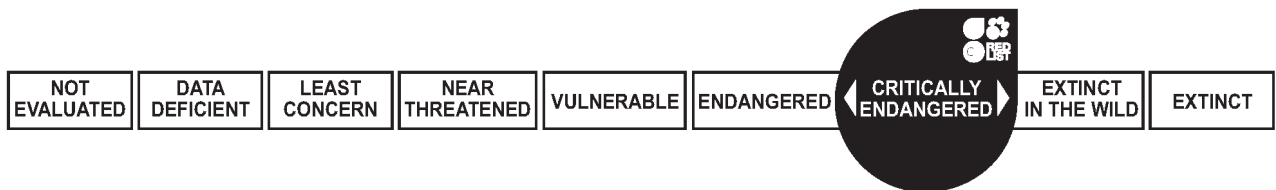(i) Explain why the number of waders on Islay has decreased since the introduction of the flatworm. [2]

....

....

....

25. The black-faced lion tamarin *(Leontopithecus caissara)* is a species of monkey living in the rainforests of South America.

(a) The black-faced lion tamarin is classified as Critically Endangered on the IUCN red list and listed on Appendix 1 of CITES. There are only about 400 individuals remaining in the wild.

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT

(i) On the sliding scale above suggest what will happen to the black-faced lion tamarin unless measures are taken to conserve the species. [1]

....

(ii) If conservation measures fail, state what will happen to the biodiversity of the habitat in which the black-faced lion tamarin lives. [1]

....

26. Cardiff Bay is a 2.0 km² freshwater lake. The Bay is not tidal but visiting yachts, from all over Europe, can enter the Bay from the sea, through locks. The Bay is fed by two rivers, the Taff and the Ely.

The following public information notice has been posted in Cardiff Bay.

Killer shrimps

Routine environmental monitoring identified that an invasive species of shrimp, *dikerogammarus villosus*, or killer shrimp has established itself within Cardiff Bay. It has been found in several sites across the UK.

There is no risk to public health or pets, however this non - native species poses a threat to the aquatic wildlife in our rivers, streams and lakes.

Controls are in place to try to prevent the spread to other water bodies.

Water users are advised to 'Check, Clean and Dry' all equipment and clothing, as they will not survive in dry conditions for more than 48 hours.

CARDIFF
CAERDYDD
HARBOUR AUTHORITY
AWDURDOD HARBWR

(a)   (i)   Invasive species are also known as alien species. Explain what is meant by the
           term *invasive species* and why they are a problem.   [2]

....

....

....

      (ii) In the public information notice opposite there is an error in the way in which the
            scientific name of the killer shrimp has been written. Identify the error by writing the
   scientific name in the correct form.   [1]

            ....

      (iii) Killer shrimps feed on native freshwater shrimps, aquatic insects and small fish.
            State how the biodiversity of the UK will be affected by the killer shrimp.   [1]

....

(b) Killer shrimp fact file:

Environment	Freshwater reservoirs and lakes in UK. Cannot live in water with a salt content > 2.5 %
Native range	Black Sea, Russian Far East
Invasion pathway into UK	Unknown
Feeding	Predator
Status in UK	Established
Date of first record in UK	2010
Speed of spread	Downstream 124 km/year Upstream 35 km/year
Predators	Trout, perch, aquatic birds
Body length of adult	Up to 30 mm
Reproduction	Females lay about 50 eggs which hatch into young about 1.8 mm in length

The map below shows the spread of the killer shrimp westwards along the rivers and canals of Europe. It also shows the dates at which the killer shrimp was first recorded at various points.
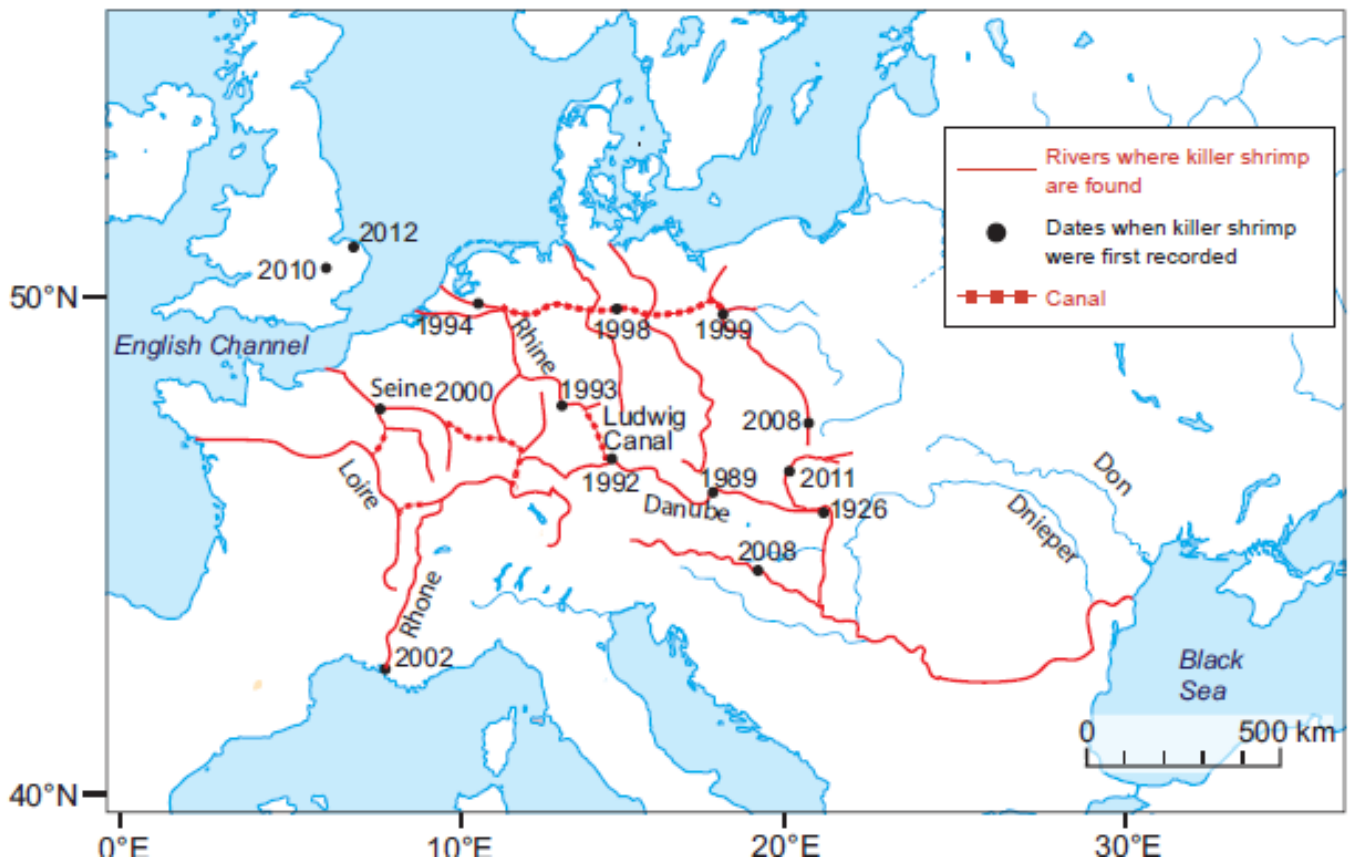
(i) Use the map to suggest the route by which the killer shrimp travelled from the River Danube to the River Rhine and state the date when this occurred. [1]

....

....

(ii) The salt content of the English Channel is 3.4–3.5 %. State why the killer shrimp could not have travelled to Great Britain through the waters of the English Channel. [1]

....

....

(iii) As a trainee research biologist working for Natural Resources Wales you have been asked to study all the information in detail. Suggest **one** way by which the killer shrimp could have arrived in Great Britain. [1]

....

....

(iv) The River Taff rises in the Brecon Beacons and flows through Merthyr Tydfil to Cardiff Bay. Travelling along the River Taff, Merthyr Tydfil is 55.1 km from Cardiff Bay. If the killer shrimp were to travel up the River Taff from Cardiff Bay, calculate, to **two** significant figures, how long it would take to reach Merthyr Tydfil. [2]

time taken to reach Merthyr Tydfil = _____ years

27. *Varroa destructor* is a parasitic mite of honeybees. A colony of honeybees affected by the parasite becomes weakened and eventually dies out. The parasitic mite originated in Asia, where it is a pest of the Asian honeybee, *Apis cerana*. It has spread across most continents, arriving in the UK in the early 1990s and affecting the native European honeybee, *Apis mellifera*.

Infested honeybees

Dead bee
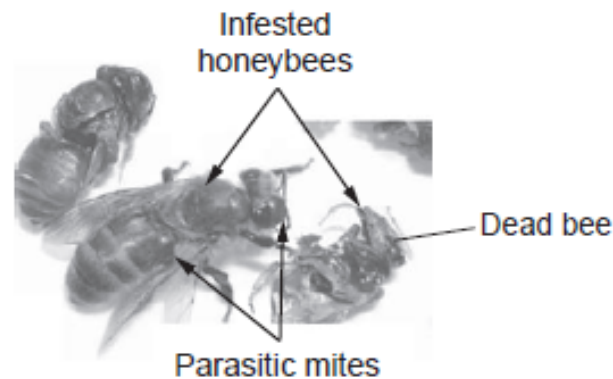
Parasitic mites

(a) Use your knowledge of classification to suggest why the parasitic mite was able to spread from the Asian to the European honeybee. [2]

....

....

In 2014-2015 there were 1650 registered beekeepers in Wales who kept bee colonies, each of which is one beehive. The National Bee Unit recommends that honeybees should be treated with pesticides to try and reduce the numbers of the parasitic mite in beehives.

In recent years many beekeepers in North West Wales have stopped treating their bees with pesticides. These beekeepers believe that there is no difference in colony losses between bees treated with pesticides and bees not treated with pesticide.

The table below shows Winter Losses (the number of colonies that died out) between 2010-2015 in North West Wales.

Season	Number of beekeepers in the survey		Total number of colonies	Number of treated colonies	% winter loss in treated colonies	Number of colonies not treated	% winter loss in not treated colonies
	Treating	Not treating					
2010-2011	10	5	71	44	27	27	11
2011-2012	11	31	355	180	8	175	7
2012-2013	8	46	251	75	41	176	32
2013-2014	12	55	396	81	9	315	6
2014-2015	17	65	500	97	8	403	8

(b)   What percentage of beekeepers in Wales took part in this survey in 2014-2015?   [2]

percentage of beekeepers = ... %

(c)   (i)   Use the information in the table to state **one** conclusion about the effect of the pesticides on winter losses of bees.   [1]

....

....

....

....

(ii)   Give **two** reasons why some beekeepers across the UK would argue that the strength of evidence in this survey is weak.   [2]

....

....

....

....

28.

Read the information below about bird species which are at risk of becoming endangered.

- Conservation scientists investigated the numbers of the four species of birds, shown below, in an area of the UK.
- They counted in 1999 and again in 2009.
- Numbers had decreased.

Species	Habitat
Pied Flycatcher	Oak trees
Turtle Dove	Farmland
Cuckoo	Woodland
Grey Partridge	Farmland

Drawings not to scale

The bar chart below shows the % decrease in number between 1999 and 2009.
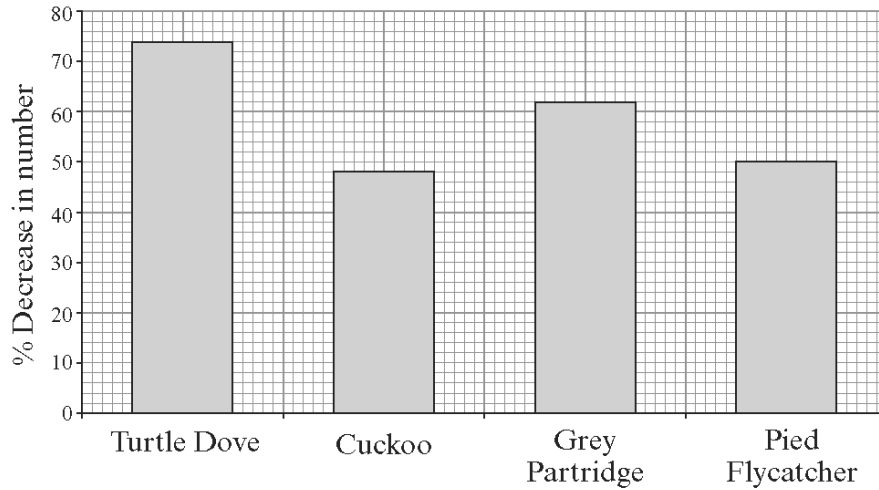
(Data from British Trust for Ornithology)

Answer the questions below using the information **opposite and above**.

(a) Which species is most at risk of becoming endangered? [1]

Species ....

Reason ....

(b) The number of Pied Flycatchers in 2009 was 520.
Calculate the number that would have been present in 1999. [1]

....

(d) If the numbers of these birds continue to decline in future years how will biodiversity in the area be affected? Underline your answer and give a reason. [1]

increase   decrease   no change

Reason ....

....