

National 5 Biology

Life on Earth Homework



Name _____

Teacher _____

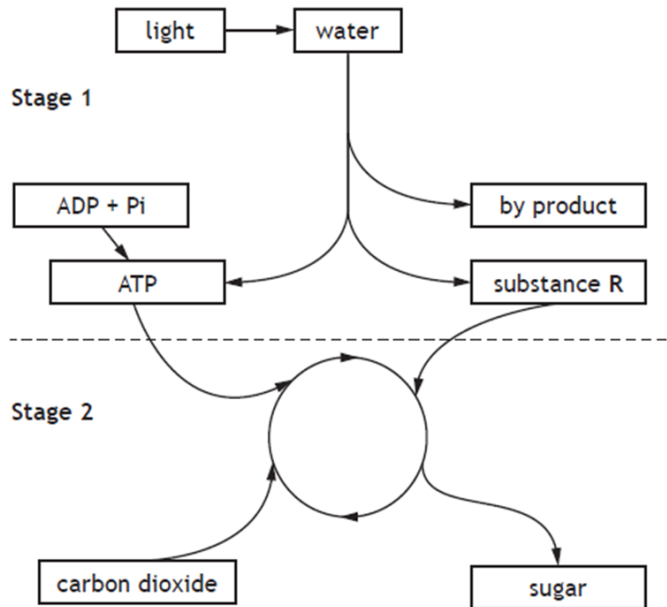
Homework	Score	Percentage
1. Photosynthesis		
2. Energy in Ecosystems		
3. Sampling techniques		
4. Revision		
5. Food production		
6. Mutations & Speciation		

Homework 1—Photosynthesis

- Which of the following substances are raw materials required for photosynthesis?
 - carbon dioxide and glucose
 - oxygen and glucose
 - oxygen and water
 - carbon dioxide and water
- Which of the following are produced during photosynthesis?
 - oxygen and glucose
 - carbon dioxide and water
 - carbon dioxide and glucose
 - oxygen and water
- What is the role of chlorophyll in a plant cell?
 - to trap heat energy
 - to trap light energy
 - to trap carbon dioxide
 - to trap water
- Where is chlorophyll located in a plant cell?
 - cell wall
 - cytoplasm
 - chloroplasts
 - vacuole
- Which of the following energy conversions is carried out by chlorophyll?
 - heat to chemical energy
 - chemical to light energy
 - light to heat energy
 - light to chemical energy
- What are the products of the light reactions stage of photosynthesis?
 - hydrogen and glucose
 - ATP and hydrogen
 - glucose and ATP
 - oxygen and ATP
- Which of the following is NOT a limiting factor of photosynthesis?
 - light intensity
 - carbon dioxide concentration
 - oxygen concentration
 - temperature
- What process occurs during photolysis?
 - water is split into hydrogen and oxygen
 - light energy turns ADP + Pi into ATP
 - carbon dioxide combines with hydrogen
 - ATP converts glucose into starch

Homework 1—Photosynthesis

9. The flow diagram below represents stages of photosynthesis in a leaf.



a) Name stages 1 and 2 as shown in the diagram above.

Stage 1 _____

Stage 2 _____

1

b) The diagram shows that light energy is used to split water into a by product and substance R.

i) Identify substance R _____

1

ii) Describe how substance R contributes to the production of sugar during stage 2.

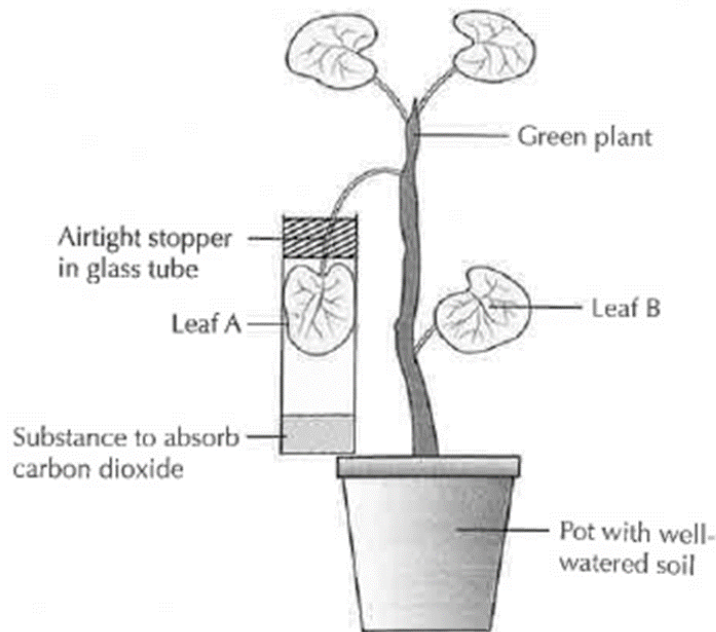
1

c) Explain why photosynthesis would not occur at a temperature of 70°C.

2

Homework 1—Photosynthesis

10. An investigation was carried out into the requirements for photosynthesis in green plant. The plant was kept in darkness for 24 hours before being placed in bright light for 5 hours.



- a) After the apparatus has been in bright light for 5 hours, a test for starch was carried out on leaf A.

Predict the result of this test and give a valid conclusion about the requirements for photosynthesis that can be drawn from it.

Result _____ 1

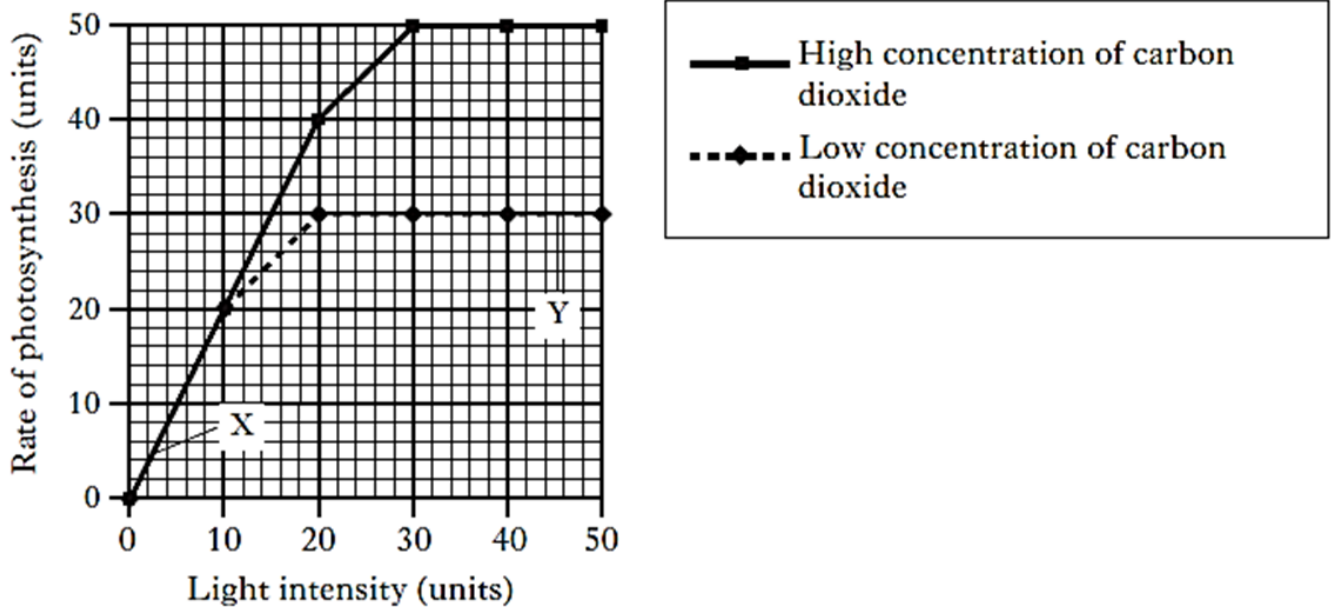
Conclusion _____
_____ 1

- b) Describe how leaf B could be altered to show that light is needed for photosynthesis.

_____ 1

Homework 1—Photosynthesis

11. The graph below shows the effects of two different environmental factors on the rate of photosynthesis.



a) What are the limiting factors are points X and Y?

X _____

Y _____

2

b) Suggest one way that the rate of photosynthesis could have been measured.

1

12. Green plants produce glucose during photosynthesis, which can then be broken down to produce energy during respiration.

Describe one other fate of glucose in plants.

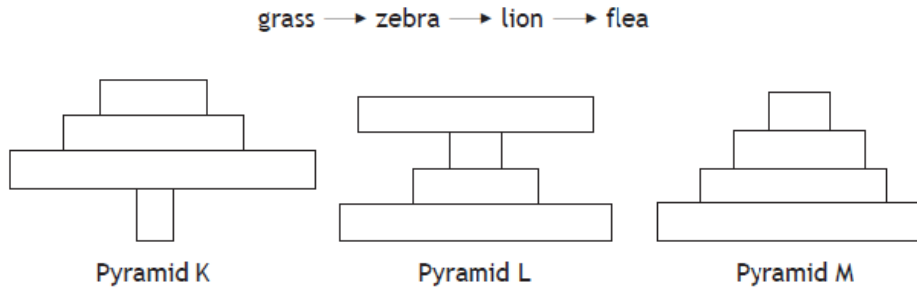
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Homework 2—Energy in Ecosystems

- Which statement describes a niche?
 - The place where an organism lives.
 - All the living organisms in a habitat and the non-living components.
 - The role of an organism in a community.
 - All the living organisms present in a habitat.
- All food chains start with a
 - primary consumer
 - the sun
 - producer
 - secondary consumer
- Which of the following is NOT a way that energy can be lost in a food chain?
 - heat
 - undigested material
 - movement
 - growth
- Which of the following is an example of intra specific competition?
 - Red squirrels competing for food.
 - A grey squirrel and a red squirrel competing for food.
 - A lion and a jaguar competing for habitat.
 - A dandelion and a daisy competing for nutrients.
- Which statement describes a population?
 - The place where an organism lives.
 - The number of one species in an ecosystem.
 - The role of an organism in a community.
 - All the living organisms present in a habitat.
- Which of the following statements about primary consumers is true?
 - They hunt secondary consumers.
 - They get their energy from producers.
 - They are carnivores.
 - They receive 90% of producers' energy.
- An ecosystem receives 5,000,000kJ of energy from the Sun. How much energy reaches the primary consumer?
 - 5,000,000kJ
 - 500,000kJ
 - 50,000kJ
 - 5000kJ
- Which of the following substances would plants NOT compete for?
 - Water
 - Sunlight
 - Food
 - Space

Homework 2—Energy in Ecosystems

9. The diagram below shows a food chain with three pyramids of numbers.



a) Identify the pyramid which represents the food chain shown above.

Pyramid _____

1

b) Identify the pyramid that would represent a food chain that started with an oak tree.

Pyramid _____

1

c) A food chain can also be represented by a pyramid of energy.

Explain the meaning of the term “*pyramid of energy*”.

1

d) Underline one option in each bracket to make the following sentences about the food chain above correct.

Zebra are (*primary / secondary*) consumers, and receive their energy from (*grass / lions*).

Lions are (*primary / secondary*) consumers, and (*hunt / are hunted by*) zebras.

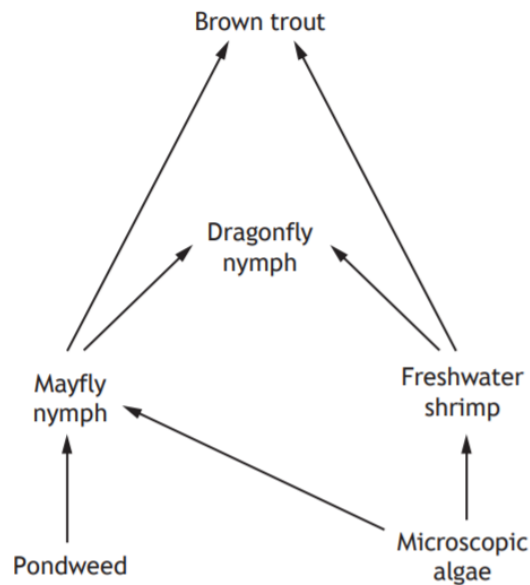
2

e) What do the arrows in a food chain represent?

1

Homework 2—Energy in Ecosystems

10. The diagram below shows part of a food web from a Scottish loch ecosystem.



- a) If freshwater shrimp were to die out, what would happen to the number of mayfly nymphs? Justify your answer.

Mayfly nymph numbers – increase/decrease/stay the same

Justification _____

1

- b) If the number of microscopic algae cells decreased, what would happen to the number of freshwater shrimp?

freshwater shrimp numbers – increase/decrease/stay the same

Justification _____

1

- c) From the food web above, name the secondary consumer(s).

1

Homework 2—Energy in Ecosystems

11. The following result table shows the number of insect species recorded in the same area of woodland over a period of time.

Year	Insect species present
2009	35
2010	32
2011	28
2012	21
2013	17

- a) Calculate the simplest whole number ratio of insect species present in 2011 compared to 2012.

Space for working

_____ : _____

1

- b) Calculate the percentage decrease in the number of insect species present between 2009 and 2013.

Space for working

_____%

1

- c) The number of insect species present in the woodland area is continually decreasing. One reason for this could be due to an increase in interspecific competition between the different species.

Suggest one resource that the insects would have to compete for.

1

Homework 3—Sampling Techniques

1. Which of the following pieces of equipment measure the abundance of daisies in a field?

A pitfall trap
B quadrat
C line transect
D plant meter

2. Which of the following are both biotic factors?

A temperature & predation
B grazing & light intensity
C light intensity & temperature
D grazing & predation

3. What precaution should be taken to ensure that birds do not prey upon insects that are collected in a pitfall trap?

A make sure the trap is covered with leaves
B makes sure there's a small hole in the bottom of the trap
C place the trap level with the ground
D set up several different pitfall traps

The results below show the abundance of various plants during quadrat sampling.

Use this information to answer Q4 & 5.

Plant species	Abundance
Daisy	5
Dandelion	8
Clover	6
Buttercup	3
Plantain	2

4. How many times greater is the number of dandelions compared to the number of buttercups?

A 2
B 2.5
C 2.7
D 3.5

5. How could the reliability of these results be improved?

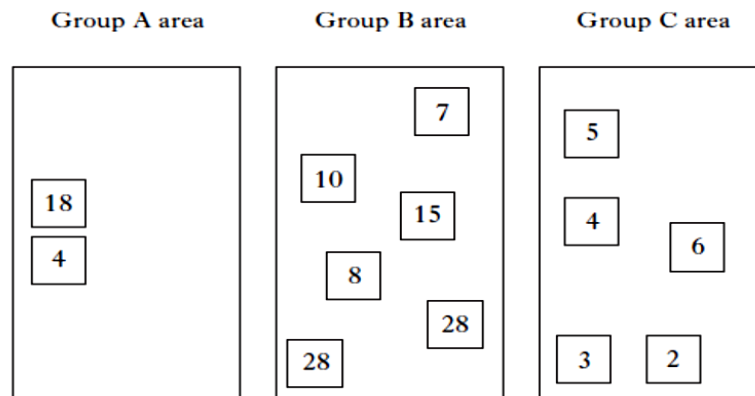
A place the quadrats evenly
B throw the quadrats randomly
C throw the quadrats more times and calculate an average
D use a smaller quadrat

6. An ecosystem is

A the place where an organism lives.
B the living and non-living components of an area.
C the role of an organism in a community.
D the number of one species.

Homework 3—Sampling Techniques

7. Three groups of students used quadrats to carry out a survey on the distribution of mussels on different areas of the coastline. Each quadrat measured 50cm x 50cm therefore every four quadrats = 1m². The position of the quadrats and the number of mussels found is shown below for each group.



- a) Complete the following table with the results from the area of Group C. 1

Group	Average number of muscles per quadrat	Estimated number of mussels per m ²
A	11	44
B	16	64
C		

- b) Which group has made an error which makes their results less reliable? 2

Group _____

Explanation _____

- c) Quadrats are used to sample living things. Describe how to sample an abiotic (non-living) factor of your choice and how to minimise errors when doing so.

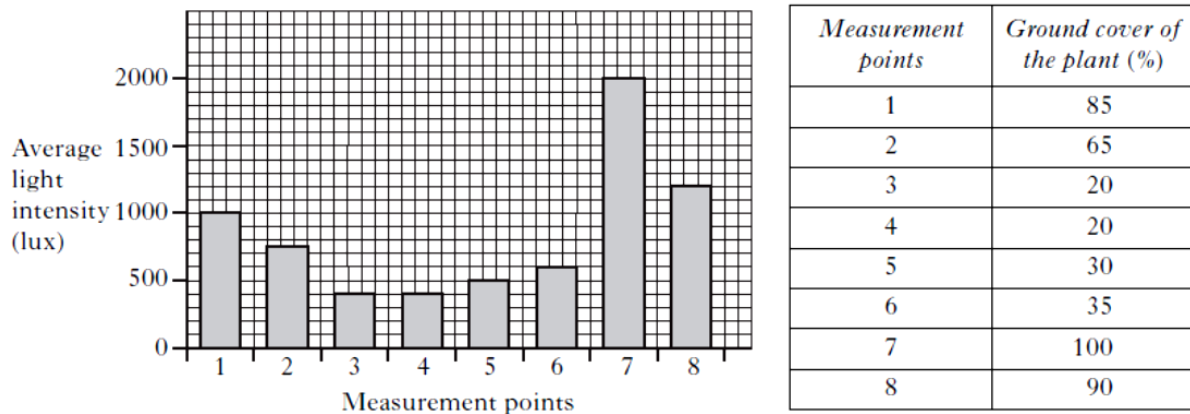
Abiotic factor _____

Description _____

Homework 3—Sampling Techniques

8. An investigation was carried out into the effect of light intensity on the distribution of a plant species. At eight different measurement points in a garden, the average light intensity was measured and the percentage ground cover of the plant was recorded.

The results are shown below.



- a) Identify the independent and dependent variable in this investigation.

Independent _____

Dependent _____

1

- b) Using the information above, what is the light intensity in the garden where the ground cover of the plant was 100%?

_____ lux

1

- c) What was the percentage ground cover of the plant when the light intensity was 750 lux?

_____ %

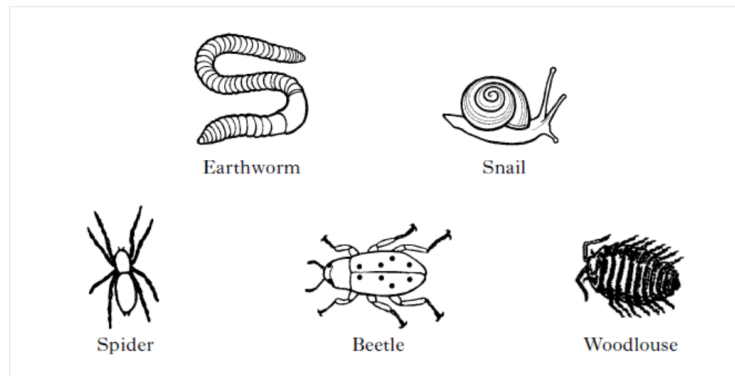
1

- d) What is the relationship between light intensity and percentage ground cover of the plant?

1

Homework 3—Sampling Techniques

9. The diagrams below show the invertebrates collected by the pupils.
They are not drawn scale.



- a) Complete the following key using information from the diagrams.

1	Legs	Go to 2	
	No legs	Go to	<input style="width: 40px; height: 30px;" type="text"/>
2	12 legs or more	<i>Woodlouse</i>	
	Fewer than 12 legs	Go to 3	
3	Spots on body	<i>Beetle</i>	
	No spots on body		<input style="width: 150px; height: 30px;" type="text"/>
4	Shell	<i>Snail</i>	2
	<input style="width: 150px; height: 30px;" type="text"/>	<input style="width: 150px; height: 30px;" type="text"/>	

- b) Give **three** features of the beetle mentioned in the key.

1. _____
2. _____
3. _____

Homework 4—Revision

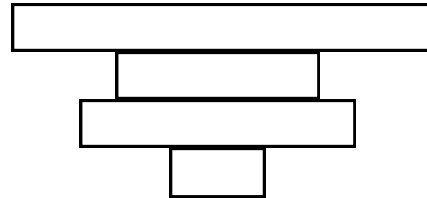
1. Which of the following is a correct example of a population?
- A Dandelions in a field
 - B Dandelions and buttercups in a field
 - C All the plants in the field
 - D All the plants and animals in the field.

2. Which term describes all the organisms living in an area and the non living factors which the organisms interact?
- A habitat
 - B ecosystem
 - C biome
 - D niche

3. Which of the following are resources **only plants** would compete for?
- A space, nutrients, food
 - B space, mates, food
 - C light, space, mates
 - D light, space, nutrients

4. What type of organism is always at the start of a food chain?
- A producers
 - B primary consumers
 - C predators
 - D secondary consumers

5. The diagram below shows a pyramid of numbers representing a food chain.

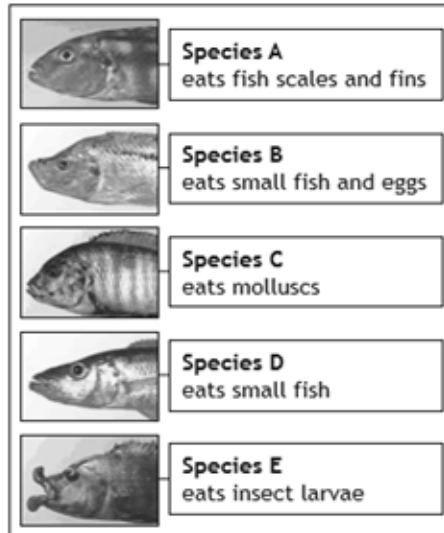


- Which of the following food chains could this unusually shaped pyramid represent?

- A Oak tree—caterpillar—blue tit— flea
 - B Oak tree—caterpillar—blue tit- cat
 - C Grass—caterpillar—blue tit—flea
 - D Grass—caterpillar—blue tit—cat
6. A rabbit feeds on grass, is eaten by foxes and is a habitat for fleas. The statement above describes the rabbit's
- A ecosystem
 - B community
 - C niche
 - D prey
7. What two products from the light reactions stage of photosynthesis are required for carbon fixation?
- A oxygen & ATP
 - B hydrogen & glucose
 - C ATP & carbon dioxide
 - D hydrogen & ATP

Homework 4—Revision

8. The Cichlid fish below are all found in Lake Malawi in Africa.



a) Using the information above, identify the feature of the fish that reduces competition between the species.

_____ 1

b) Predict which two species of Cichlid would be in competition with each other if there was a shortage of fish eggs. Give a reason for your answer.

Species _____ and _____

Reason _____

_____ 1

c) The fish in the diagram above are in interspecific competition with each other. Describe what is meant by the term intraspecific competition, and then state which type is fiercer.

Description _____

_____ 1

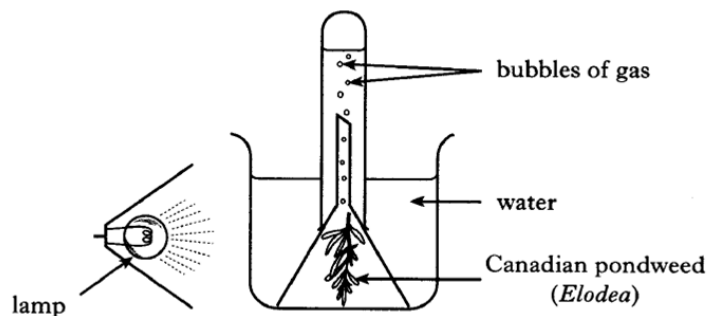
Fiercer: Interspecific Intraspecific

1

Homework 4—Revision

9. An investigation into the effect of light intensity on the rate of photosynthesis was carried out using the pond weed *Elodea*.

The diagram below shows how the experiment was set up.



The rate of photosynthesis was measured by counting the bubbles of gas produced per minute, and the results are shown in the table below.

Light intensity (lux)	Number of bubbles of gas produced (per minute)
5	8
10	14
15	26
20	40
25	40

- a) Identify the dependent variable.

1

- b) Name the gas produced by the *Elodea* plant.

1

- c) Describe how to set up a control for the experiment above.

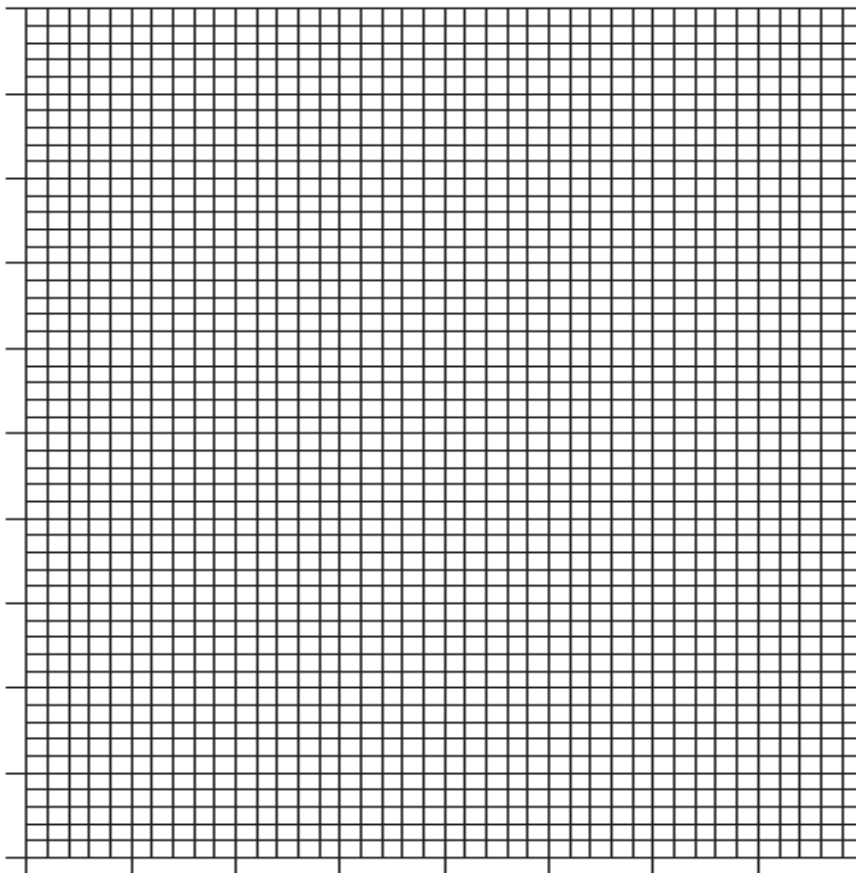
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Homework 4—Revision

- d) Describe how to increase the reliability of the investigation.

1

- e) Using the graph paper below, draw a line graph showing the results of the investigation.



3

- f) Draw a conclusion about the Elodea investigation.

2

Homework 5—Food Production

- Which of the following statements about a woodland describes a **community**?
 - all the oak trees
 - all the plants
 - all the oak trees & blackbirds
 - all the plants & animals
- Indicator species can provide information about
 - number of organisms in a lake
 - number of predators in a woodland
 - levels of light in an ecosystem
 - levels of pollution in a river
- In 1997, the USA planted 8.2 million hectares of land with genetically engineered crops. By 1998 this had increased to 20.5 million hectares.

What was the percentage increase in the area sown between 1997 and 1998?

 - 12.3%
 - 66%
 - 150%
 - 166.7%
- The substance that provides nutrients to the soil for plants to make amino acids is
 - pesticides
 - GM crops
 - fertilisers
 - biological control
- Which of the following would NOT increase the yield of crops produced?
 - pesticides and fertilisers
 - pesticide and biological control
 - fertilisers and biological control
 - mutagenic agents and biological control
- Using a predator to kill a pest is an example of using
 - pesticides
 - GM crops
 - fertilisers
 - biological control
- Which of the following shows the correct order of molecules needed in the production of proteins in crops?
 - nitrites—amino acids—protein
 - amino acids—nitrates—protein
 - nitrites—amino acids—protein
 - amino acids—nitrites—protein
- Which statement below correctly describes an event that would follow the production of algae bloom?
 - increase in oxygen levels
 - decrease in light levels
 - decrease in bacteria numbers
 - decrease in carbon dioxide levels

Homework 5—Food Production

9. Pesticides can increase the yield of crops by providing them with nutrients needed to produce proteins. However, pesticides can have a negative impact on food chains in the ecosystem.

Describe the disadvantage of using pesticides.

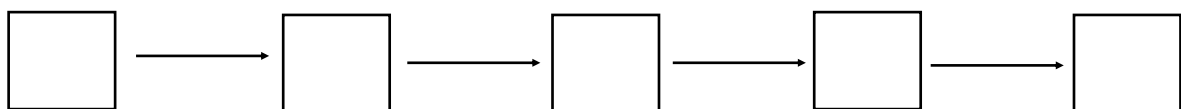
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10. Fertilisers are also used to increased food yield. However if used extensively, they can lead to the production of algae bloom.

Use the letters indicated below to put the following events in the correct order.

A	Algae bloom develops
B	Decrease in oxygen levels
C	Increase in bacteria
D	Decrease in light levels
E	Increase in nitrate levels

2



11. A farmer was wanting to increase the yield of their crops without having to use pesticides or fertilisers.

Name an alternative method of increasing yield and give a description of the technique.

Name _____

1

Description _____

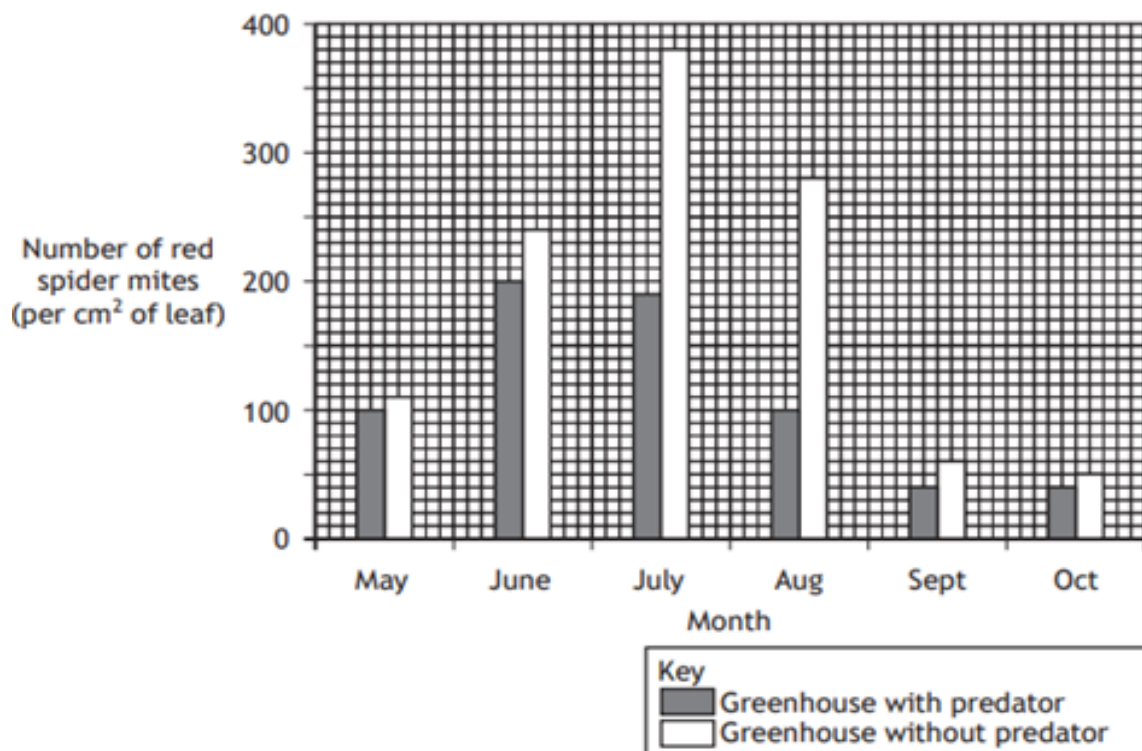
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Homework 5—Food Production

12. Red spider mites are a common pest which destroy tomato plants. Some of the mites are resistant to chemical pesticides.

Tomato growers aimed to investigate whether a predator would reduce the spider mite numbers in their greenhouse. Two identical greenhouses were used and the predator was released into only one greenhouse.

The results are shown in the graph below.



- a) With reference to the aim of this investigation, give the conclusion that the tomato growers would have drawn from these results.

1

- b) The greenhouse containing tomato plants without predators was included as a control experiment.

State the purpose of the control in this investigation.

1

Homework 5—Food Production

- c) Calculate the percentage decrease in the number of red spider mites in the greenhouse with a predator between June and September.

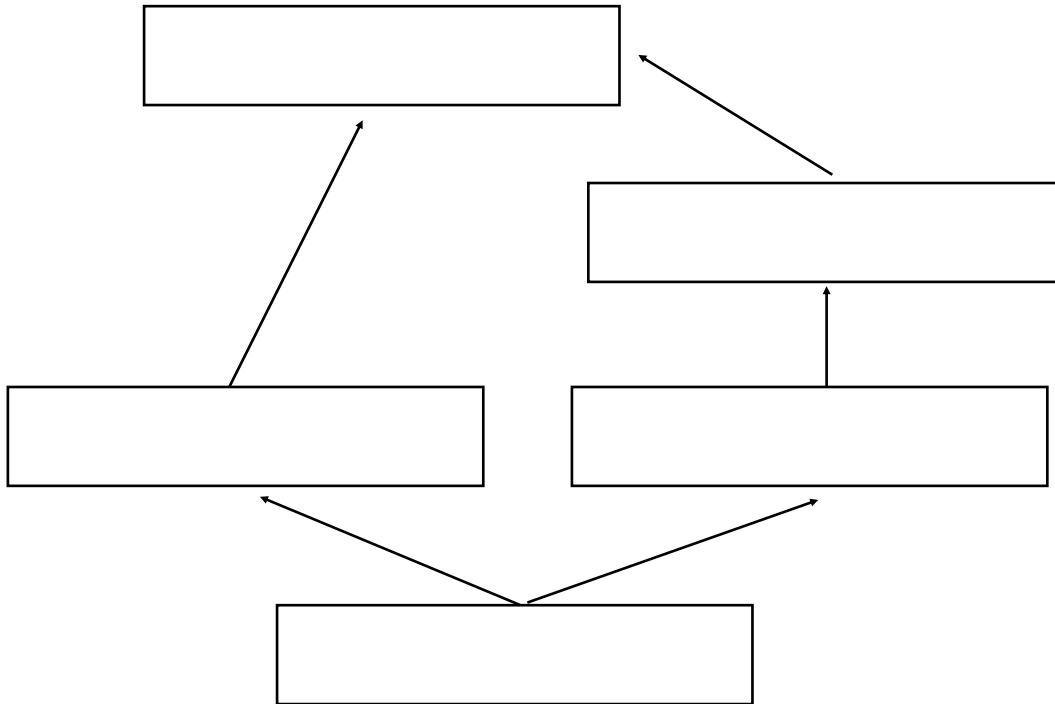
Space for working

_____ %

1

- d) Red mite spiders feed on green leaves and are preyed upon by toads and small birds. Foxes hunt toads, and cats hunt small birds. Cats are also sometimes hunted by foxes.

- i) Use the information above to fill in the boxes in the food web below.



2

- ii) From the information above, identify all the primary consumers.

1

- iii) Describe what the arrows in the food chains above represent.

1

Homework 6—Mutations & Speciation

1. Survival of the fittest is also known as
- A Selection pressure
 - B Natural selection
 - C Selective advantage
 - D Species selection

2. Which of the following is a source of new alleles in a population?
- A Mutation
 - B Isolation
 - C Natural selection
 - D Environmental conditions

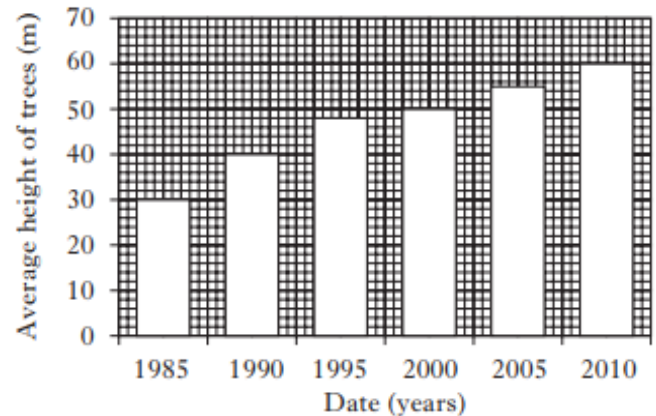
3. The peppered moth is found in two distinct forms. One form is dark coloured and the other is light coloured.

The moths rest on the trunks of the trees. Pale coloured tree-trunks in an area were darkened by pollution.

What would happen to the numbers of the two forms of the Peppered Moth in that area?

- A The numbers of each form would increase.
- B The dark form would increase and the light form would decrease.
- C The numbers of each form would decrease.
- D The light form would increase and the dark form decrease.

4. The chart below shows the average height of trees in a woodland over a 25 year period.



What is the percentage increase in tree height between 1985 and 2010?

- A 30%
 - B 50%
 - C 60%
 - D 100%
5. A species
- A can interbreed and can produce fertile offspring.
 - B can interbreed but cannot produce fertile offspring.
 - C cannot interbreed and cannot produce fertile offspring.
 - D cannot interbreed but can produce fertile offspring.
6. Which of the following is NOT a type of isolating barrier?
- A geographical
 - B ecological
 - C reproductive
 - D geological

Homework 6—Mutations & Speciation

7. The Scottish crossbill is a small bird which is native to Scotland. It inhabits pine forests in northern Scotland and feeds on pine seeds using its crossed beak.

a) State the term used to describe the role of the Scottish Crossbill described above within its community.

1

b) The Scottish crossbill bird has slowly evolved from another species of small bird native to Scotland. Decide if each of the following statements about evolution is True or False by ticking the correct box.

If the statement is false, write the correct word in the correction box to replace the word underlined in the statement.

<i>Statement</i>	<i>True</i>	<i>False</i>	<i>Correction</i>
Genetic variation within a population allows the population to <u>adapt</u> in a changing environment.	<input type="checkbox"/>	<input type="checkbox"/>	
Isolation barriers can be geographical, <u>environmental</u> or reproductive.	<input type="checkbox"/>	<input type="checkbox"/>	
Sub-populations evolve until they become genetically <u>identical</u> .	<input type="checkbox"/>	<input type="checkbox"/>	

3

c) Genetic variation will increase biodiversity in an ecosystem.

Define the terms biodiversity and ecosystem.

Biodiversity _____

Ecosystem _____

2

Homework 6—Mutations & Speciation

8. Researchers have discovered an advantageous genetic mutation that causes high bone density in humans.

One man in the USA was discovered to possess this mutation after he walked away without injury from a serious car crash. Further studies have found several members of the same extended family with this mutation.



20 members of the family provided blood samples for DNA and biochemical testing. 7 of them were found to have high bone density. The same tests were performed on another group of 20 unrelated individuals with normal bone density.

The location of the gene mutation was able to be identified and it is hoped that the findings will help in developing medications to increase bone density for the treatment of conditions such as osteoporosis.

- (a) (i) Calculate the percentage of the family who did **not** have the mutation for high bone density. 1

Space for calculation

_____ %

- (ii) Explain why the biochemical tests were also performed on the 20 individuals with normal bone density. 1

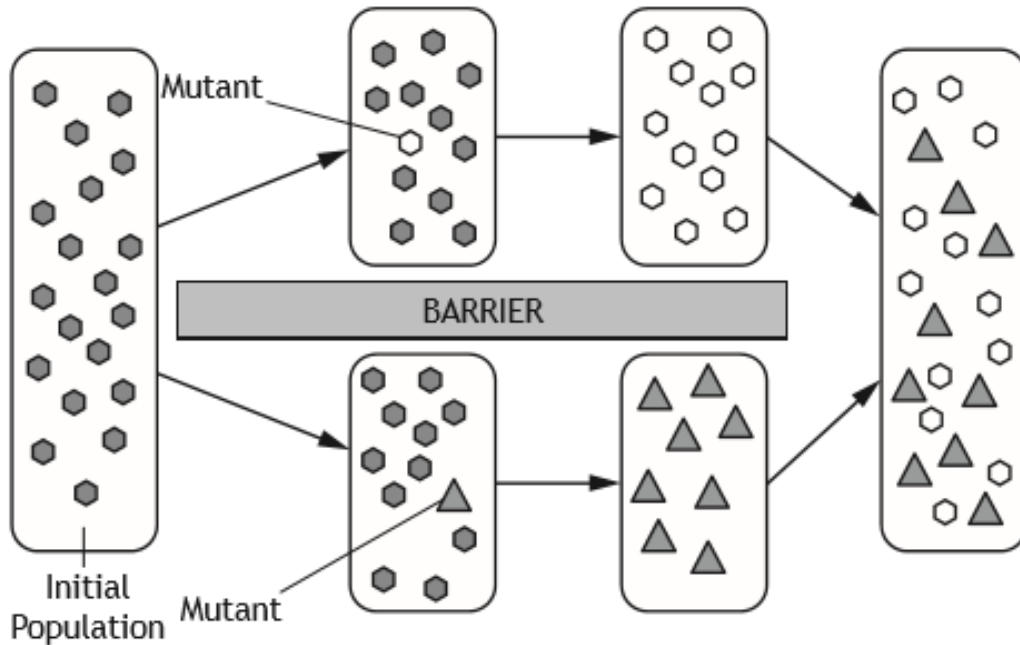
- (b) Name **one** factor which can increase the rate of mutation. 1

- (c) Mutations are the only source of new alleles.

Explain why it is important that new alleles arise in a species. 1

Homework 6—Mutations & Speciation

9. The following diagram shows the stages in the formation of a new species.



- (a) Using the information in the diagram, describe how new species are formed.

4
