Name: Form:

MYP 2
Year 8
Plants and Ecology

Statement of Inquiry:	Exploring **relationships** in the **environment** that result from **interactions** between organisms.
Key Concept:	Relationships
Related Concepts:	Environment and Interaction

4-5

8B MYP Command Terms

Term	Definition
Analyse	Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.
Apply	Use knowledge and understanding in response to a given situation or real circumstances
Describe	Give a detailed account or picture of a situation, event, pattern or process
Design	Produce a plan, simulation or model
Discuss	Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence
Document	Credit sources of information used by referencing (or citing), following one recognized referencing system. References should be included in the text and also at the end of the piece of work in a reference list or bibliography
Evaluate	Make an appraisal by weighing up the strengths and limitations
Explain	Give a detailed account
Formulate	Express precisely and systematically the relevant concept(s) or argument(s)
Interpret	Use knowledge and understanding to recognize trends and draw conclusions from given information
Outline	Give a brief account
Present	Offer for display, observation, examination or consideration
Recall	Remember or recognize from prior learning experiences
Select	Choose from a list or group
Solve	Obtain the answer(s) using appropriate methods
State	Give a specific name, value or other brief answer without explanation or calculation
Suggest	Propose a solution, hypothesis or other possible answer
Summarize	Abstract a general theme or major point(s)

Glossary: Plants and Ecology

WORD	MEANING
Anther	Part of the stamen. It produces pollen grains.
Carpel	Female reproductive organ found in flowers. It is made of a stigma, style and ovary.
Egg cell	The female sex cell in plants.
Embryo	Tiny plant, found inside a seed, with a very small shoot and a very small root.
Fertilization	Joining of a male sex cell with a female sex cell.
Filament	Part of the stamen. It supports the anther.
Flower	Organ system containing reproductive organs – carpel (female), stamen (male).
Fruit	Something used to carry seeds. Can be fleshy or dry.
Ovary	Part of the carpel. It contains ovules, each of which contains an egg cell.
Ovule	Contains egg cells. Is found in the ovary.
Petal	Part of the flower that is usually colourful to attract pollinators.
Pollen grain	The male sex cell in plants.
Pollen tube	Tube that grows from a pollen grain down through the stigma and style and into the ovary.
Pollination	Transfer of pollen from an anther to a stigma.
Seed	Contains a plant embryo and a store of food.
Sepal	Usually green, it protects the flower bud and supports the petals.
Stamen	Male reproductive organ found in flowers. It is made of an anther and a filament.
Stem	A plant organ used to take water to the leaves and to support the leaves.
Stigma	Part of the carpel. It is where pollen lands.
Style	Part of the carpel connecting the stigma to the ovary.
Fertilizer	A chemical or natural substance that contains nutrients for plant growth.
Germination	The process by which a plant grows out from a seed.
Seed	Contains a plant embryo and a store of food.
Seed coat	Hard outer covering of a seed
Cell wall	Tough wall around plant cells. Help to support the cell.
Chlorophyll	Green substance found inside chloroplasts. It absorbs light.
Chloroplasts	Green disc containing chlorophyll. Found in plant cells. Where glucose is made by photosynthesis.

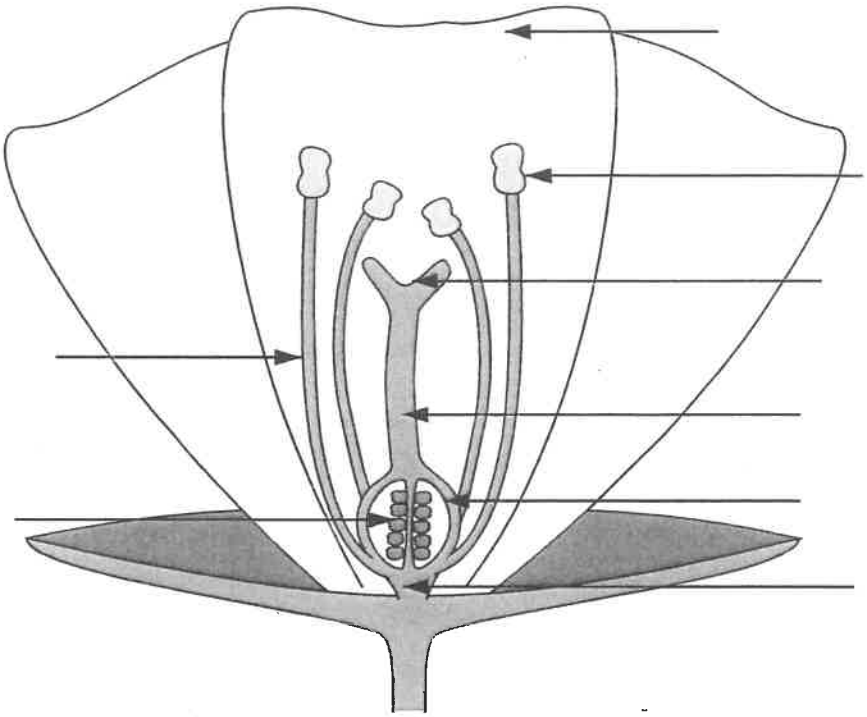
Fats	Substance needed by living things to make cell membranes. Our bodies also use fats as a store of energy and to keep warm.
Glucose	A type of sugar made during photosynthesis.
Iodine	A yellow brown solution that turns blue-black in the presence of starch.
Photosynthesis	Process that plants use to make their own food. It needs light to work. Carbon dioxide and water are used up. Glucose and oxygen are produced.
Proteins	A substance made from amino acids. Proteins are needed for growth and repair.
Starch	Insoluble carbohydrate made from glucose and used as a storage material in plants.
Accuracy	How close the measured value is to the known value.
Control variables	The variables or factors that are kept the same in a scientific investigation for fair testing.
Dependent variable	The variable that is **measured** in a scientific investigation.
Elodea	A type of pondweed that lives in fresh water.
Fair test	A controlled investigation carried out to answer a scientific question.
Independent variable	The variable that is **changed** in a scientific investigation in order to look at its effect.
Rate	How fast something is changing, measured over a period of time.
Reliability	How much you can trust the data collected.
Biofuel	A fuel that is made from plants or animal biomass.
Carbon dioxide	A gas that is a reactant in photosynthesis and a product of respiration.
Global warming	A long term rise in the Earth's temperature.
Greenhouse effect	Trapping of sun's heat on the Earth's surface.
Palm oil	A vegetable oil that comes from the fruit of oil palm trees, used widely in production of household products.
amphibian	Vertebrate with moist skin, e.g. frog.
animal kingdom	The group of organisms that contains all vertebrates and invertebrates.
arthropod	Invertebrate that has jointed legs; e.g. fly, spider.
bird	Vertebrate with feathers, e.g. eagle.
classification	Sorting things into groups.
cone	Something used to carry the seeds of conifers.
conifer	Plant with needle-shaped leaves. Reproduces using seeds found in cones.
cuticle	Layer of cells on leaves that is waterproof.
echinoderm	Invertebrate that has a body in five parts, e.g. starfish.
exoskeleton	Thick outer covering found in arthropods.
fern	Plant that has many small waterproof leaves. Reproduces using spores.
fish	Vertebrate with wet scales, e.g. salmon.

flowering plant	Plant with large, flat leaves. Reproduces using seeds found in fruits. Fruits and seeds form inside flowers.
fruit	Something used to carry the seeds of flowering plants. Can be fleshy or dry.
habitat	The place an organism lives in, e.g. woodland.
invertebrate	Animal without a backbone.
mammal	Vertebrate with hair and produces milk, e.g. human.
mollusc	Invertebrate that crawls on a fleshy pad, e.g. snail.
moss	Plant with many thin leaves but without roots and xylem. Reproduces using spores.
plant kingdom	Group of organisms that are able to produce their own food and have specialised cells.
reptile	Vertebrate with dry scales, e.g. snake.
root	Plant organ used to take water out of the soil.
seeds	Grow into new plants. Made by conifers and flowering plants.
spore	Very small part of a plant that can grow into a new plant. Made by mosses and ferns.
vertebrate	Animal with a backbone.
xylem vessel	Transports water through a plant.
adapted	When the features of an organism help it to survive in a habitat, it is adapted to that habitat.
community	All the plants and animals that live in a habitat.
environment	The conditions around an organism.
humidity	The amount of water vapour in the air.
physical environmental factors	The non-living conditions in the environment of an organism, e.g. temperature, light.
population	Total number of individuals of the same species in a habitat.
adaptation	The features of an organism that allow it to live in its environment.
compete	All organisms need some of the same things and so each organism has to try to get these things before another organism does. For example, plants compete with one another for light.
competition	Organisms compete with each other for food, light and space in a habitat.
distribution	The places where an organism can be found in a habitat.
ecologist	A person who studies the environment.
estimate	Provide a rough idea about the numbers of something or the size of something.
pitfall trap	Sampling method used to collect small animals that live on the ground.
pond dipping	Sampling method used to collect organisms from ponds.
quadrat	A square frame, thrown randomly on the ground, which is used to sample the plants in an area.

sample	A small part of something. If you sample something you take a small part of it. You use your results from the small part to suggest what the rest of it is like.
sweepnet	Sampling method used to collect small animals from long grass.
tree beating	Sampling method used to collect animals from trees and bushes.
Tullgren funnel	Sampling method used to collect small animals from samples of, for example, leaves.
uneven distribution	When a plant or animal is not found all over a habitat, only in certain places where the habitat is suitable.
pooter	A small container connected to two tubes. Used to catch tiny animals.
chemical energy	The kind of energy stored in chemicals. Food, fuels and electrical cells all contain chemical energy.
consumer	An organism that has to eat other organisms to stay alive. Animals are consumers.
food web	Many food chains linked together.
primary consumer	The first animal in a food chain.
producer	An organism that is able to make its own food.
pyramid of numbers	Way of showing the numbers of different organisms in a food chain.
secondary consumer	The second animal in a food chain.
tertiary consumer	The third animal in a food chain.
top predator	The last animal in a food chain.

8B 1a Flower Structure

Label the diagram using the keywords from the list of structures below



Write the matching number in the function column which corresponds to the structure number

Number	Structure
1	Filament
2	Anther
3	Ovary
4	Stigma
5	Petal
6	Stamen
7	Carpel
8	Stem
9	Sepal
10	Style
11	Receptacle
12	Ovule

Function	Number
Green stalk. Provides support.	
Female part, seeds made here. Consists of stigma, style, ovary.	
Supports & holds anther. Part of stamen.	
Male part of flower. Makes pollen. Made up of anther & filament.	
Special leaves form ring around bottom. Protect the buds.	
Sticky to catch pollen.	
Top part of stalks where flowers attached.	
Part of stamen, contains pollen.	
Brightly coloured	
Eggs stored here, join with pollen.	
Contains female reproductive cells	
Supports stigma	

8B 1b Flower Dissection

Flowers contain the male and female reproductive organs of plants.

1 Look carefully at your flower. What plant is it from?

_____

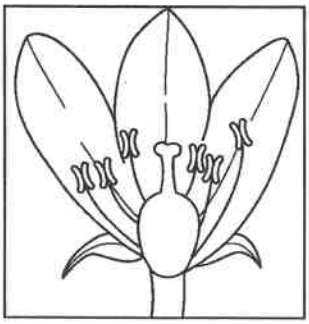
2 How many petals are there on your flower?

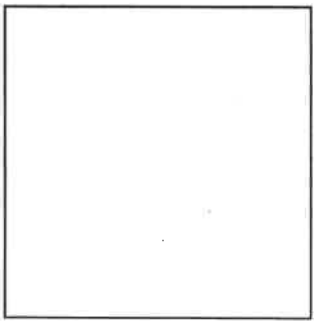
_____

3 What colour are the petals?

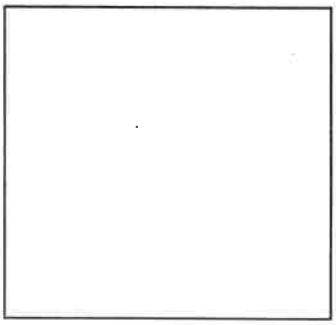
_____

Using tweezers, carefully take off the petals from one side of the flower so that you can see the male and female reproductive organs. Your flower may look similar to the one below.



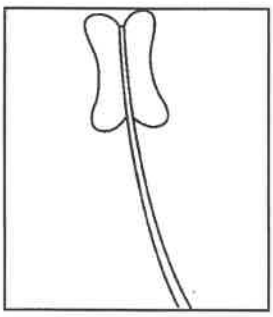


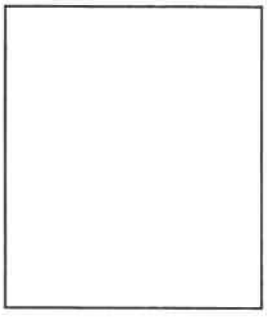
A petal from the flower – stick in or draw the shape of one petal in this box.



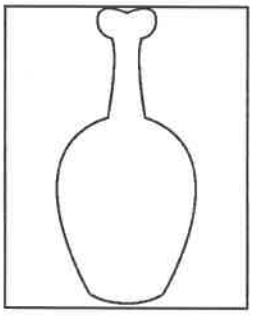
The flower looks like this – draw a picture showing the flower with half the petals taken off.

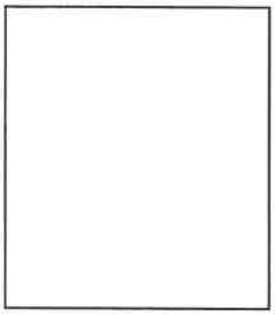
Now take off one stamen and remove the carpel. Stick them or draw them in the boxes. Label their parts if you can.





The stamen looks like this.





The carpel looks like this.

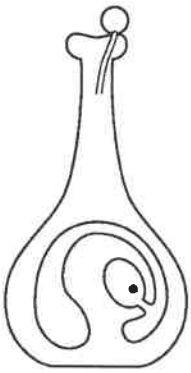
4 How many stamens are there in the flower?

_____

5 Any other interesting observations?

8B 1c Plant Fertilisation

1 The drawing below shows a pollen tube starting to grow.



a Complete the drawing to show where the pollen tube will end up.

b Label the parts of the diagram. Use the words in the box.

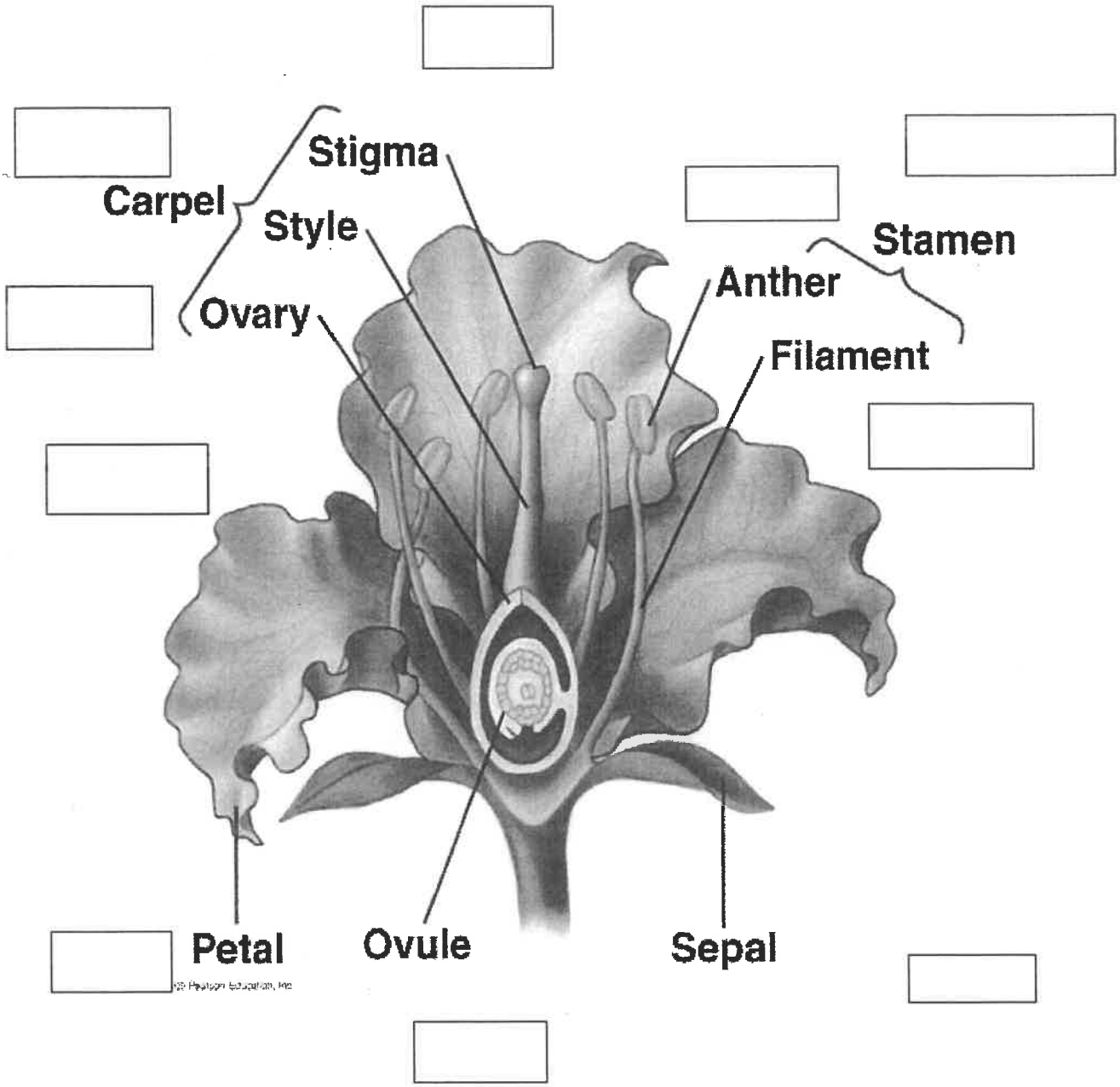
egg cell	ovary	ovule	pollen grain	pollen tube	stigma	style

2 Fill in the missing words in the following sentences.
Use the words in the box. Each word may be used more than once.

egg	embryo	fertilisation	nucleus	ovule	pollen	seed	stigma	style	tube cell

When a _____ grain lands on a _____, a pollen _____ starts to grow. This grows down the _____ and into the ovary. It then grows towards an _____. Here it finds an _____ cell. The nucleus from the pollen _____ then joins with the _____ in the _____ cell. This is called _____. An _____ now grows inside the ovule.

The ovule turns into a _____.


Stigma
Carpel
Style
Ovary
Stamen
Anther
Filament
Petal
Ovule
Sepal

8B 2a Factors Affecting Seed Germination

Investigating factors that affect the rate of seed Germination

Aim: To design and carry out an experiment to investigate a factor which could affect the number and/or height of seeds that germinate.

Prior Knowledge – what do you know?

Materials required

- cotton wool
- petri dish
- cress seeds
- lamp
- different NPK fertilisers
- thermometer

Brainstorm

- What factors **could** I change to increase the number/height of germinated seeds?
- Which one **will** I choose to change?
- How could I **measure height?**
- What **measurements** will I make so that I have meaningful results?

⚠ **Safety.**
Wear safety googles.

- How will I make my experiment a **fair test**?
- How much of each substance will I use?

Design - Reporting

Your report should include the following:

- **Research Question** – clearly state the question you are going to investigate.
- **Explain** what you think will happen in terms of the Science involved.
- **Independent (Input) Variable** – State clearly the variable are you going to change and how will you change its value?
- **Control Variables** – state clearly the variables that you need to keep constant and say how you will control them.
- **Dependent (Outcome) variable** – state clearly what measurements you are going to take.
- **Apparatus** – draw a neat, labelled diagram of the assembled apparatus
- **Method** – write a procedure that a fellow student could follow.

Now you are ready to carry out your experiment

Data Collection & Processing

- **Carry out** your planned experiment.
- **Record** your results in a *suitable table* – remember headings and units. Values of *controlled variables* and any *observations* should also be recorded.
- **Present** your results in a suitable way – line graph? Bar graph?

Concluding & Evaluating

- Use your results to draw a **conclusion**. What pattern do the results show?
- Explain how your results helped you to reach this conclusion
- Try to **explain** the pattern using **scientific ideas**
- Describe some problems you had trying to obtain **accurate** and **reliable** results in this experiment
- Try and think of some ways of solving these problems if you were to repeat the experiment again

MYP Science
Practical Report Template

Name:	Form:

UNIT:	
Statement of Inquiry:	
Key Concept:	
Related Concepts:	
Investigation Title:	**Seed Germination**

Experiment Design

Research Question

(What are you trying to find out?)

How does ....

Background Scientific Information and Hypothesis

(What do you think will happen and why?)

Variables

Independent *(What will change and how will you change it?)*	
Dependent *(What will you measure to gather results?)*	
Control *(What variables will you keep the same to make it a fair test? How will you keep the variables constant?)*	

Apparatus Set-up

(Draw a labelled diagram of the assembled apparatus that you will use. Write the name of any equipment not shown in the diagram)

Method

(Write a step by step account of how you conduct your experiment – the method must be DETAILED). Add as many steps as you need to.

1.

2.

3.

4.

5.

Safety

(How will you make sure your method is safe?)

Reliability

(What will you do to ensure your results are reliable?)

Criterion C - Processing and Evaluating

Results

Raw Data

(A neat, organized table of results should be drawn, with headings, units, repeats and averages include)

Observations

(What changes did you notice as the experiment was conducted, e.g. colour change, bubbles, heat change?)

Graphing Results

You should draw a graph of your results and attach it to this report.

Analysis of Graph

(What did your results show? Are there any trends or patterns in your results? Can you give an example of a pattern or trend from your results? Are there any anomalies in your results?)

Conclusion and Evaluation

Scientific Conclusion and Explanation of Results

(Summarize what your results show. How well does this support your hypothesis ? Can you explain your results using scientific knowledge?)

Evaluation of Scientific Method and Results

(How reliable were your results? How well did your investigation answer the research question? What went well with your method?

(Were there any problems or parts of your investigation that were not very accurate or could have been done better?)

Issue with justification	Suggested SCIENTIFIC Improvement

8B 3a GM Crops - The Good, the Bad and the Ugly

Video Title	Impressions	Arguments *FOR* use of GMO	Arguments *AGAINST* use of GMO
GMO and the Environment https://www.youtube.com/watch?v=KonUXpTv0SI	Credible? Yes No Bias ❑ Pro ❑ Against ❑ Neutral		
Greenpeace https://www.youtube.com/watch?v=1H9WZGKQeYg	Credible? Yes No Bias ❑ Pro ❑ Against ❑ Neutral		

Bayer https://www.youtube.com/watch?v=frH8a0BYWgs	Credible? Yes No Bias ❑ Pro ❑ Against ❑ Neutral		
Fuse School https://www.youtube.com/watch?v=kZlYkYNpnP0	Credible? Yes No Bias ❑ Pro ❑ Against ❑ Neutral		
Ted Ed https://www.youtube.com/watch?v=7TmcXYp8xu4&t=61s	Credible? Yes No Bias ❑ Pro ❑ Against ❑ Neutral		

Claim, Evidence, Reasoning

Using the information you gathered from the videos, make a personal claim, based on the roel you have assumed within your group about whether or not GMO foods should be allowed in our food supply.

Provide ***four*** pieces of evidence and explain why/how they support your claim.

MYP 2: Year 8 Science

Criterion D Assessment - Reflecting the Impacts of Science

UNIT:	Plants & Ecology
ASSESSMENT TITLE:	GM Crops: the Good, the Bad, the Ugly
Inquiry Statement	Exploring **relationships** in the **environment** that result from **interactions** between organisms.
Key Concept:	Relationships
Related Concepts:	Environment, Interaction

Assignment Instructions (GRASPS)

Goal	Produce a group podcast which outlines a variety of viewpoints associated with using GM crops.
Role	You must work on this task in groups of **FOUR**. Each person in the group will **assume a different role** from the following list; 1. Farmer 2. Environmentalist 3. Doctor 4. Director of a Biotechnology Firm producing GM Crops.
Audience	The local community.
Situation	The local community has seen an increased interest in the use of **genetically modified crops as a food source** and would like further information on the **pros and cons of such crops before approval** for use can be given. Your podcast will be broadcast on the local radio station.
Product	Produce a group podcast in which you discuss GM crops from the viewpoint of the role you have been assigned. The podcast should be no more than a **TOTAL of 5 minutes** in length, allowing each member of your group to provide a 1min 20s viewpoint.
Success Criteria for Assessment	In your podcast you will: - Clearly explain the **advantages and disadvantages** associated with GM crops - You refer to **data to support your argument** in the role you have assumed. - You must use **accurate scientific terminology** in your verbal communication in the podcast. - Draw a **final conclusion** to state that from the role you have assumed are you **for or against GM crops**

Other Information:

You MUST provide a Bibliography and cite all your sources.

Due Date: this will be set by your teacher.

Level Descriptors and Task Specific Clarifications for Criterion D:

Level	Level Descriptor	Task Specific Clarification
0	The student does not reach a standard described by any of the descriptors below.	No data or clear evidence provided.
1-2	The student is able to, **with limited success:** i. **state** the ways in which science is used to address a specific problem or issue ii. **state** the implications of using science to solve a specific problem or issue, interacting with a factor iii. **apply** scientific language to communicate understanding iv. document sources.	ii. Student simply states the problem of using non GM crops. ii. Simply state that GM crops are better. No explanation or relevant data given. iii. Little evidence of scientific vocabulary being used. iv. Source of information given, but not correctly referenced.
3-4	The student is able to: i. **Outline** the ways in which science is used to address a specific problem or issue ii. **Outline** the implications of using science to solve a specific problem or issue, interacting with a factor iii. **sometimes apply** scientific language to communicate understanding iv. **sometimes** document sources correctly.	i. At least one problem associated with GM crops. Some data is given, but source may not be referenced. ii. Students provide at least 1 reason to explain why GM crops are an improvement. iii. Some scientific vocabulary is used. iv. Bibliography has only one source referenced, but this may not be accurately formatted.
5-6	The student is able to: i. **Summarize** the ways in which science is used to address a specific problem or issue ii. **Describe** the implications of using science to solve a specific problem or issue, interacting with a factor iii. **usually apply** scientific language to communicate understanding **clearly and precisely** iv. **usually** document sources correctly.	i. Problems associated with non GM crops are summarized, but not explained fully. Some data/example that supports the argument is given. ii. The advantages of GM crops are described, but not fully explained. iii. Some good scientific vocabulary is used. iv. At least 3 sources are referenced in APA format
7-8	The student is able to: i. **Describe** the ways in which science is applied and used to address a specific problem or issue ii. **Describe and summarize** the implications of using science and its application to solve a specific problem or issue, interacting with a factor iii. **consistently apply** scientific language to communicate understanding **clearly and precisely** iv. document sources **completely**	i. The student presents a clear explanation of the problems associated with non GM crops, using examples. ii. Contrast these with the advantages of GM crops, describing and summarising how these work. Students give clear and specific examples. iii. Explanations involve excellent scientific vocabulary. iv. Correct bibliography is provided citing at least 5 reputable and relevant sources, in APA format.

8B 5a Photosynthesis – Key Information

Highlight any information that you think is relevant to how plants get the materials to grow in one colour and what happens to the materials they produce in another colour.

Green plants are unique in their ability to make their own food. Unlike most organisms that have to consume food that is already there, green plants have the ability to produce their own. This is called Photosynthesis.

This is done using carbon dioxide from the air, and water from the soil. Water is transported to the leaves, where photosynthesis occurs, whilst carbon dioxide diffuses into the leaf from the air through tiny holes in the underside of the leaf called stomata.

The process then requires energy to break the atoms in carbon dioxide and water apart. This energy comes from sunlight, which plants collect. In order to harness this energy, the cells of the leaf contain chloroplasts, which have a green chemical called chlorophyll. This is the chemical that harnesses the light energy.

Once the atoms of carbon dioxide and water have been broken apart (carbon, hydrogen and oxygen), they are then rearranged to form two products, one of which is glucose. The plant can then convert glucose into many different things, including starch for storage, cellulose for new cell walls, proteins, oils and fats. All of these materials can then be used to make new cells, which in turn mean the plant grows bigger. We call the amount of biological material that the plant has, its biomass. Therefore the plant can use the food it makes to increase its biomass.

This is good news for us, as it means that animals and humans have food to eat.

8B 5b Testing for Starch in Plants

Apparatus

- **Food samples**
- **Water**
- **Spotting tile**
- **Pipette**
- **Iodine solution**

Iodine will stain your skin.

Method

1 You will be provided with a range of human foods that come from plants.
For each food, write down the part of the plant that it has come from in the results table below.
2 Use a pipette to add two drops of iodine solution to each food.
3 Look for a blue-black colour. If it appears after testing, then starch is present.
4 Enter your results in the table below.

Recording your results

Name of food	Part of plant	Does it contain starch?

Considering your results/conclusions

Do all the parts of the plants that you tested contain starch? _____

_____

Do any of the food samples contain more starch than others?

_____

Starch is a store of energy for the plant. For each food tested that contained starch, suggest a reason why a store of energy might be needed in that part of a plant.

_____

_____

_____

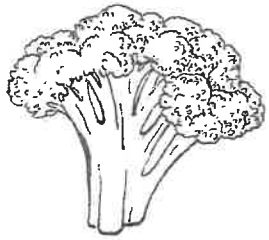
_____

Suggest some reasons why humans might eat the foods that do not contain starch.

8B 5c Plants We Eat

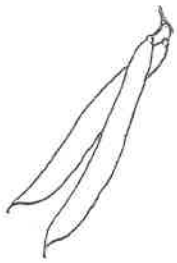
1 The drawings below show plants that we eat. For each one, write down the name of the plant and which part of it we eat. Use the words in the box to help you.

apple	**broccoli**	**carrot**	**celery**	**flower**	**fruit**	**hazel nut**
leaf	**lettuce**	**potato**	**root**	**runner bean**	**stem**	**tomato**



Name _____

Part of plant _____

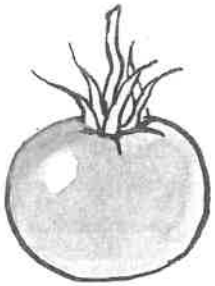


Name _____

Part of plant _____

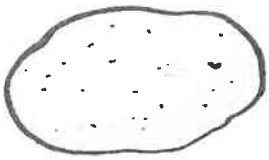
Name _____

Part of plant _____



Name _____

Part of plant _____

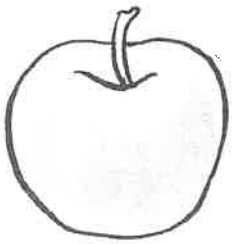


Name _____

Part of plant _____

Name _____

Part of plant _____



Name _____

Part of plant _____

2 All the materials in all the foods are made using glucose. What process do plants use to make glucose?

_____

3 Some glucose is turned into proteins and fats. These are often stored in seeds. Choose one food from question **1** which you would expect to contain a lot of protein and fat.

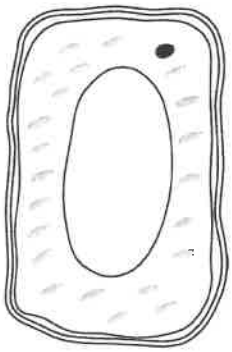
_____

4 Glucose is often turned into starch. Choose one food from question **1** which contains a lot of starch.

_____

8B 5d Uses of Glucose

1 Copy this drawing of a cell in a leaf. It is called a palisade cell and it makes lots of glucose by photosynthesis.



2 What process happens in the cell to make glucose?

3 Most of the glucose is changed into starch as soon as it is made. Label your palisade cell drawing to show where you would expect to find starch.

4 Some plants can store starch in special parts. Which one of these stores a lot of starch?

orange apple flower potato tomato pear

5 People eat food with starch in it to give them energy. Why do plants store up starch?

6 Glucose molecules are shaped like this:

Many glucose molecules join in a line to form a starch molecule. Make a drawing of what you think a starch molecule looks like. The links between each glucose molecule can be shown by a straight line.

7 Some of the glucose is used to make cellulose. Label your palisade cell drawing to show where you would expect to find cellulose.

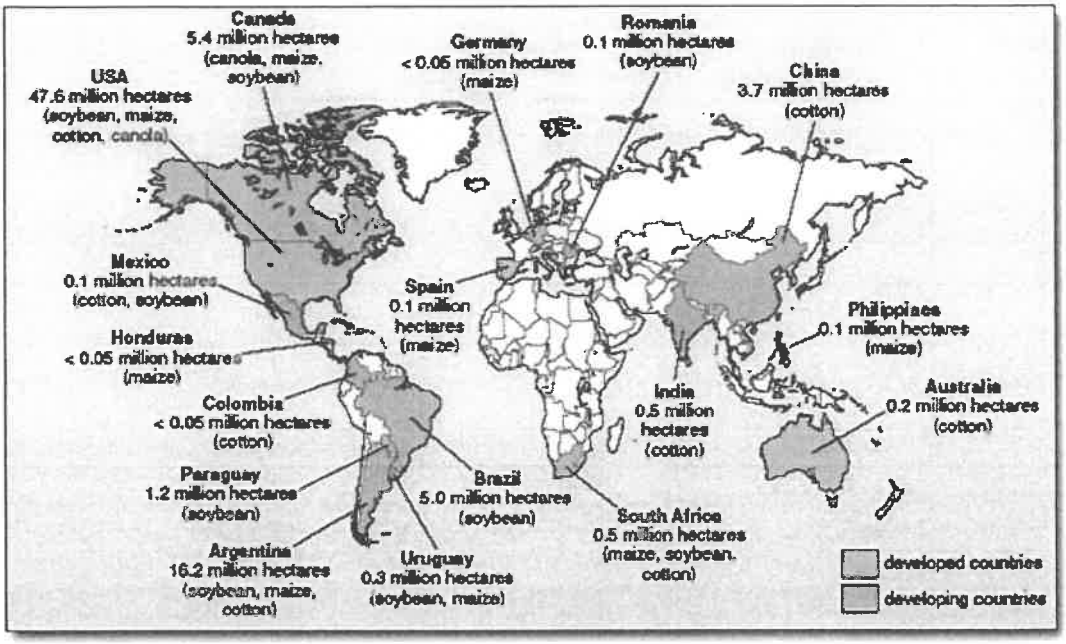
8 Some of the glucose is used to make fats and oils. These are needed to make cell membranes. Label your palisade cell drawing to show where you would expect to find oils and fats.

9 Glucose is used for aerobic respiration in plants. Copy and complete the word equation for aerobic respiration.

_____ + _____ → carbon dioxide + water (+energy)

10 Aerobic respiration happens in the cytoplasm of every cell. Label your palisade cell drawing to show where you would expect to find respiration happening.

8B 5e Crops of the World



Q1) Define a crop

Q2) Name 3 different categories of crops

Q3) Complete the following table on major crops

Name	Details on nutritional content	Countries where this is grown	Additional information
Wheat			
Rice			
Maize			

Q4) Complete the following table on 3 additional crops of your choice

Name	Details on nutritional content	Countries where this is grown	Additional information

Keywords (add any extra to this list as you find them)

Biodiversity, food, grazing, agriculture, arable, farming, plants, crops, harvested

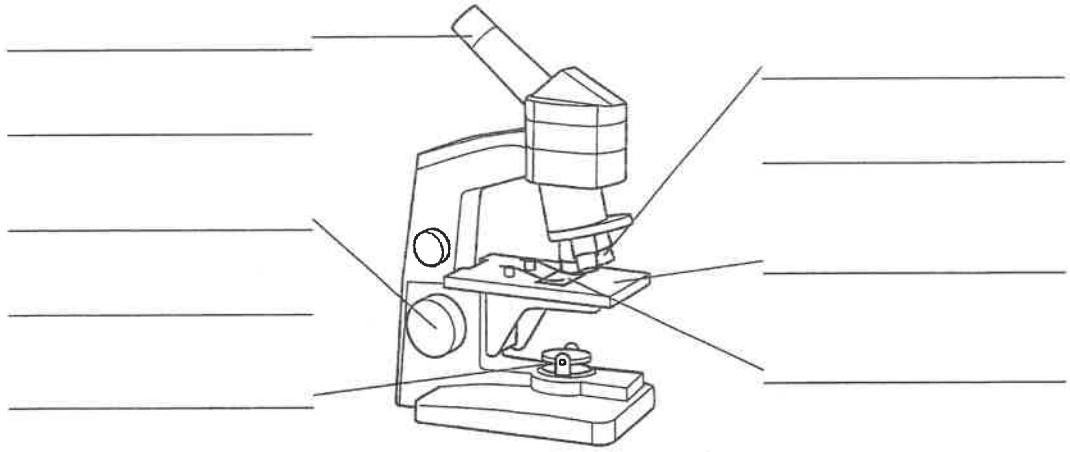
Useful websites

https://www.idrc.ca/en/article/facts-figures-food-and-biodiversity

http://nationalgeographic.org/encyclopedia/crop/

8B 6a Microscope Review

Label the parts of a light microscope.



The eyepiece of the microscope we use has a magnification of 10x. Calculate the total magnification of images seen using different objective lenses.

Hint: Total magnification = Eyepiece magnification x Objective lens magnification

Objective lens	Objective lens magnification	Eyepiece magnification	Total magnification
Lower power			
Medium power			
Higher power			

8B 6b Starch Granules and Chloroplasts

Observing chloroplasts in pondweed

Pondweeds such as elodea are suitable to be viewed under the microscope as their leaves are thin and therefore let sufficient light through.

How can you identify the chloroplasts?

Materials:
Pondweed, glass slide, coverslip, pipette and water

Method:

1. Use scissors or your fingers to gently remove one leaf from the pondweed.
2. Place the leaf on a glass slide.
3. Add one drop of water on the leaf.
4. Place coverslip over the specimen.
5. View the leaf under lower and medium power on the microscope.
6. Identify the cell wall and chloroplasts in the pondweed cells.

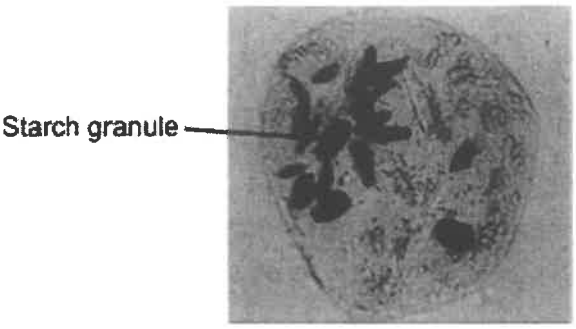
In the space below, produce a magnified drawing of one pondweed cell seen under medium power. Label the parts visible.

Tips for good biological drawings:

- Use a pencil
- Use single, solid lines
- No shading
- Draw only what you can see

Observing starch granule in banana

Plants such as banana stores food in the form of starch in their cells.



How can you identify starch granules?

Materials:

Unripe banana, glass slide, coverslip, iodine solution, toothpick

Source: https://www2.mrc-lmb.cam.ac.uk/microscopes4schools/banana.ph

Safety goggles should be worn as iodine solution is an irritant

Method:
(adapted from https://www2.mrclmb.cam.ac.uk/microscopes4schools/banana.php)

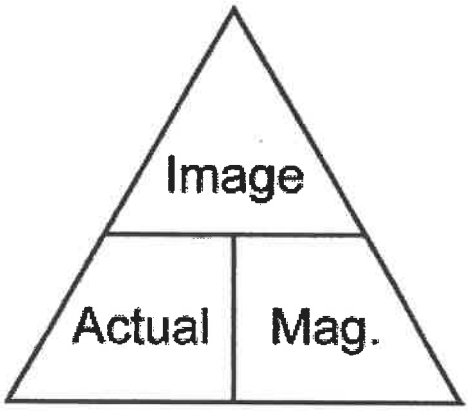
1. Collect a small piece of unripe banana.
2. Using a toothpick, smear a little bit (less than the size of a sesame seed) of the banana on a microscope slide to rub the cells apart.
3. Add one drop of iodine solution on the specimen and place coverslip over.
4. Remove excess solution with a piece of tissue paper.
5. View the slide under lower and medium power on the microscope.
6. Identify starch granules which are stained blue-black.

In the space below, produce a magnified drawing of one banana cell seen under medium power. Label the parts visible.

8B 6c Magnification Calculations (Extension)

The magnification of an image can be calculated using the formula:

$$\text{Magnification} = \frac{\text{Image size}}{\text{Actual size}}$$



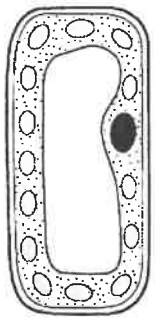
1,000µm = 1mm

Calculate the **magnification** of the following images:

1. If the sperm cell is 53 µm in length (head to tail)

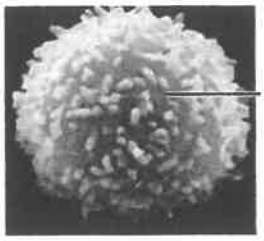
2. If the red blood cell is 8 µm in diameter

3. If the largest chloroplast in this palisade cell is 5 µm in length.



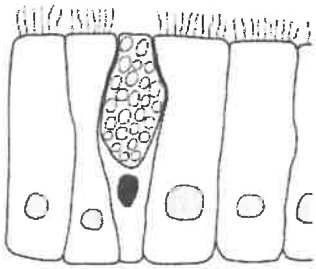
Calculate the **actual size** of the following cells or structures:

4. If the **white blood cell** diameter is magnified x 2700



5. If the diameter of the **xylem vessel** is magnified x 650

6. If the length of the longest **cilia** are magnified x 2000



8B 7a Investigate a Factor that Affects the Rate of Photosynthesis Criteria B & C Assessment Overview

Let's review our Statement of Inquiry.

Exploring **relationships** in the **environment** that result from **interactions** between organisms.

Photosynthesis is fundamental to not just plants but all living things. Oxygen is released into the atmosphere through photosynthesis to be used by other organisms for respiration. Plants are a food source for many organisms. Factors that affect the rate of photosynthesis are therefore of great significance.

Aim

To investigate a factor that affects the rate of photosynthesis in *Elodea*.

Tasks

i) Planning

- You will work in groups of 2 or 3 and agree on **ONE factor** to investigate.
- Your teacher will demonstrate a method to measure the rate of photosynthesis, by counting the **number of bubbles** rising from the cut piece of *Elodea*.
- You need to **complete** the planning of your investigation before starting data collection. You may have time to do some pre-testing to finalise your method.
- You can use the planning board to help you design your investigation and identify the **independent, dependent and controlled variables.**

ii) Data collection

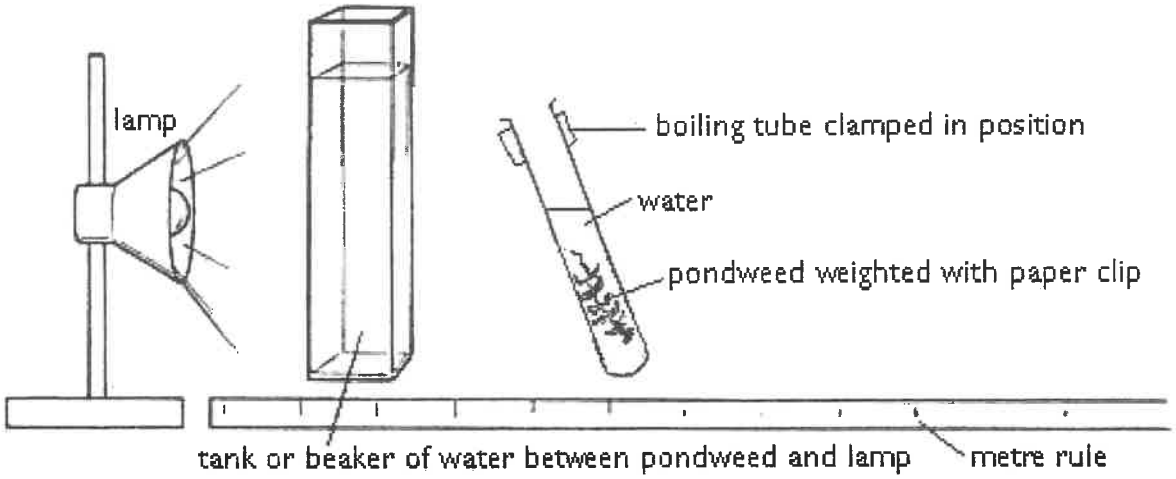
- You should try to collect as much data as you can within the time given in class. Remember **multiple trials** help increase the reliability of your data.
- Make sure a **results table** is set up for data to be recorded.

iii) Write up

- You need to produce a **full scientific report** to document your planning and findings.
- You could use the report **template** attached to help structure your work.
- Make sure you check your work against the **checklist**.

Adapted from http://www.nuffieldfoundation.org/practical-biology/investigating-factors-affecting-rate-photosynthesis

Set up



Sodium hydrogen carbonate (0.5g at a time) could be added to alter the carbon dioxide concentration.

Planning Notes

MYP 2: Year 8 Science

Criterion B Assessment – Inquiring and Designing

Criterion C Assessment – Processing and Evaluating

UNIT	**Plants and Ecology**
ASSESSMENT TITLE:	Investigate into a Factor Affecting the Rate of Photosynthesis
Statement of Inquiry:	Exploring **relationships** in the **environment** that result from **interactions** between organisms.
Key Concept:	Relationships
Related Concepts:	Environment, Interaction
ATL Focus:	**Social** – collaboration (ii) – manage and resolve conflict, and work collaboratively **Self-management** – organisation (iii) – select and use technology effectively and productively
Key Scientific Vocabulary:	

Prediction	
Independent variable	
Dependent variable	
Controlled variables	
Reliability	
Qualitative data	
Quantitative data	
Validity	

Command Terms:

Design	Produce a plan, simulation or model
Outline	Give a brief account
Interpret	Use knowledge and understanding to recognize trends and draw conclusions from given information
Analyse	Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.

Assignment Instructions (GRASPS)

Goal	To investigate how ONE factor affects the rate of photosynthesis in elodea.
Role	Students are acting as scientists to report on findings from a scientific investigation.
Audience	The audience of this report is a group of environmental scientists who have been studying a nearby lake.
Situation	Environmental scientists are interested in finding out reasons for the recent changes in oxygen level in the lake, and have asked for your help to investigate.
Product	A scientific investigation report to communicate your findings.
Success Criteria for Assessment	The ***final scientific report MUST include*** (see MYP Practical Report Checklist for Students in your booklet): - Title - Research Question - Background information - Hypothesis - Variables - Apparatus - Method - Safety considerations - Results table - Observations - Graph - Analysis and Conclusion - Strengths and Weaknesses - Improvements

Level Descriptors and Task Specific Clarifications for Criterion B:

Level	Level Descriptor	Task Specific Clarification
0	The student does not reach a standard described by any of the descriptors below.	i. No research question stated. ii. No prediction stated. iii. Variables not identified. iv. Method and safety precautions not stated.
1-2	The student is able to: i. **select** a problem or question to be tested by a scientific investigation ii. **select** a testable prediction iii. **state** a variable iv. design a **method with limited success**.	i. A research question is stated but not relevant to the investigation. Limited background information on photosynthesis given. ii. A **prediction** with reference to photosynthesis is **stated**. iii. Independent, dependent and controlled variables **identified** but with inaccuracies. Method of data collection not indicated. iv. A method is presented but incomplete or not relevant to the investigation. V. Safety precautions not stated.
3-4	The student is able to: i. **state** a problem or question to be tested by a scientific investigation ii. **outline** a testable prediction iii. **outline** how to manipulate the variables, and **state** how **data** will be collected iv. design a **safe method** in which he or she **selects materials and equipment**.	i. A research question is **stated** with reference to **photosynthesis**. Background information **outlines the reaction of photosynthesis**. ii. A prediction with reference to **photosynthesis** is **stated** with limited explanation. iii. Independent, dependent and controlled variables **identified** but incomplete. Basic **method of data collection** is **stated**. iv. Method is presented in **steps** but does not clearly show how the experiment is conducted and/or how data is collected. Safety precautions stated but are not specific to the experiment.
Level	Level Descriptor	Task Specific Clarification

5-6	The student is able to: i. **outline** a problem or question to be tested by a scientific investigation ii. **outline and explain** a testable hypothesis using **scientific reasoning** iii. **outline** how to manipulate the variables, and **outline** how **sufficient relevant data** will be collected iv. design a **complete and safe method** in which he or she **selects appropriate materials and equipment.**	i. A research question is stated with reference to photosynthesis. Background information **outlines the reaction of photosynthesis**, and **how the rate of photosynthesis could be compared.** ii. A prediction with reference to photosynthesis is **outlined** and **explained** with basic reasoning. iii. Independent, dependent and controlled variables **correctly identified**, with an outline of **how relevant data is collected to measure photosynthesis.** iv. Method is presented in **clear steps** with relevant details, with suitable materials and apparatus chosen. A **labelled diagram** to show how the apparatus is set up. **Relevant safety precautions** discussed.
7-8	The student is able to: i. **describe** a problem or question to be tested by a scientific investigation ii. **outline and explain** a testable prediction **using correct scientific reasoning** iii. **describe** how to manipulate the variables, and **describe** how **sufficient, relevant data** will be collected iv. design a **logical, complete and safe method** in which he or she **selects appropriate materials and equipment.**	i. A research question **clearly identifies the independent and dependent variables** with reference to photosynthesis. Background information **outlines the reaction of photosynthesis**, factors that could affect the reaction, and **how the rate of photosynthesis could be compared.** ii. A prediction with reference to **the relationship between the independent and dependent variables** is outlined and **explained** using relevant scientific reasoning. iii. Independent, dependent and controlled variables **correctly identified**, outlining **how** they are manipulated, measured or controlled, and **why.** Values of variables stated where appropriate. iv. Method is presented in **clear steps** with all relevant details, stating **values** and **measuring equipment** used. A **fully labelled diagram** to show how the apparatus is set up. **Safety precautions** discussed and are relevant to this investigation.

MYP 2 Science Plants and Ecology Year 8

Level Descriptors and Task Specific Clarifications for Criterion C:

Level	Level Descriptor	Task Specific Clarification
0	The student does not reach a standard described by any of the descriptors below.	i. No data presented. No graph plotted. ii. Trend not stated. iii. No conclusion on whether the prediction is supported by data. iv. No strengths or limitations relevant to the investigation stated. v. No improvement or extension stated.
1-2	The student is able to: i. **collect and present** data in numerical and/or visual forms ii. **Accurately interpret** data iii. **state** the validity of a prediction based on the outcome of a scientific investigation, **with limited success** iv. **state** the validity of the method **with limited reference** to a scientific investigation v. **state limited** improvements or extensions to the method	i. **Raw, quantitative** data from are presented in a **table**. A **graph** is **plotted** with inaccuracies. ii. A **trend** is stated but is not supported by data. No scientific explanation given to explain the trend. iii. A **conclusion** is drawn to state if the prediction is supported by the data, but with inaccuracies. iv. At least **one limitation** relating to the investigation is stated, but not relevant to the validity of the investigation. v. At least **one improvement or extension** stated but is not relevant to the limitation identified.
3-4	The student is able to: i. **correctly collect and present** data in numerical and/or visual forms ii. **accurately interpret** data and **describe** results	i. **Raw, quantitative** data are neatly presented in a **table** with **headings.** **Averages** calculated and presented in a table, with some inaccuracies. A **graph** is **plotted** with **labelled axes.** **Limited qualitative data** from the experiment recorded. ii. **Trend** shown in the graph is outlined with some inaccuracies. Limited explanation on the trend is given and is not fully relevant to the chosen factor and photosynthesis.

	iii. **state** the validity of a hypothesis based on the outcome of a scientific investigation iv. **state** the validity of the method based on the outcome of a scientific investigation v. **state** improvements or extensions to the method that would benefit the scientific investigation.	iii. A conclusion is drawn to state if the prediction is supported by the data. iv. At least **one limitation** relating to the **validity** of the investigation is stated. v. At least **one improvement relating to each limitation** raised is stated. **Extensions** of investigation stated.
5-6	The student is able to: i. **correctly collect, organize and present** data in numerical and/or visual forms ii. **accurately interpret** data and **describe** results **using scientific reasoning** iii. **outline** the validity of a hypothesis based on the outcome of a scientific investigation iv. **outline** the validity of the method based on the outcome of a scientific investigation v. **outline** improvements or extensions to the method that would benefit the scientific investigation.	i. **Raw, quantitative** data from **multiple trials** are neatly presented in a **table** with **headings and relevant units.** **Averages** calculated and presented in a table. A correct type of **graph** is **plotted**. The graph has **correctly labelled axes** including **units** and **suitable scales**. **Qualitative data** from the experiment recorded. ii. **Trend** shown in the graph is correctly outlined. **Anomalies/outliers** are identified. Trend is **explained** using **correct scientific knowledge** relating to the chosen factor and photosynthesis. iii. Correct conclusion is drawn as to **how well the data support the hypothesis** and answer the research question, with **reliability of the data** stated. iv. At least **two limitations** relating to the **validity** of the investigation are outlined. Consider how the limitations affected the data and how well the research question could be answered. v. At least **one improvement relating to each limitation** raised is described in detail. **Extensions** of investigation described.
Level	Level Descriptor	Task Specific Clarification
7-8	The student is able to: i. **correctly collect, organize, transform and present** data in numerical and/ or visual forms	i. **Raw, quantitative** data from **multiple trials** are neatly presented in a **table** with **informative headings and relevant units.** **Rate** of photosynthesis and **averages** correctly calculated and presented in a table.

MYP 2 Science Plants and Ecology Year 8

		A correct type of **graph** is **accurately plotted**. The graph has **correctly labelled axes** including **units** and **suitable scales.** **Meaningful qualitative data** taken throughout the experiment recorded.
	ii. **accurately interpret data** and **describe** results **using correct scientific reasoning**	ii. **Trend** shown in the graph relating to the **factor** investigated and **rate of photosynthesis** is correctly outlined with reference to **specific data points.** **Anomalies/outliers** are correctly identified. Trend is **explained** using **correct scientific knowledge** relating to chosen factor and photosynthesis.
	iii. **discuss** the validity of a hypothesis based on the outcome of a scientific investigation	iii. Correct conclusion is drawn as to **how well the data support the hypothesis** and answer the research question, with **reliability of the data discussed.**
	iv. **discuss** the validity of the method based on the outcome of a scientific investigation	iv. At least **two strengths and limitations** relating to the **validity** of the investigation are discussed in detail. Consider how the limitations affected the data and how well the research question could be answered.
	v. **describe** improvements or extensions to the method that would benefit the scientific investigation.	v. At least **one improvement relating to each limitation** raised is described in detail. Relevant **extensions** of investigation described.

Student Task Planning Notes:

MYP Practical Report Checklist - Student

Before you submit your practical report to your teacher you must use the checklist below to ensure all parts of your report have been completed.

	Section	What you need to do	Completed Y/N
DESIGN **(MYP Criterion B: Inquiring and Designing)**	Title	Give a **name** to the experiment you are conducting	
	Research Question	The research question should be **clear, concise**, and include the independent variable and the dependent variable.	
	Background Information	You should give the **science theory** behind your investigation, and it should include scientific terminology. This should be presented as a **short scientific paragraph.**	
	Hypothesis	**What** do you predict will happen in your experiment and **why**?	
	Variables	**Independent** Variable - what will you change and how will you change it? **Dependent** Variable - what will you measure and how will you measure it? **Control** Variables - what are they? How and why are they controlled?	
	Apparatus	Have you completed a **diagram of assembled equipment** that shows how to successfully collect data? Have you used a **ruler and pencil** to do this? Have you **labeled** all the chemicals and equipment in your diagram?	
	Method	Have you written your method in the following format: - **Stepwise** - **Logical** order of steps in investigation - Used **correct names for chemical and equipment** - Provided detailed account of the steps in the method - Describe how you will **change the independent** variable - Describe how **control variables are monitored**	

	Safety	Discuss any **safety issues** with chemicals or equipment being used, and describe what **precautions** should be taken to ensure you conduct the investigation safely.	
RESULTS and CONCLUSION **(MYP Criterion C: Processing and Evaluating)**	Results Table	A **table of results must include**: - Headings - Units - Repeats - Averages	
	Observations	Record **detailed** observations: - At **start** of experiment - **During** experiment - At **end** of experiment Observations can include colour change, bubbles, heat etc.	
	Calculations	Calculate **averages** of repeats. Show **formula** for calculation Show **working out** for calculations Give final answer to calculation with **correct units**.	
	Graph	Draw a graph to include the following; - **Heading, labels with units** on each axis - **Suitable scales** that occupy minimum ¾ of each axis - **Plot** all points accurately - Draw a **curve or straight line of best fit** that ignores points that do not fit the pattern. - **Discuss trends or patterns** observed in graph.	
	Conclusion	**Summarize** what your results show. Does this support your **prediction/hypothesis**? Explain your results using **scientific knowledge**?	
	Evaluation	Discuss the **reliability** of your **results**. Discuss the **validity** of the **method** you used.	
	Improvements	Suggest improvements to the **scientific method** and describe how they can **reduce or eliminate errors**	

8B 9a Respiration and Photosynthesis

1 Copy and complete these word equations.

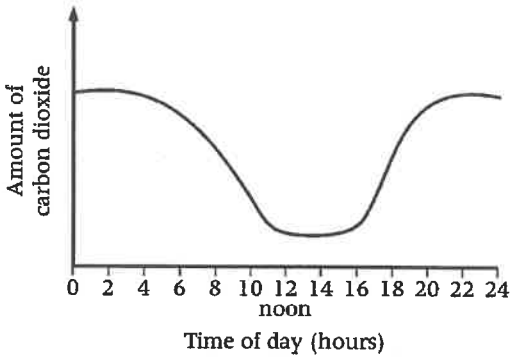
a Photosynthesis:

carbon dioxide + _____ (+ light energy)→ _____ + glucose

b Aerobic respiration:

oxygen + _____ → _____ _____ + water (+ _____)

2 Scientists can find out about photosynthesis by measuring the concentration of different gases near plants. This graph shows the concentration of carbon dioxide in the air around an oak tree during a day in May.



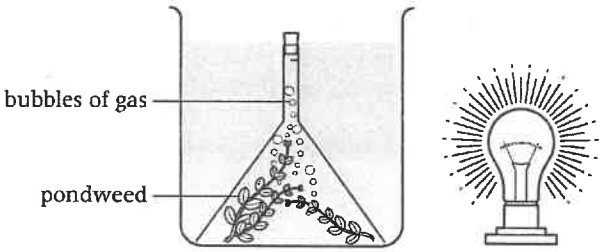
a Which process in a plant uses up carbon dioxide?

b When do you think carbon dioxide was being used up by the tree?

c At which times of the day do you think that the light was brightest? Explain your answer.

d What does this tell you about the process that uses up carbon dioxide?

3 It is known that photosynthesis gets faster if there is more light. It is also known that photosynthesis gets faster if there is more carbon dioxide. This experiment was set up to see if this was also true for plants that grow under water.



a What gas did the bubbles contain?

Write down whether each of the following changes would make the number of bubbles go up or down. Explain your reasoning.

b The light bulb was moved further away.

c Why do you think this?

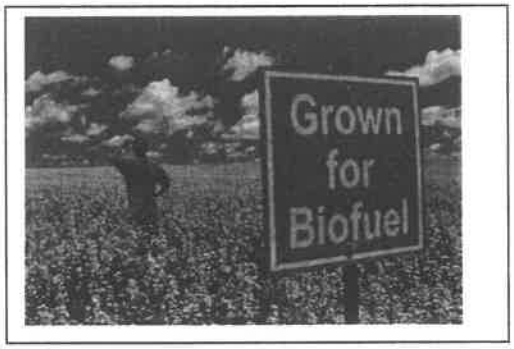
d Extra carbon dioxide was dissolved in the water.

e Why do you think this?

What do you think today's lesson is going to be about?

What could today's learning objectives be? (use command words such as 'describe', 'explain' etc)

8B 10a Biofuels Information Sheet



Biofuels have been around as long as cars have. At the start of the 20th century, Henry Ford planned to fuel his Model Ts with ethanol, and early diesel engines were shown to run on peanut oil.

But discoveries of huge petroleum deposits kept gasoline and diesel cheap for decades, and biofuels were largely forgotten. However, with the recent rise in oil prices, along with growing concern about global warming caused by carbon dioxide emissions, biofuels have been regaining popularity.

Gasoline and diesel are actually ancient biofuels. But they are known as fossil fuels because they are made from decomposed plants and animals that have been buried in the ground for millions of years. Biofuels are similar, except that they're made from plants grown today.

Much of the gasoline in the United States is blended with a biofuel—ethanol. This is the same stuff as in alcoholic drinks, except that it's made from corn that has been heavily processed. There are various ways of making biofuels, but they generally use chemical reactions, fermentation, and heat to break down the starches, sugars, and other molecules in plants. The leftover products are then refined to produce a fuel that cars can use.

Countries around the world are using various kinds of biofuels. For decades, Brazil has turned sugarcane into ethanol, and some cars there can run on pure ethanol rather than as additive to fossil fuels. And biodiesel—a diesel-like fuel commonly made from palm oil—is generally available in Europe.

On the face of it, biofuels look like a great solution. Cars are a major source of atmospheric carbon dioxide, the main greenhouse gas that causes global warming. But since plants absorb carbon dioxide as they grow, crops grown for biofuels should suck up about as much carbon dioxide as comes out of the tailpipes of cars that burn these fuels. And unlike underground oil reserves, biofuels are a renewable resource since we can always grow more crops to turn into fuel.

Unfortunately, it's not so simple. The process of growing the crops, making fertilizers and pesticides, and processing the plants into fuel consumes a lot of energy. It's so much energy that there is debate about whether ethanol from corn actually provides more energy than is required to grow and process it. Also, because much of the energy used in production comes from coal and natural gas, biofuels don't replace as much oil as they use.

For the future, many think a better way of making biofuels will be from grasses and saplings, which contain more cellulose. Cellulose is the tough material that makes up plants' cell walls, and most of the weight of a plant is cellulose. If cellulose can be turned into biofuel, it could be more efficient than current biofuels, and emit less carbon dioxide.

8B 10b Plus – Minus - Interesting

Use the biofuel information sheet to complete the following table:

PLUS MINUS INTERESTING (PMI)	
From 2025 the only source of fuel will be biodiesel made from vegetable oil	
Benefits (plus)	Harms (minus)
Interesting thoughts or ideas	

10c Renewable Energy Resources – Is biodiesel the Answer?

Virtually everyone thinks that renewable sources of energy are better than continuing to burn fossil fuels. However, people can't agree on which renewable energy source would be the best choice.

Biodiesel seems to be a good choice. It is made from plants which use up carbon dioxide during **photosynthesis**. So, when it is burned, it will not add to the 'greenhouse effect'.

However, many people are worried about losing land needed for growing food and how this affects **biodiversity**.

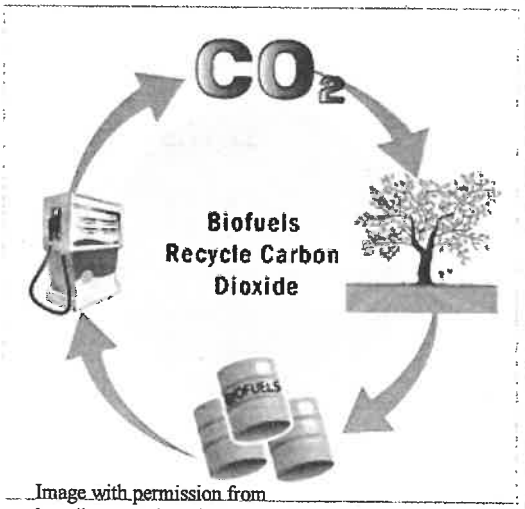
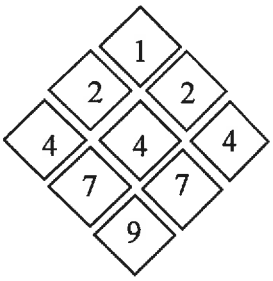


Image with permission from
http://community.middlebury.edu/~cri/biodiesel_cycle.png

Instructions:

Collect a set of 12 biodiesel cards for your discussion group.

You must arrange then into a 'Diamond 9'. You must decide which nine contains the most important information so these can be arranged as follows:



Most convincing reason for using

Least convincing reason for using

This will mean discarding three of the cards. If you wish, you may discard an extra **one or two cards** and write your own reasons for using these instead on the blank cards provided.

Now compare your diamond 9 with those prepared by other groups.
Are they all the same? Can you persuade another group to change the position of any of their cards? Are you willing to change the position of any of your cards?

8B 10d Biofuels Q and A

Once heralded as the alternative fuel source of the future, biofuels have come under scrutiny recently with a number of reports suggesting they cause more harm to the environment than originally thought.

Q1) What are biofuels?

Q2) Where do we get them from?

Q3) Are they a new invention? Explain your answer.

Q4) Why did we stop using biofuels?

Q5) So why is there renewed interest?

Q6) Are biofuels expensive to buy in the UK? Explain your answer.

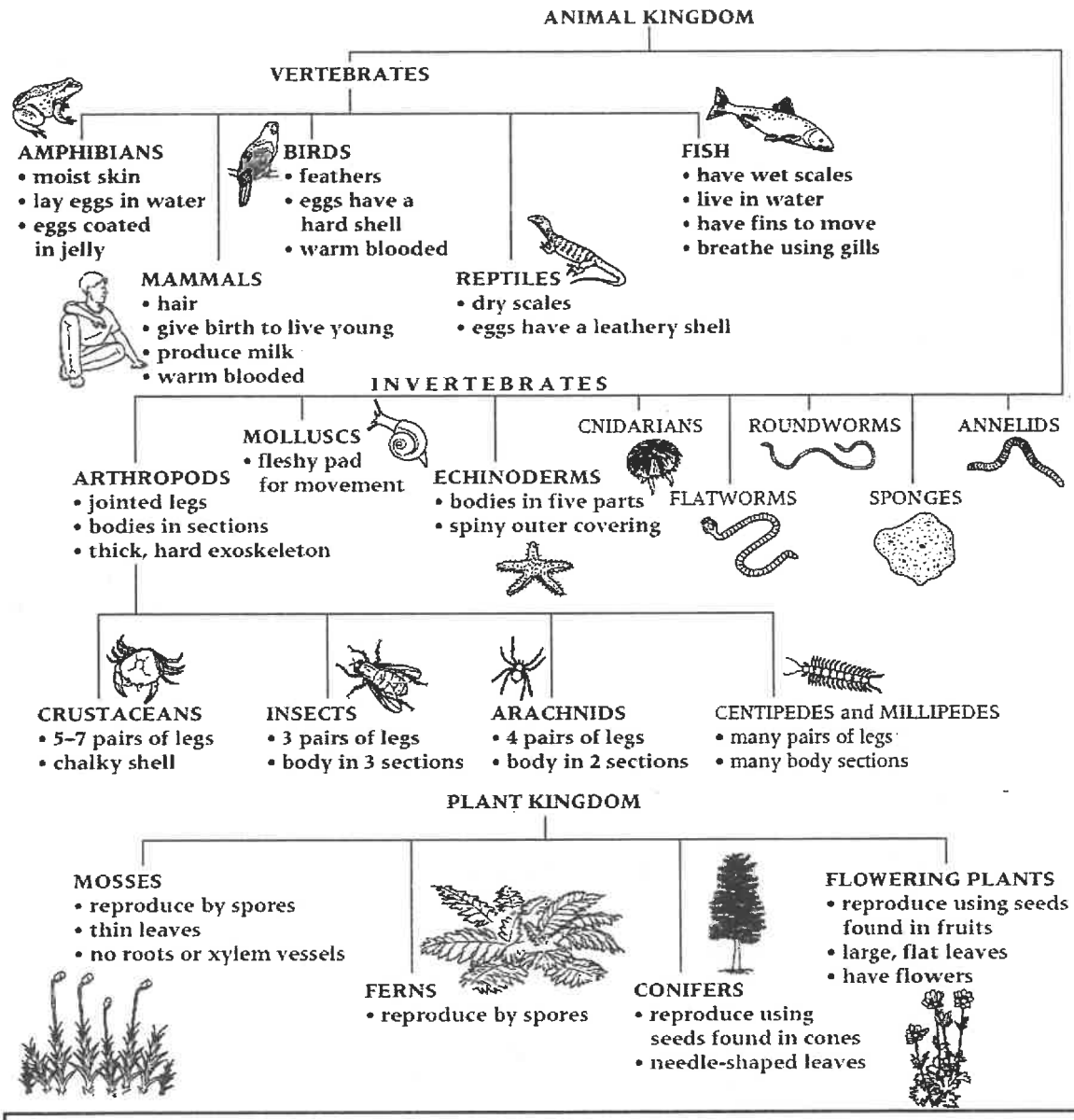
Q7) What are the benefits?

Q8) Are they good for the environment? Explain your answer.

Q9) Are there any negative impacts? Explain your answer.

Q10) Are some biofuels better than others? Explain your answer.

8B 12a Sorting Kingdoms



1 Draw a table like the one below.
2 Look at the exhibition of organisms.
3 Write the name of each animal or plant in your table and decide which groups it is in. Use the diagram above to help you. For example, an ant is an animal, an arthropod and an insect.
4 Write down the reason why you have put it in the smallest of these groups. For example, an ant is an insect because it has six jointed legs.

Name	Kingdom	Group(s)	Reason
ant	animal	arthropod; insect	has six jointed legs

8B 12b Identifying Plants

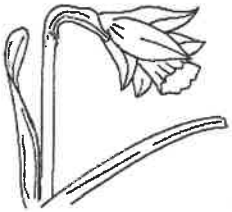
1 Look carefully at these pictures. Write the words conifer, fern, flowering plant or moss underneath the correct picture.

a 

b 

c 

d 

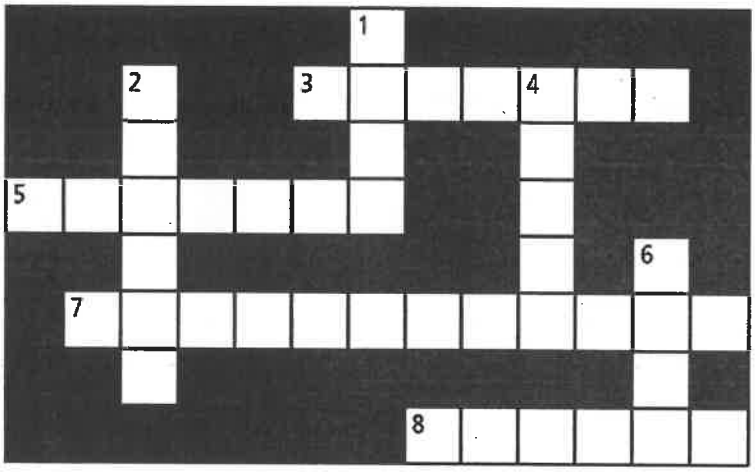
e 

f 

g 

h 

2 Using the clues below, fill in the answers on this crossword.



Across

3 A fir tree is in this plant group.

5 Things made by some plants which are often brightly coloured.

7 Seeds and spores are used for this.

8 Conifers have needle-shaped ones.

Down

1 Group of small plants that make spores.

2 Ferns reproduce using these.

4 Contains seeds from a flowering plant.

6 Contains seeds from a conifer.

literacy, knowledge

8B 12c Grouping Plants

1 Using the words in the box, fill in the correct word in each of the blank spaces.

cones
conifers
ferns
flowering plants
fruits
mosses
photosynthesis
respiration
spores
water

a _____ and _____ both use seeds for reproduction.

_____ and _____ both use _____ for reproduction.

b _____ contain seeds in flowering plants.

c _____ contain seeds in conifers.

d _____ have no xylem vessels.

e Xylem vessels carry _____ around the plant.

f Plants make their own food using a process called _____.

g The life process that plants use to release energy from food is called _____.

2 Find out the name of one plant in each group. Write the name of the plant and the group that it is in.

Name of plant	Plant group that it belongs to

literacy, knowledge, research

8B 13a Using Identification Keys

1. The diagram shows an animal.

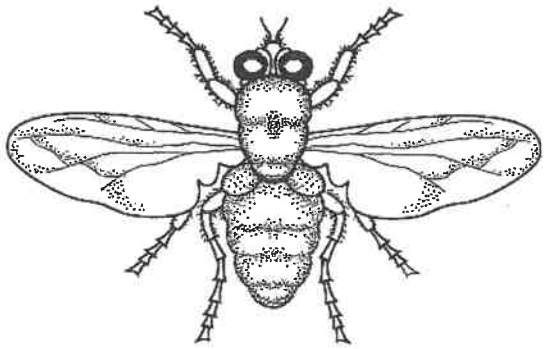
Use the key to identify the animal.

1) has legs ..... go to 2
has no legs ..... go to 3

2) has a shell ..... *animal A*
has no shell ..... *animal B*

3) has one muscular foot ..... *animal C*
has more than one foot ..... *animal D*

2. The diagram shows an animal.
Use the key to identify the animal.



1. wings present ..... go to 2
wings absent ..... go to 3

2. one pair of wings visible ..... A
two pairs of wings visible ..... B

3. three pairs of legs C
four pairs of legs ..... D

3. The table shows some features of animals.
Which animal could be a bird?

	feature			
	feathers	gills	hair	wings
A	×	✓	✓	×
B	✓	✓	×	×
C	✓	×	×	✓
D	×	×	✓	✓

key
✓ = present
× = not present

4. The photos shows six members of the cat family, Felidae

Use the key to identify the cats, A to F.
Tick (_) the boxes in Table 1.1 to show how you identify each cat.
Write the name of each cat in the correct box in Table 1.1.

Cat A has been completed for you as an example.

Question	Name of cat
1 a Ears pointed	Go to 5
b ears rounded	Go to 2
2 a Fur with no stripes	P. leo
b Fur with stripes or spots	Go to 3
3 a Fur with stripes, but no spots	P. tigris
b Fur with spots	Go to 4
4 a Fur with spots, but no stripes	A.Jubatus
b Fur with spots and stripes	N. nebulosi
5 a Fur with spots	L. rufus
b fur with no spots	L. caracal


A


B


C


D

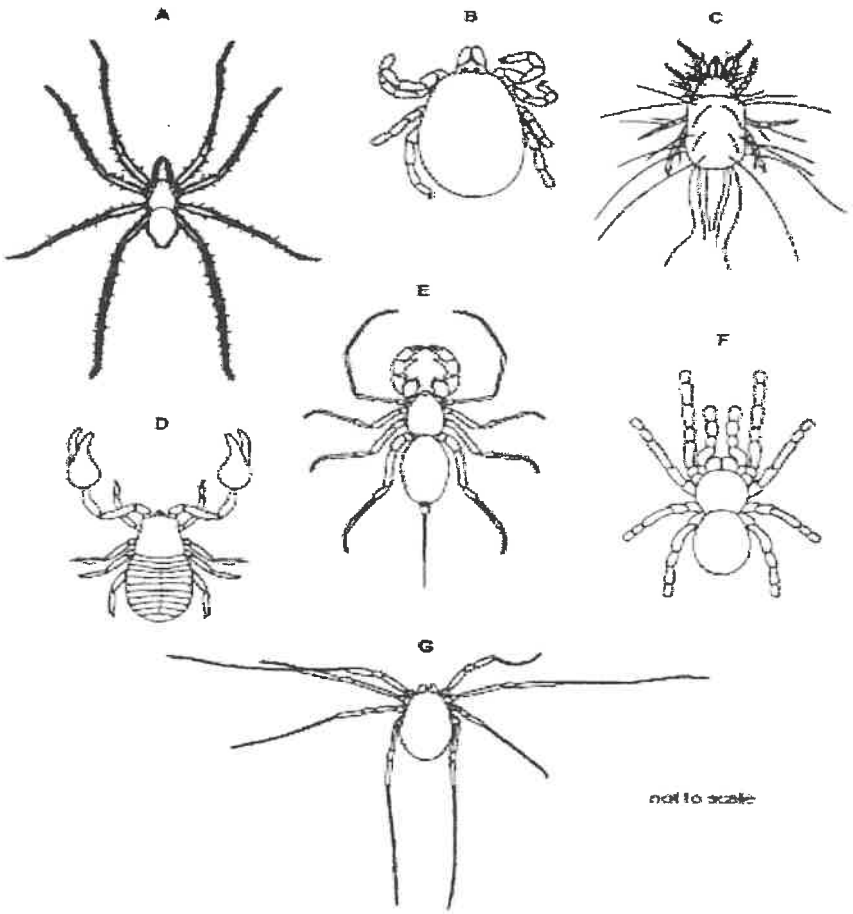

E


F

MYP 2 Science Plants and Ecology Year 8

Table 1.1

cat	1 (a)	1 (b)	2 (a)	2 (b)	3 (a)	3 (b)	4 (a)	4 (b)	5 (a)	5 (b)	name of cat
A											L.caracal
B											A.Jubatus
C											P. leo
D											N.nebulosi
E											L. rufus
F											P. tigris



MYP 2 Science Plants and Ecology Year 8

Extension

5. The diagrams show seven species of arachnid.

Use the key to identify each species.
Write the letter of each species (A to G) in the correct box beside the key.

One has been done for you.

Key

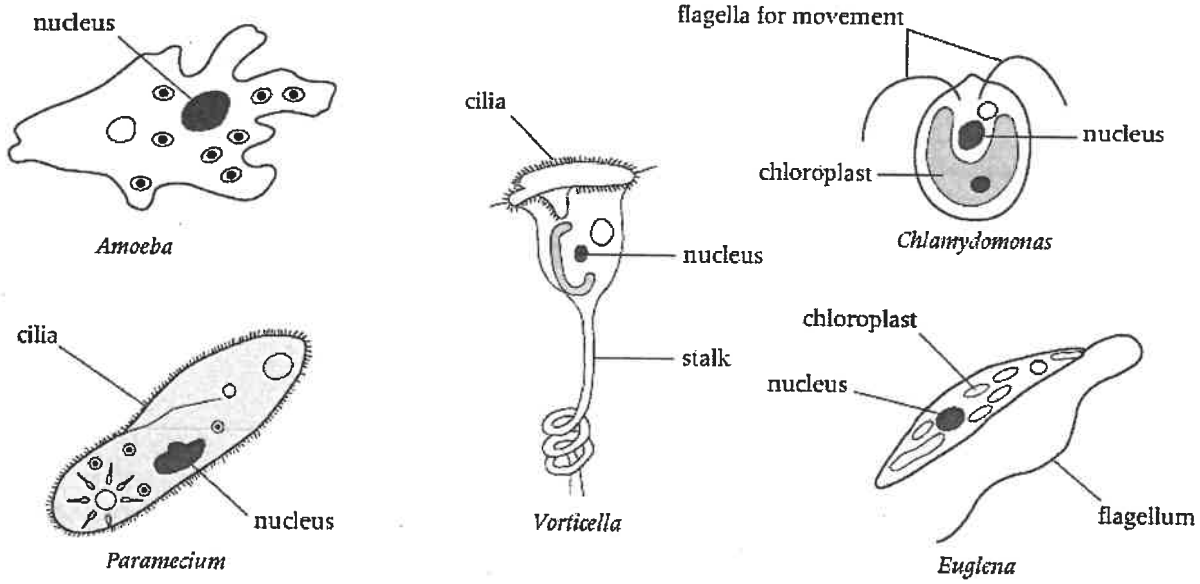
1 (a)	Tail present	*Abaliella dicranotarsalis*	
(b)	Tail not present	go to 2	
2 (a)	Legs much longer than body	go to 3	
(b)	Legs not much longer than body	go to 4	
3 (a)	Hairs on the legs	*Tegenaria domestica*	
(b)	No hairs on the legs	*Odielus spinosus*	
4 (a)	Body segmented	*Chelifer tuberculatus*	
(b)	Body not segmented	go to 5	
5 (a)	2 body parts about the same size	*Poecilotheria regalis*	
(b)	One part of the body larger than the other	go to 6	
6 (a)	Body covered in long hairs	*Tyroglyphus longior*	
(b)	Body not covered in hairs	*Ixodes hexagonus*	

8B 13b Constructing Keys

Here are some drawings of simple organisms that are found living in water.

Each one is a **unicellular** organism. This means that it is made up of just one cell.

In order to see them you would have to use a microscope.



Look carefully at the labelled features of these organisms. Using these features design a statement key to classify them.

Your key should allow someone else to find the names of the organisms if they were just given the labelled drawings to look at.

S knowledge

8B 13c Make your own Classification Key

1. Choose 4 different animals online.

Choose animals that are similar. For example:

- 4 different dogs,
- 4 different cetaceans (whales or dolphins)
- 4 different sharks,
- 4 different rodents
- 4 different insects,etc.....

2. Paste a picture of each of these animals in this table.
   Include their common name and their scientific (bi-nomial) name.

Animal 1: Common name: Scientific name:	**Animal 2:** Common name: Scientific name:
Animal 3: Common name: Scientific name:	**Animal 4:** Common name: Scientific name:

3. design a statement key to classify them. Again, your key should allow someone else to find the names of the organisms if they were only given your pictures to look at.

Submit on the GC when you are finished

Write your statement key here:

My Key:

1.

8B 14a Constructing a Savannah Food Web

Ecologists have been studying the feeding relationships of animals in a savanna grassland. They want to present these relationships in the form of a **food web.**

Pictures of these animals and plants, together with their common names and scientific names, are found on the next page.

1. Cut out pictures of the animals together with their names.
2. Read the sentences below.
3. Complete a **food web** by joining the connections with the pictures. Remember the arrows should show one organism being "eaten by" the other.

Feeding relationships:

- Rhinoceros *feed on* **grass**
- Rhinoceros and giraffes *eat* the leaves of **Acacia trees**
- Grasshoppers and mice *compete for* **grass**
- snakes eat mice
- Ocelots *feed on* snakes
- Vultures *feed on* dead mongooses, **leopards** and rhinoceros
- Monkeys *feed on* grasshopper and Snakes
- Ocelots *feed on* mice
- Impala *feed on* **small shrubs** and **grass**
- Mongooses *feed on* drongo birds
- Monkeys and drongo birds *compete for* grasshoppers
- Lions *feed on* rhinoceros and giraffes
- Leopards *feed on* impalas and monkeys

Leopard
Panthera pardus

Monkey
Chlorocebus pygerythrus

Small Shrubs
Salvadora persica

Mouse
Rhabdomys dilectus

Mongoose
Herpestes vitticollis

Grasshopper
Hieroglyphus daganensis

Snake
Python sebae

Lion
Panthera leo

Giraffe

Giraffa giraffa

Vulture

Gyps africanus

Grass

Themeda triandra

Dicrurus macrocercus

Acacia tree

Acacia caffra

Ocelot

Leopardus pardalis

Rhinoceros

Ceratotherium simum

Impala

Aepyceros melampus

8B 14b Chains, Webs and Pyramids

Here are three food chains:

A grass → rabbit → fox

B wheat → field mouse → fox

C wheat → field mouse → grass snake

1 Sketch a pyramid of numbers for food chain A.

2 Use all three food chains to draw a food web.

3 Name one producer in the food web. _____

4 Name a primary consumer. _____

5 Name a secondary consumer. _____

6 a If the field mice died, what would happen to the number of grass snakes?

_____

b Why would this happen?

_____

c If the field mice died, what might happen to the number of rabbits?

_____

d Why might this happen?

_____

knowledge

8B 14c Pyramids of Numbers

1 Sketch a pyramid of numbers for each of the following food chains:

a grass → rabbit → fox

b oak tree → caterpillar → robin → owl

c lettuce → slug → thrush → cat → flea

Farmer Giles.

Farmer Green.

Farmer Giles reared chickens, which he then sold for humans to eat. He worked out that to feed 1 human he would have to produce 40 chickens. To feed the 40 chickens he had to grow 10 000 corn plants.

Farmer Green just grew corn. He sold his corn to be fed to humans. He worked out that he needed to grow 1000 corn plants to feed 1 human.

2 a Draw the food chain for Farmer Giles' farm.

b Draw a pyramid of numbers for this food chain.

3 a Draw the food chain for Farmer Green's farm.

b Draw a pyramid of numbers for this food chain.

4 a What happens to the number of organisms as you go up each pyramid?

b What happens to the size of the organisms as you go up each pyramid?

5 a How much more land than Farmer Green would Farmer Giles need to feed 1 human?

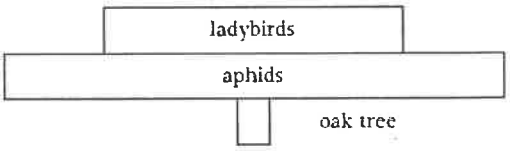
b Why is it more efficient to produce food for humans from plants than from animals?

S knowledge

8B 14d Pyramids of Biomass

Each level on a **pyramid of numbers** is called a **trophic level.** Animals that are on the same level in two different pyramids of numbers are said to be at the same trophic level. Producers, for example, are always at Trophic level 1.

Pyramids of numbers do not take into account the *size* of the organisms. A better way of showing things is to use a **pyramid of biomass.** This shows the actual *mass* of material at each trophic level. A sample is taken and the masses of the different organisms are measured. This often involves drying the organisms in an oven to get rid of all the water. How wet or dry the weather is can affect how much water is found inside an organism. This would affect the **biomass** and might make the measurement inaccurate. So, the biomass is a measure of the *dry* mass of material at each trophic level.



A pyramid of numbers.

1 Explain why the pyramid of numbers above is not shaped like a pyramid.

2 What number tropic level are the ladybirds at?

3 Draw a food chain for this pyramid of numbers.

4 What do you think the word 'biomass' means?

5 Sketch a pyramid of biomass from the pyramid of numbers above. You do not need to add any figures, just draw the shape.

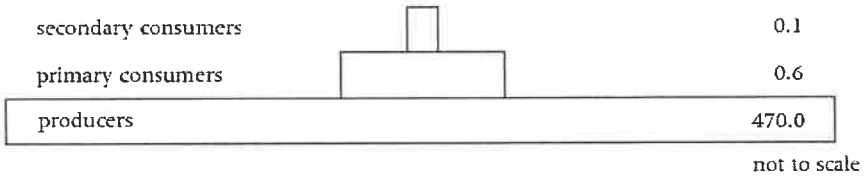
6 To work out a pyramid of biomass, the dry masses of the organisms are used. Why?

7 The biomass of an oak tree changes during the course of a year. Why is this?

8 Only about 10% of the chemical energy in an organism's food is used for growth. What happens to the rest?

9 The biomass at each trophic level gets smaller as you go up the pyramid. Why do you think this is? (*Hint*: Think about 'energy loss'.)

10 A difficult question! The diagram below shows a pyramid of biomass for a field. The units are g/m^2. Describe what this pyramid tells you in as much detail as you can.



knowledge, literacy

8B 15a Ecological Terms

1 Look at the list of words that are often used when studying habitats. Match each word with its meaning by colouring them in the same colour.

community	A person who studies habitats.
ecologist	The place where an organism lives.
environment	The number of organisms of one species living in a habitat.
habitat	How much water vapour there is in the air.
humidity	All the different organisms living in the same place.
light intensity	A sampling square used to estimate plant populations.
microhabitat	The surroundings of an organism.
population	How bright the light is.
quadrat	Small area in a habitat where organisms live.

2 There are 150 lions living on the grasslands in one part of Africa. They feed on large animals such as gazelles, zebras and wildebeest and these feed on the leaves of acacia trees and grasses.

a What is the population of lions? _____

b What is the community on the grasslands? _____

_____

c What is the habitat of the lions? _____

Extension: List factors that will affect the population of lions.

_____

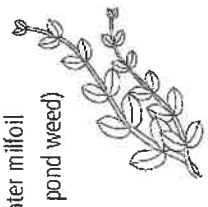
_____

8B 15b Survival Adaptations

The table below gives the names and adaptations of some organisms.

Complete the table, giving a reason for each adaptation. (*Hint*: You may need to find out where some of the organisms live.)

In the last row fill in the information for another organism of your choice.

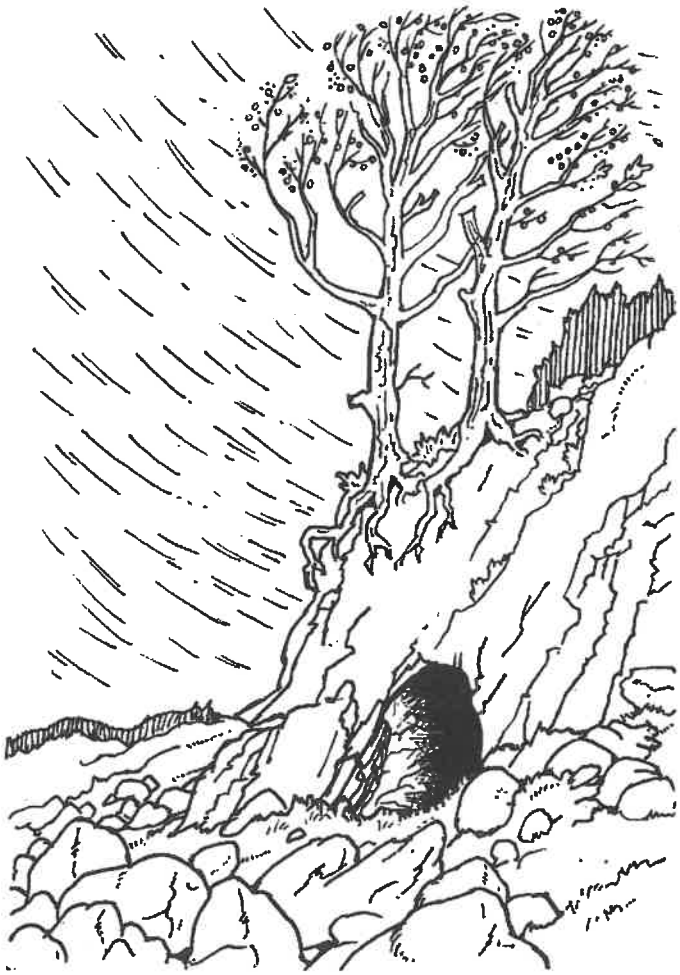
Organism	Adaptation	Reason
Earthworm 	1 Soft slimy skin 2 Bristles 3 Moves away from light	
Limpet 	1 Sucker at bottom 2 Hard shell	
Water milfoil (a pond weed) 	1 Long floppy stem 2 Leaves only present near surface of water 3 Flowers formed above the surface of the pond	
Rabbit 	1 Large ears 2 Powerful hind legs	

knowledge

8B 15c A Well Adapted Creature

Here is a list of conditions in an imaginary habitat:

- cold, wet and windy weather
- ground water is frozen
- steep rocky ground
- small animals live in dark caves
- tall trees with smooth bark grow in the mountains. They have berries on their highest branches.



Design an imaginary creature that is adapted to survive in this habitat. Make a large drawing and label all its important features.

You will need to think about:

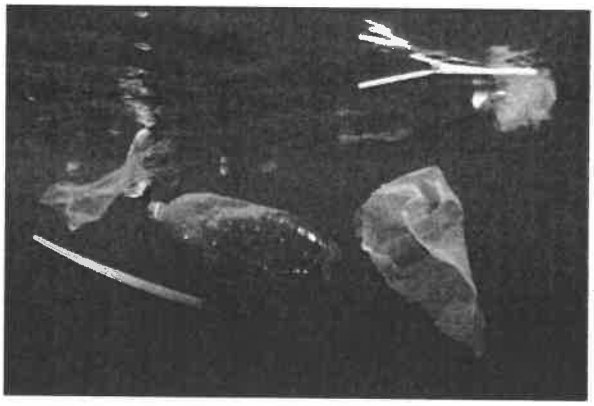
- what it eats and how it gets water
- how it moves around
- how it is protected from the weather.

S knowledge, considering

Sustainable	The place in which an organism lives is called a ....
Community	The total number of individuals of a certain species in a habitat is called a ....
Ecosystem	The conditions around an organism is called the ....
Ecologist	Components of an ecosystem that are non-living (e.g. light intensity) are the ....
Biotic factors	The features that help an organism to survive in its habitat are ....
Photosynthesis	What an animal does is known as its ....

Habitat	All the plants and animals that live in the same place forms a ....
Population	Living things and non-living things interact to form an ....
Environment	A person who studies the relationship between organisms and their environment is an ....
Abiotic factors	Components of an ecosystem that are living are the ...
Adaptations	The process carried out by plants to make their own food is ....
Behaviour	If something is allowed to carry on into the future, it is considered ....

8B 16a A Plastic Ocean



A Plastic Ocean is a documentary made in 2016 to show the devastating impact that the extensive use of plastic has on marine life, and its wider impact on the environment and human populations.

Website: https://plasticoceans.org/projects/

Source: https://gcaptain.com/plastic-waste-in-the-worlds-oceans-could-double-by-2030-iea-warns/

You will watch a video based on the documentary. Using ideas from the video, your knowledge on food chains and from additional research, answer the following questions.

1) What are microplastics and where do they come from?

2) How do microplastics enter the food chain?

3) What is **bioaccumulation**? You can use the impact of microplastics on the marine good chain to explain this idea.

4) What impact does the bioaccumulation of microplastics have on the human population?

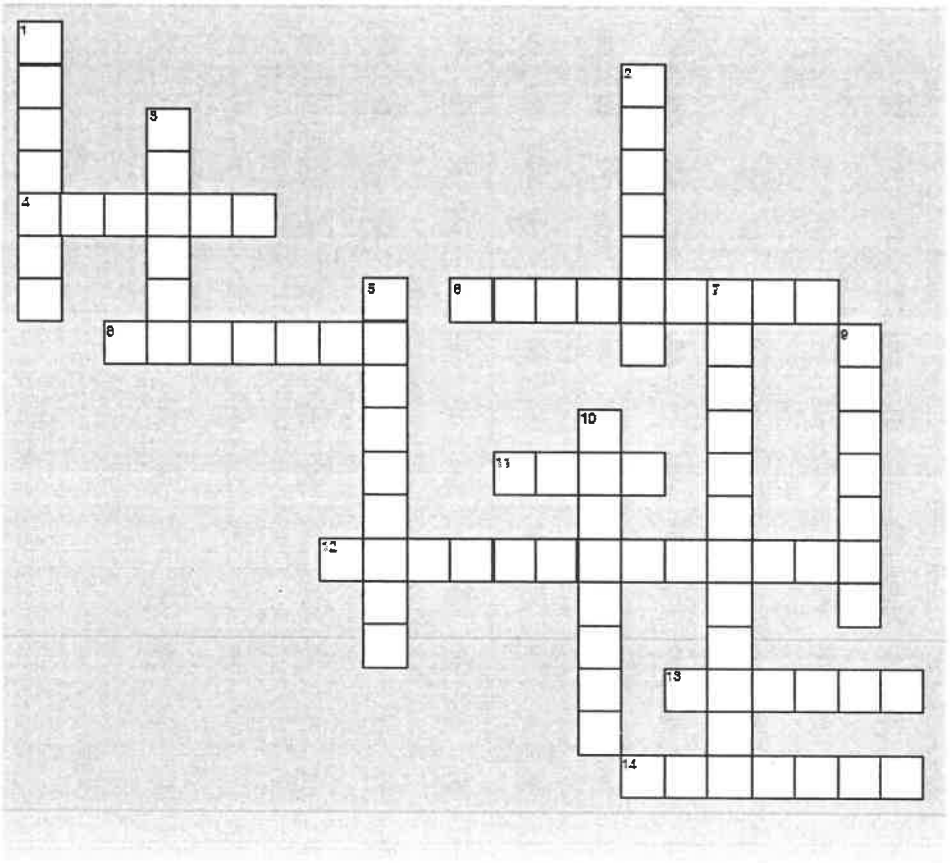
5) What actions can be taken to reduce this impact? What can you do to help?

8B 16b A Plastic Ocean Word Search

C E Z B O O P X E D P E P T T
G E D C Z L R S R O W V L E U
L Y E U A V U I L D A I A G R
A A R S C E B I S T R T N N T
N V T E L A C R A Q T A K A L
D I G G E Y T S F H S N T H E
C U N S U S N I X O T R O C E
F I S O L U T I O N S E N V H
S N U R D L E B E N X T L N F
K N I H T E R L O L M L T I H
F P R I V E R S C T A A E H E
E S U E R E N M W Y T H O P A
W B L Y T O K G F N C L W L L
N Z N A V D N X A R N E E O T
V W W F I S H J A M W J R D H

ALTERNATIVE
BOTTLE
CHANGE
CURRENT
DOLPHIN
EDUCATION
FISH
GYRE
HEALTH
LAND
MAGNET
NURDLE
OCEAN
PLANKTON
PLASTIC
POLICY
RECYCLE
RETHINK
REUSE
RIVERS
SEABIRD
SINGLEUSE
STRAW
TOXINS
TURTLE
WATER
WHALE

8B 16c A Plastic Ocean Crossword



Word List

AWARENESS
BIOACCUMULATE
CHANGE
ENTANGLEMENT
FOOD
JELLYFISH
MINUTES
NURDLES
PLASTIC
REFUSE
RECYCLE
RETHINK
SOLUTION
TUVALU

Across

4 The island paradise drowning in plastic

6 Behavioural change starts with this

8 The last Resort in the 3 R's

11 1 in 3 sea birds mistake plastic for this

12 For toxins to travel up the food chain

13 The first choice to make in the 3 R's

14 What we want you to do when it comes to your plastic habits

Down

1 80% of marine litter is made up of this

2 Single Use Plastics have an average lifetime of just 12 of these

3 We are creating "a wave of"

5 A turtle's favorite food

7 A significant source of injury to marine life

9 Name of the raw pre-production plastic pellets made from oil

10 We want to be part of this and not the problem

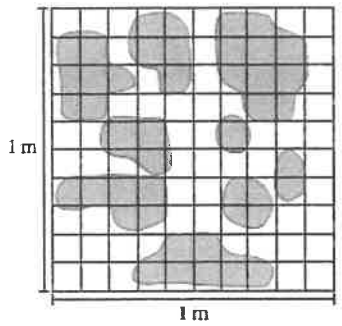
PlasticOceans.org

8B 17a Quadrat Studies

If you wanted to find out how much grass was growing on a field, it would be impossible to count the plants because there would be too many. Instead you can estimate the area of the field covered by the grass.

To do this, you would use a **grid**. This is a quadrat that is divided into 100 small squares. You count the number of small squares that the grass fills. For partly filled squares you ignore those that are less than half filled, but count those that are more than half filled.

If 20 squares out of 100 are filled the **percentage cover** is 20%.



1 Look at the grid above. The shaded areas represent patches of grass. Work out the percentage cover of grass in this grid.

2 If you were using this technique to estimate the grass cover in a large field, what would you have to do to improve the accuracy of your estimate?

Some students studied two grassy areas. One area was frequently walked over and used as a playing field. The other was rarely walked over.

The students estimated the number of five different plants growing in the two areas using a quadrat to see if they were affected by being walked on. The results are shown in the table below.

Plant	Number in rarely walked on area	Number in frequently walked on area
A	25	10
B	195	160
C	100	5
D	20	75
E	40	40

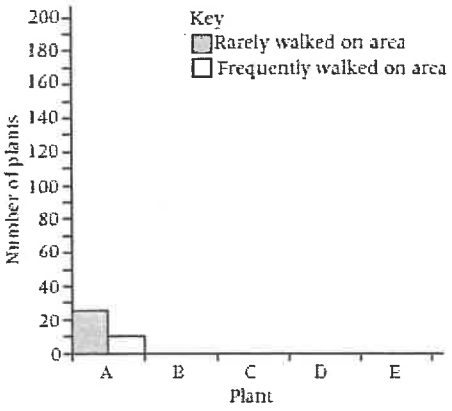
3 a Draw a bar chart to show these results. A bar chart has been started here to show you how to do this. You will need to use a key to show the differences between the bars.

b Which plant is most affected by being walked over?

c Which plant is least affected by being walked over?

d How is plant A affected by being walked over?

e How is plant D affected by being walked over?



S knowledge, presenting

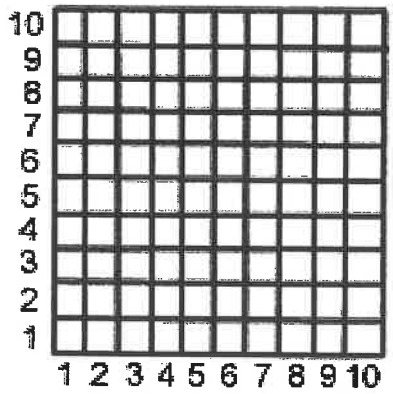
8B 17b Quadrat Sampling Practical

Some mysterious plants have landed on the Island School playground. It has been decided that we should only investigated further if these plants cover more than 20% of the surface of the playground.

Your task is to apply random sampling to estimate the % coverage of these plants on our playgrounds.

Method

1. A 10m x 10m area will be marked out in the playground. The area will be divided into 100 squares shown as the diagram below.
2. You will need to sample 10 squares, determined using a random method.
3. Use this random number generator website to generate 10 pairs of numbers between 1 and 10 http://www.random.org/integers/. Do this twice so you have a set of X and Y coordinates.
4. Using the grid below, shade in the 10 squares that you will be sampling in (first number on x axis and second number on y). Record the pairs of numbers.



10 pairs of numbers

X	Y

5. At the playground, in each of the squares that you have randomly chosen to sample, place the quadrat at the centre.
6. Count the number of small squares in the quadrat with the plants present (if 50% or more of the square is covered then count it). Since there are 100 squares in your quadrat, this should give you a number out of a hundred and therefore the percentage.
7. Add the 10 numbers together and divide by 10 to calculate the **AVERAGE % COVER per quadrat.**
8. To estimate the % coverage on the playground, consider the following:
    a. What is the area of one quadrat? (Hint: Each side is 0.5m)
    b. What is the total area you have sampled using the quadrats?
    c. Can you calculate the total % coverage?

Answer the following questions

1. In your opinion, how reliable are your results?

2. How can you increase the reliability of your data?

3. List the things that you could do to make the results more accurate.

Notes:

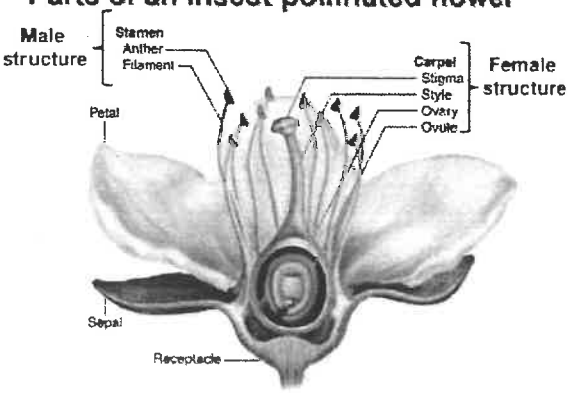
8B 18a Revision of Key Concepts

Read through and complete:

1. Plant organs and reproduction

- The flower contains sex organs

Parts of an insect pollinated flower



- P..... is the transfer of **pollen** from the **a**..... to the **S**.....
- A **pollen grain** develops a **pollen tube** to reach the **ovary**
- The n..... from the pollen cell travels down the **pollen tube**.
- F..... takes place in the **ovary** where the n..... from the **pollen cell fuses** with the n..... from the **egg cell**
- This develops into an **embryo** which becomes a **seed**
- The **ovary** becomes the **fruit** surrounding the seed.

Q: *Cover up the above information and describe how a flower is fertilized using the words* ***anther, stigma, ovary, pollen, pollen tube, gametes, zygote***

2. Seed germination

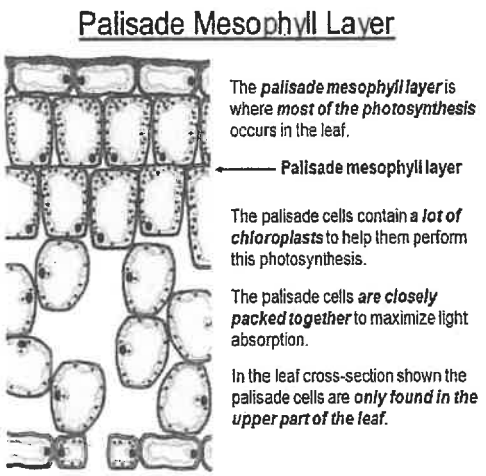
- S..... contain **embryonic plants**
- Seeds need the correct t....., oxygen and w..... to **germinate**
- Germination can be investigated by varying these factors
- When a seed germinates, the seedling emerges from the seed coat.

3. **Plants make their own food during p.....**
- Word Equation

c..... d..... + Water → oxygen + g.....

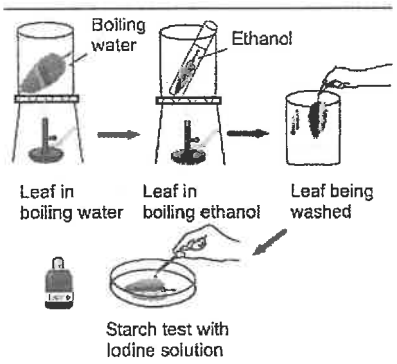
- L..... is needed for this process. Green plant cells contain a lot of **chloroplasts** which contain a chemical called c..... to absorb the l.....

Palisade cells in the leaf are adapted for efficient photosynthesis:



Q: Draw and label one palisade plant cell – label the cell membrane, cell wall, nucleus, cytoplasm, vacuole and chloroplasts

- The **glucose** produced can be respired OR used to synthesise (make) st..... (as a food store), c..... (for cell walls), **protein and fats**.
- Orange **i..... solution** can be used to test a leaf for the presence of **starch** as it will change to **blue/black** (evidence that photosynthesis has taken place)



- Different foods contain different quantities of **starch** eg p..... contain a lot. Humans eat these foods a source of e.....

4. Factors affecting photosynthesis

- Pondweed is a water plant that released bubbles of **oxygen** when **photosynthesizing**
- The rate of photosynthesis can be measured by

  .....
- L....., C..... d..... and an **optimum temperature** are all required for efficient bubble production

  These **factors** can all affect the **rate of photosynthesis.**

5. Bio fuels

- A **fuel** is a source of chemical e.....
- Fuels are burnt (combusted) to produce heat
- **Biofuels** are produced from **readily replenished p.....**
- **Biofuels** still produce c ..... d..... when burnt but are an alternative 'cleaner' source of fuel to **fossil fuels** because the plants used absorb c..... d..... when they grow.
- The main **biofuels** are e..... and b.....

Q: Can you think of any more advantages or disadvantages?

Advantages of Biofuels	**Disadvantages of Biofuels**
• Renewable energy sources • Biofuels are 'carbon neutral' as the carbon dioxide released on burning is removed by the growing plants • They are readily available – plants can be grown all over the world (but oil only found in some countries)	• Large areas of forest have been cleared to make room to grow biofuels • Lots of species lose their habitat • The decay and burning of vegetation to clear land increases the carbon dioxide in the air • The plants need land to grow so can compete with food supply

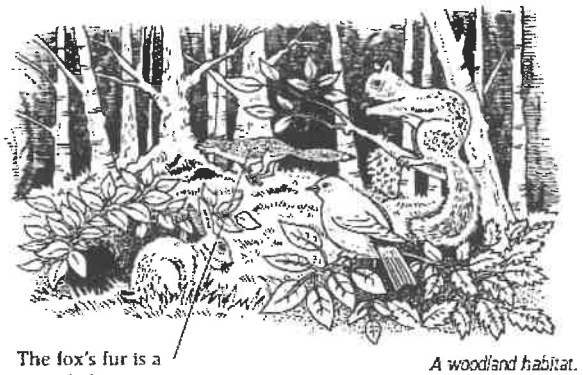
8B 18b Ecology Summary Sheets

Ecological relationships

Habitats and environments

A **habitat** is the area where an organism lives. Non-living factors in a habitat are called **physical environmental factors.** Examples include how light it is and what the temperature is. These make up the surroundings, or **environment**, of an organism.

Small areas in a habitat are called **microhabitats.** For example, the fur on a fox is a microhabitat.



The fox's fur is a microhabitat.

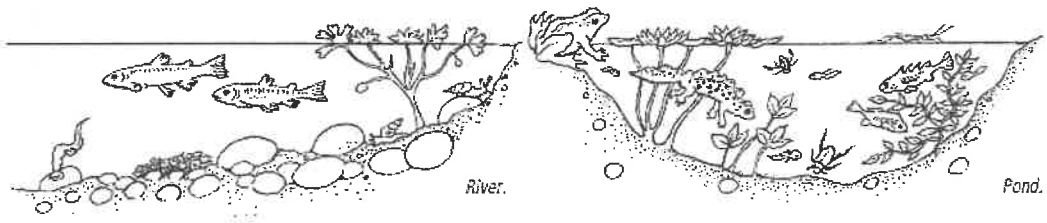
A woodland habitat.

All the plants and animals that live in a habitat make up a **community.** Within a community, the total number of one species is called a **population.** There will be a population of foxes in a wood.

In order to survive in a habitat, organisms need various **resources.** An animal needs food, water, oxygen, shelter and it needs to find a mate to reproduce. Plants need light, water and carbon dioxide in order to make food. They also need mineral salts (nutrients), oxygen and space to grow.

Adaptations

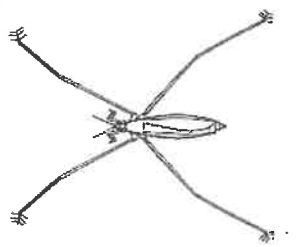
In any habitat, the organisms living there must be **adapted** to survive the environmental conditions within that habitat. Members of the same community may have similar **adaptations** to cope with the problems of their habitat. For example, many small animals and plants which live in fast-flowing rivers are adapted to stop them being swept away. In ponds, free-swimming animals and floating plants can survive because there is no current to wash them away.



River. *Pond.*

All the places in an environment where an organism is found is called its **distribution.** For example, in a pond habitat pond skaters are found on the surface of the water. They are adapted to living here because they have bristles on the ends of their legs, which prevent them from breaking the surface film of water. They feed on dead insects floating on the water.

Organisms that are better adapted to survive in an area will have a better chance of survival.



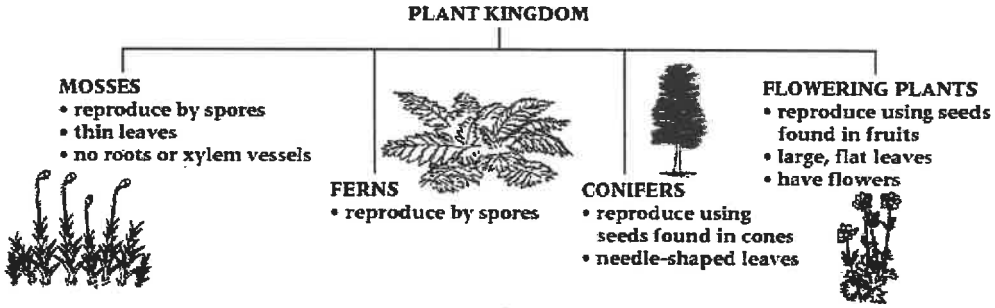
A pond skater.

Classifying living organisms

Each different type of organism is called a **species**. There are so many species that we need to put them into groups. This is called **classification**. The largest groups are called **kingdoms** and the biggest of these are the **plant kingdom** and the **animal kingdom**. The Summary Sheets for Unit 7D *Variation and classification* show how animals are classified into groups.

The main difference between plants and animals is that plants can make their own food by **photosynthesis**.

There are four main plant groups.

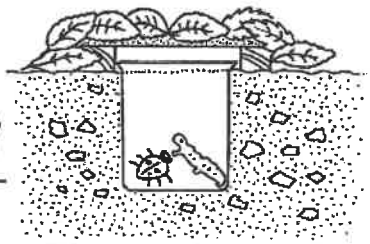


Sampling methods

Ecologists are scientists who study habitats. They catch organisms using various **sampling techniques**, then use **keys** and field guides to identify them.

A pooter is used to collect small invertebrates.

A Tullgren funnel is used to collect invertebrates from leaf litter.



A pitfall trap traps small animals that crawl along the ground.

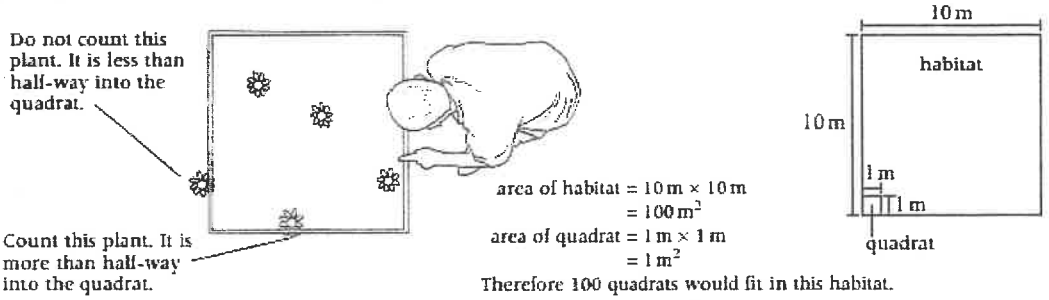
Tree beating is used to collect animals that live in trees or bushes.

Pond dipping is used to collect organisms from different parts of a pond.

A sweepnet is used to collect organisms from long grass.

Ecologists often need to know the size of a population. It would be impossible to count all the organisms in a habitat, so they take **samples** and then **estimate** the total number of organisms.

A **quadrat** is a sampling square used to estimate plant populations. The quadrat is placed randomly on the ground in different parts of the habitat and the number of plants inside it is counted each time.



The more samples that are taken, the more reliable an estimate will be.

Ecologists also measure the physical environmental factors, like how warm it is and how much oxygen is dissolved in pond water, using sensors and dataloggers. They then look to see if there are any links between the factors, such as, the warmer the water the lower the oxygen level is.

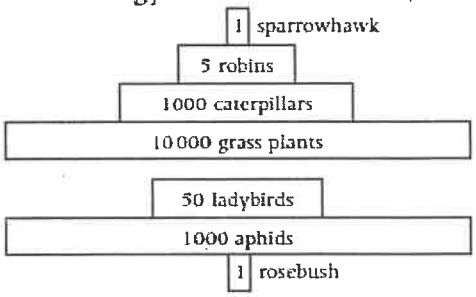
Feeding relationships

Food chains and **food webs** show the feeding relationships between different organisms in a habitat. (See Summary Sheets for Unit 7C *Environment and feeding relationships*).

The numbers of organisms at each level in a food chain can be shown as a **pyramid of numbers**. The size of the bars shows the number of organisms. Usually there are fewer organisms as you go along a food chain because energy is lost at each level, for example, for movement. Sometimes the pyramid has an unusual shape if the organisms are very different in size.

grass → caterpillar → robin → sparrowhawk

rose bush → aphids → ladybirds



One rose bush can feed many aphids.

Populations

The size of a population is affected by several factors.

- Animals **compete** with each other for resources such as food, water and shelter.
- Plants compete for light, water, nutrients (mineral salts) and space.
- If there are not enough resources the population will decrease.
- Disease can kill organisms.
- The populations of predators and prey are linked. When there are a lot of prey organisms, the number of predators increases because they have plenty of food. This decreases the number of prey, which then leads to a decrease in the number of predators.
- Harsh weather conditions can reduce populations.

Living organisms depend on others for their survival. For example, plants depend on insects for pollination.

18c

Photosynthesis

Water

Wheat

Crops

glucose

Light

Rice

Biofuels

Respiration

Plant

Biodiesel

Ethanol

anther

fertilization

stigma

Pollen grain

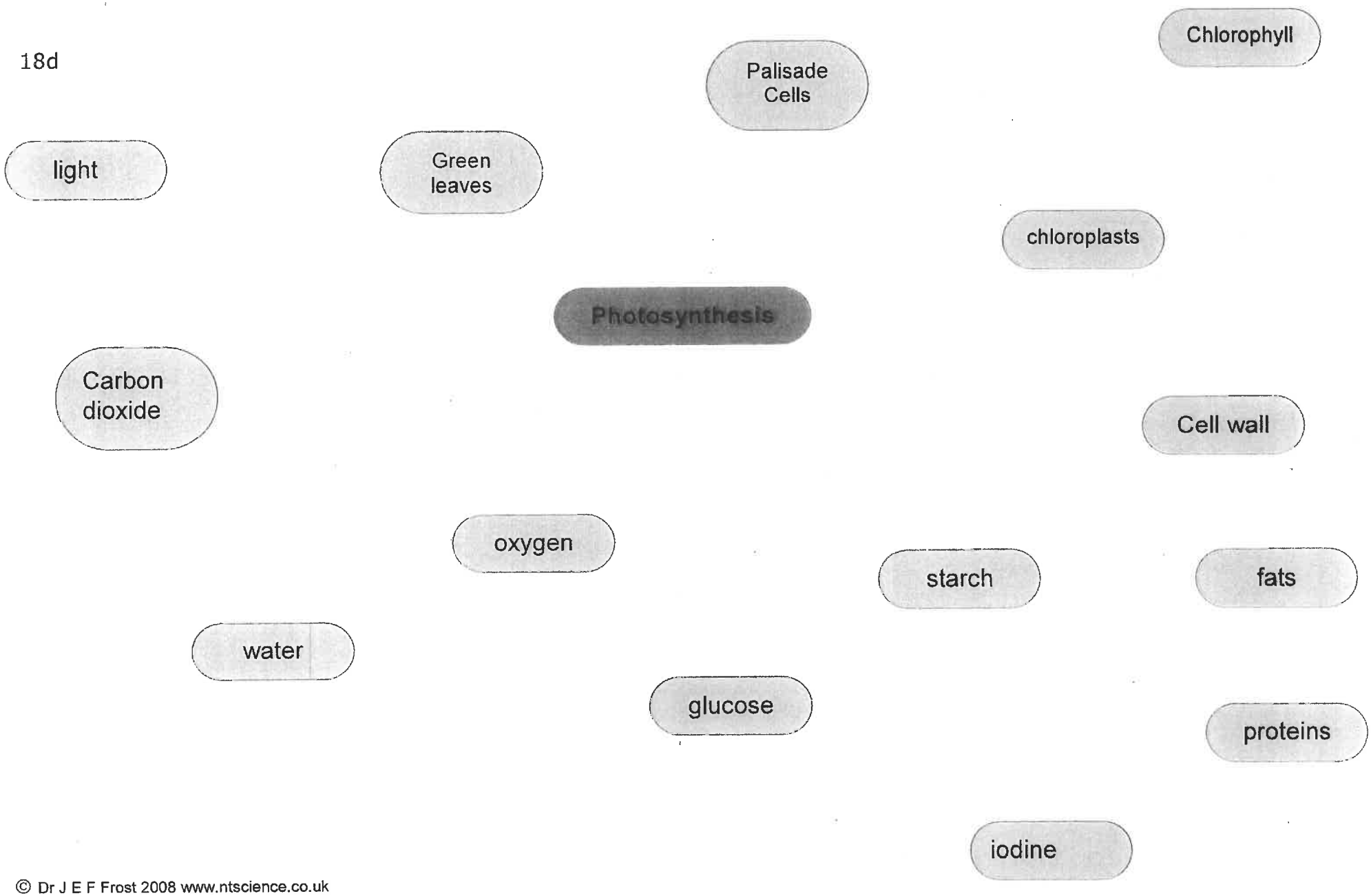
ovule

Pollen tube

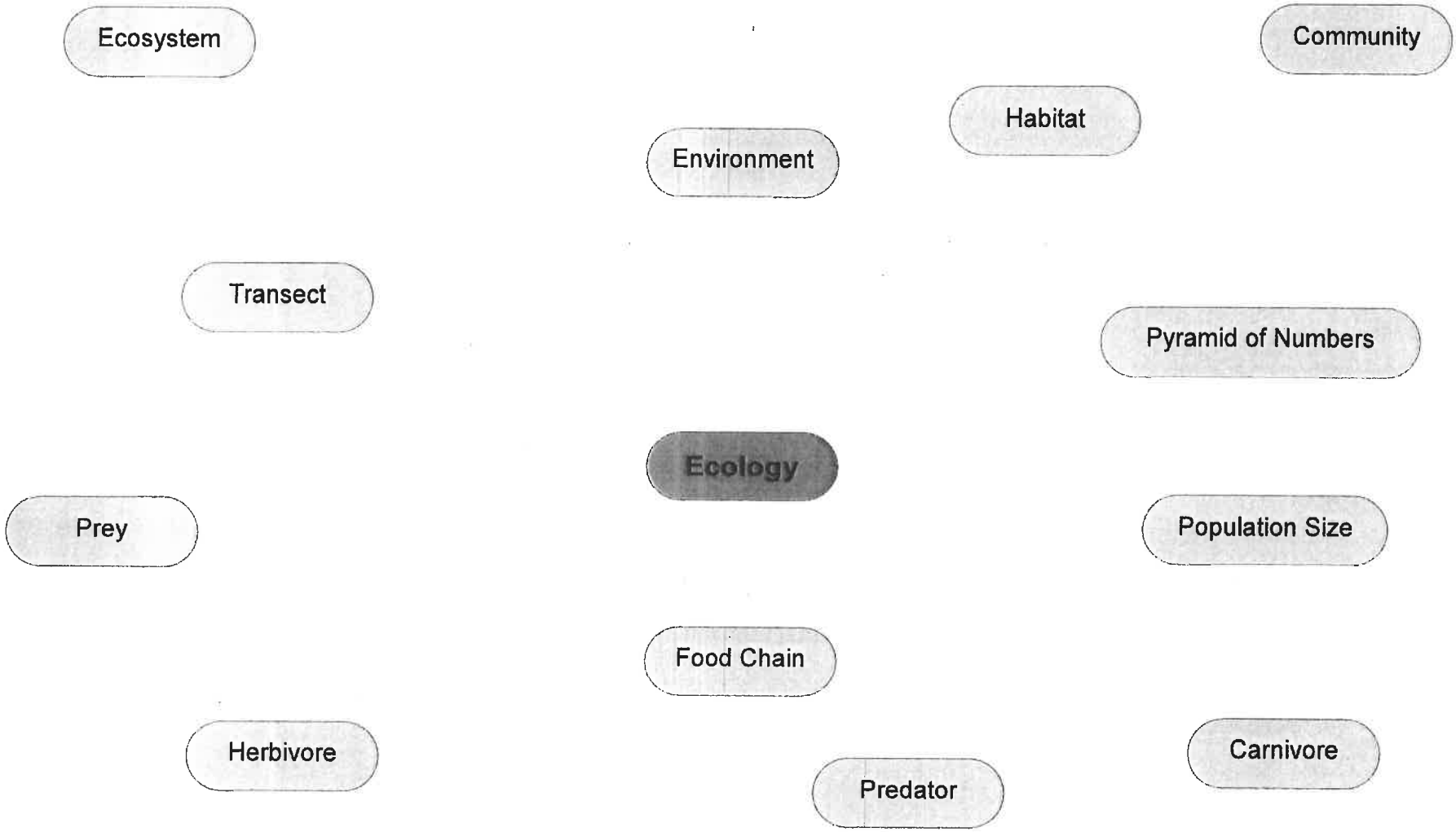
embryo

ovary

18d



18e

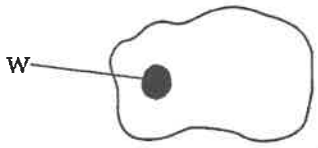


8B 18f Plants: Quick Quiz

On your answer sheet, write in or circle or highlight the correct letter for each question.

A) Revision of cells

1 On this drawing of an animal cell, what is part labelled 'W'?



A cell surface membrane **C** nucleus
B chloroplast **D** heart

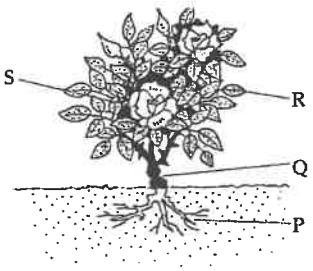
2 On the drawing of the animal cell, what does part 'W' do?

A makes energy **B** makes food
C controls the cell **D** holds the cell together

B) Photosynthesis

1 Where does photosynthesis occur in a rose bush?

A in all the parts
B in parts R and S only
C in part R only
D in part Q only



2 Plants often turn some of the food they make into another substance for storage. The name of this substance is:

A glucose. **B** starch.
C fibre. **D** pasta.

3 Which of these shows the correct word equation for photosynthesis?

A glucose + carbon dioxide → water + oxygen (+ energy)
B glucose (+ energy) → oxygen + glycerol
C water + carbon dioxide (+ energy) → glucose + oxygen
D chlorophyll + carbon dioxide → water + glycogen

4 Aerobic respiration is a process which:

A stores chemical energy in food.
B makes food for plants living under water.
C does not happen in plants but only in humans when they exercise hard.
D releases energy from food.

5 Leaves are often wide so that they can:

A absorb as much sunlight as possible.

B catch as much rain as possible.

C provide shelter for animals living under them.

D float to the ground when they drop in autumn.

6 Gases get into and out of a leaf by:

A diffusion. **B** absorption.

C conduction. **D** convection.

7 Look at this list of substances.

glucose fat cellulose protein

Which of these substances can plants make?

A glucose and cellulose only **C** glucose, cellulose and protein

B glucose, cellulose and fat **D** all of them

8 Plants need cellulose to:

A store energy.

B repair damaged cells.

C make cell walls.

D make cell surface membranes.

9 Choose from the following list the correct products of photosynthesis.

A water and carbon dioxide

B glucose and carbon dioxide

C glucose and oxygen

D water and carbon dioxide

10 In plants starch is used:

A to make flowers colourful.

B as a store of energy.

C to absorb water from the soil.

D to make leaves green.

11 Look at these chemical processes.

photosynthesis respiration burning fuels

Which of these processes add carbon dioxide to the air?

A respiration and burning

B respiration only

C photosynthesis and respiration

D burning only

12 Plants are important in keeping the atmosphere in balance because:

A they use up oxygen.

B they use up carbon dioxide.

C they provide food for animals and humans.

D they use water.

13 Which of these would **not** be a disadvantage of cutting down forests?

A Logging companies could make more profits.

B There would be fewer trees to keep the atmosphere in balance.

C Some species might become extinct.

D Floods might wash away the soil.

14 Which of the following environmental conditions will **not** increase the rate of photosynthesis in a crop plant?

A well-watered soil

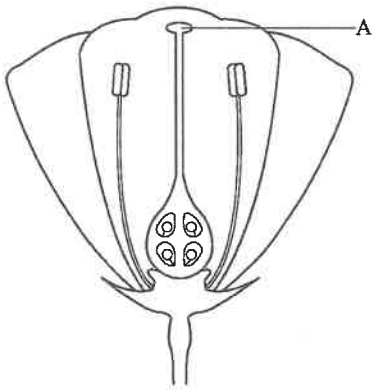
B warm weather

C bright sunshine

D windy weather

C) Fertilisation

1 On the diagram the part labelled with the letter 'A' is the:



A style. **B** ovary.

C stigma. **D** anther.

2 Pollination is:

A the carrying of pollen from an anther to a stigma.

B when two sex cells join together.

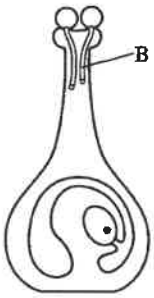
C when an insect eats pollen.

D when harmful substances enter the air.

3 Fertilisation is:

A the carrying of pollen from an anther to a stigma.
B when two sex cells join together.
C when an insect eats pollen.
D when a seed starts to grow.

4 In the diagram, the part labelled 'B' is:



A an ovary. **B** an anther.
C a xylem tube. **D** a pollen tube.

D) Ecology

1. The five groups of vertebrates are:
   A chickens, dolphins, eagles, turtles.
   B mammals, reptiles, penguins, worms, bacteria.
   C amphibians, birds, reptiles, mammals, fish
   D fish, amphibians, mammals, snakes, insects.

2. All arthropods have:
   A four legs and two eyes.
   B bodies divided into five sections.
   C jointed legs.
   D a 'fleshy pad'

3. Seeds are:
   A made by flowering plants and conifers.
   B made by certain kinds of animal.
   C only found in apples.
   D made by excretion.

4. Plants can move water to their leaves in:
   A straw vessels.
   B xylem vessels.
   C dermatic vessels.
   D leaf vessels.

5 .Which three things are all physical environmental factors?

A light intensity, temperature and oxygen concentration
B number of predators, temperature and food supply
C number of plants, number of predators and number of prey organisms
D number of dead organisms, temperature and oxygen concentration

6. Which sampling technique would you use to find small animals in leaf litter or in a soil sample?

A pond dipping
B tree beating
C a sweepnet
D a Tullgren funnel

7. A garden measures 10m by 5m. A 1 m^2 sample is taken and found to contain two dandelion plants. What would you *estimate* the population of dandelion plants to be in the garden?

A 2 **B** 45 **C** 50 **D** 100

8. What is a person who studies habitats called?

A a lumberjack B an ecologist C an echinoderm D a physicist

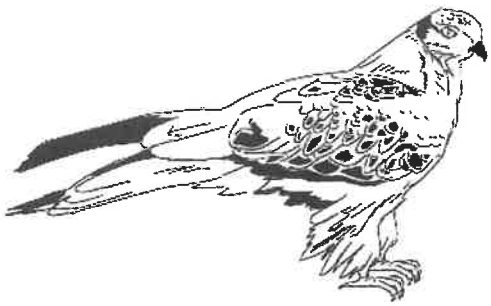
9. What is this piece of equipment called?

A a pooter **B** a shooter
C a sweepnet **D** a Tullgren

funnel

10. Use the key to work out what bird this is.

A European jay
B Kite
C puffin
D wood duck



1	Feet have claws.	go to 2
	Feet are webbed.	go to 3
2	Has a hooked beak.	Kite
	Does not have a hooked beak.	European Jay
3	Has stripes on its beak.	Puffin
	Has no stripes on its beak.	Wood duck

11. Some smaller plants that grow in woods have big leaves. This is because:

A there is not much light and bigger leaves can trap more light.
B they need to provide shelter from the rain for small animals.
C less rain gets through the trees and the big leaves help to absorb more rainwater.
D they have got more room to spread out.

12. Here is a list of things found in a particular habitat.

blackbird	**rotting log**	**snail**
bracken plant	**rock**	**tree**

Which of these things form a community?
A the rock and the rotting log
B the rock, the log, the bird and the snail
C the bird, the snail, the bracken plant and the tree
D all of them

13. What does the word 'distribution' mean?
A Where organisms are found in a habitat.
B The total number of organisms living in a habitat.
C The different species that live in a habitat.
D The different tribes that live in a habitat.

14. Which of these things do plants compete for?

oxygen	**water**	**heat**	**light**

A all of them **B** only oxygen
C oxygen and heat **D** water and light

15. Which of these things will **not** cause the number of rabbits in a population to decrease?
A There are more lettuces for rabbits to eat.
B More rabbits are eaten by foxes.
C Less rabbits catch a fatal disease.
D More rabbits catch a fatal disease.

16. Three resources that a species of rabbits needs to survive are:

A food, oxygen and carbon dioxide.
B food, water and a mate
C water, light and carbon dioxide.
D oxygen, carbon dioxide and shelter.

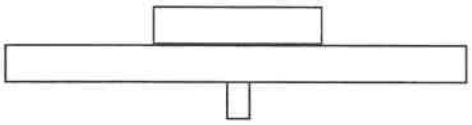
17. Which of the following is a producer?

A blue tit
B cow
C mushroom
D rose bush

18. In science, what is a 'consumer'?

A Someone who watches Watchdog on television.
B An animal that eats other organisms.
C A plant that does not need to eat anything.
D A plant that starts a food chain

19. This diagram shows the number of organisms in a food chain. Which of the following food chains does it represent?



A grass → rabbit → fox
B grass → sheep → tick
C oak tree → caterpillar → bird
D lettuce → slug → bird

20. The numbers of organisms in a food chain can be shown using:

A a number chart
B a triangle of numbers
C a pyramid of numbers
D a square of numbers