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Natural Sciences Grade 8

FS Revision Guideline 2021

Strand: Life and Living (Term 1)

Topic: Photosynthesis and Respiration

Background knowledge (Gr.4- 7):

Grades 4 & 5: The SEVEN (7) life processes of living things

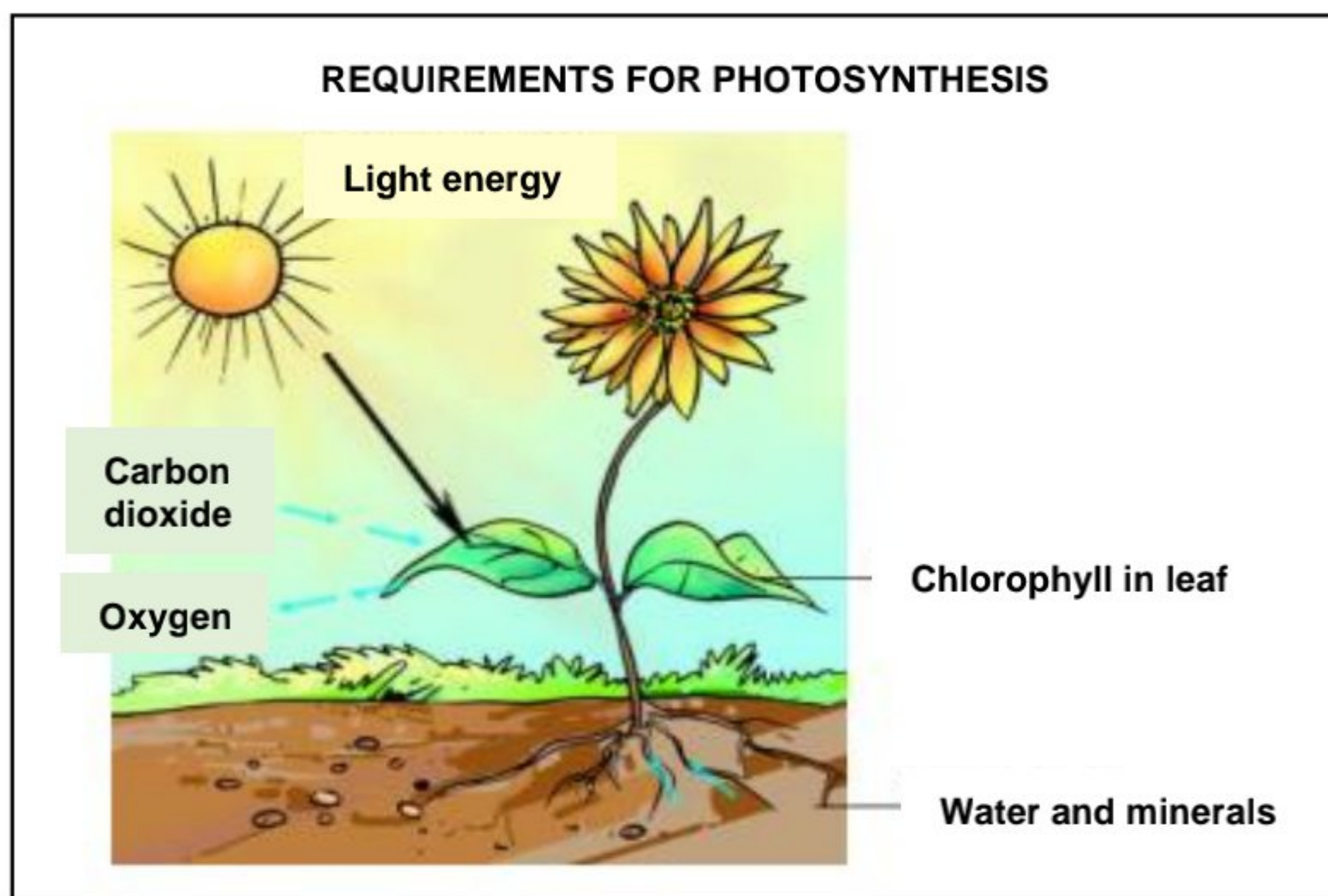
Grade 6: Photosynthesis in the context of green plants and food chains; Feeding relationships

Grades 6 & 7: Energy for movement (kinetic energy) and energy that is stored (potential energy)

Grade 8 Content:

Photosynthesis (CAPS p. 35)

- Interactions and interdependence in an ecosystem are driven by the need for energy to sustain life.
- The Sun is the important source providing this energy in the form of light and heat
- Plants use carbon dioxide (from the air), water (from the soil) and energy from the Sun in a series of chemical reactions to produce glucose (food). This process is called **PHOTOSYNTHESIS**.
- Oxygen is released into the air as a by-product.



(No further details required)

- Plants change glucose into starch, cellulose and other chemical compounds to enable processes such as growth and reproduction.

What learners should know?

1. Writing about the requirements needed for photosynthesis to take place.
2. Products which are released during photosynthesis.
3. How to test for the presence of starch in leaves of a plant.
4. How to write down a scientific report.
5. The process of photosynthesis commonly written down (word equation).

NOTE: The purpose of the activities in this document is to drill **BASIC** concepts. Refer to question banks and previous question papers for questions on higher cognitive levels. (www.mindstream.co.za)

Activity 1 (Photosynthesis)

- 1.1 Write down the requirements for photosynthesis to take place. (4)
- 1.2 What products are released during photosynthesis? (2)
- [6]**

THE SCIENTIFIC INVESTIGATION PROCESS:

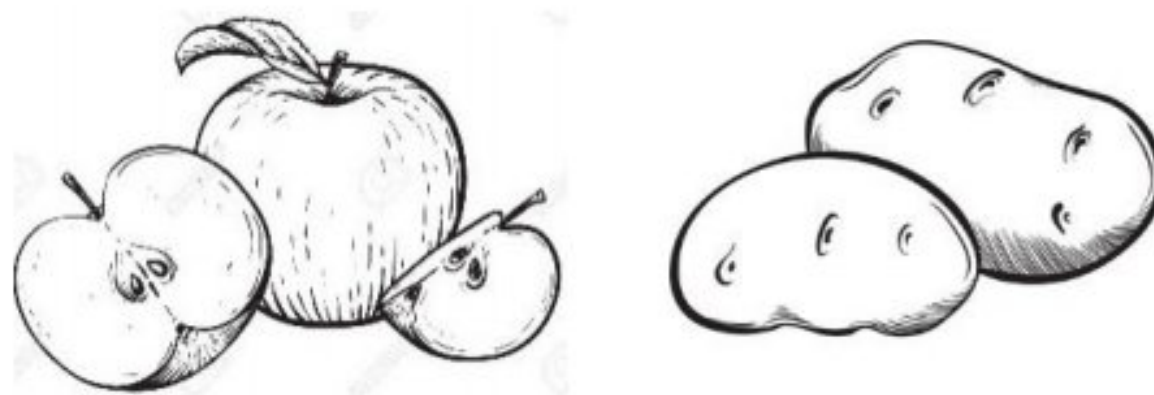
On mindstream, also see *Introduction to the Scientific Method worksheet*.

How to write a scientific report**AIM (What we want to achieve in the investigation)**

To test a piece of apple and potato respectively for starch, using iodine solution.

INVESTIGATIVE QUESTION (A scientific question on which you find the answer through experimenting.)

Which one of apple or potato contains starch?

**HYPOTHESIS (Expected outcome, based on scientific background knowledge)**

The potato contains starch, but the apple does not.

APPARATUS AND METHOD

- On a tile, use a sharp knife to cut a thin slice of apple and a thin slice of potato.
- Put the slices in separate petri dishes.
- Add a few droplets of iodine solution on each of the slices.
- Wait a few minutes and record observations.

RESULTS (Your observations, measurements, etc. during the investigation)

The iodine solution on the potato turned blue-black but the iodine solution on the apple stayed brown.

Summarise the results in a table:

	Colour-change of iodine solution	Conclusion
POTATO	Iodine turned blue-black	Starch present
APPLE	Iodine remained yellow-brown	Starch absent

CONCLUSION (Answer to the investigative question.)

The potato contains starch and the apple not.

DISCUSSION

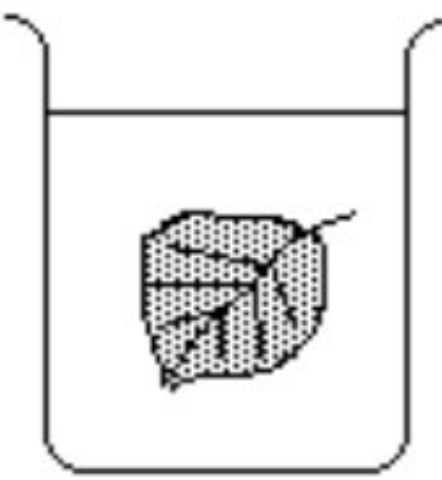
A discussion is not always needed after an investigation/experiment. Sometimes like here, there is nothing further to discuss. You can however make a comment, or if the experiment did not work, you can say what might have gone wrong.

(Acknowledgement: Oxford Successful Gr. 8 Learner Book, pp. 14-15.)

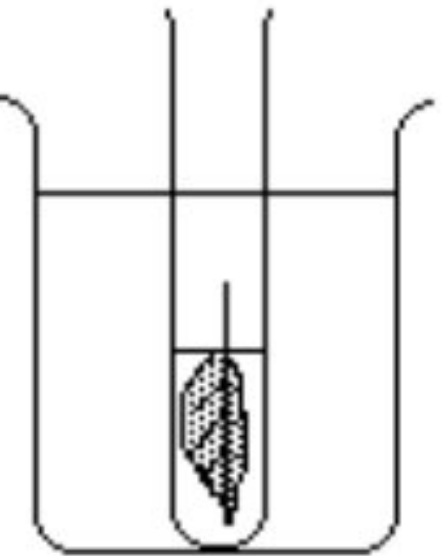
Activity 2 (Photosynthesis)**Conduct an investigation to show that leaves produce starch (CAPS p.35)**
(Teacher demonstration)

Soak the leaf in boiling water, extract chlorophyll using ethanol/methylated spirits. Add a few drops of iodine solution onto the leaf.

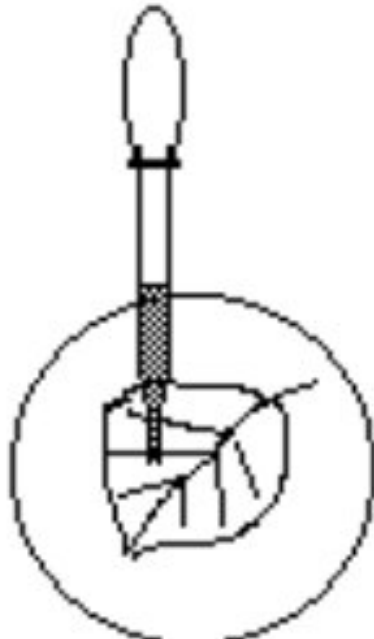
Testing a leaf for starch from photosynthesis



1. Boil the leaf in water to break the cell walls.



2. Put the leaf into ethanol / methylated spirits in a test tube and heat this in a water bath to extract (remove) the green chlorophyll.



3. Wash the white leaf in hot water then, in a petri dish add a few drops of iodine solution onto the leaf.



4. If photosynthesis has occurred the leaf will turn blue-black because it will have starch present.

In your classwork book, write a report using the headings: **Aim, Investigative Question, Hypothesis, Method, Results, Conclusion and Discussion** on the above starch test. [12]

FORMAL PRACTICAL TASK:

See practical worksheet on "Do green leaves produce starch" the FS NS Hub:

www.mindstream.co.za

Activity 3 (Photosynthesis)

Potatoes contain starch due to the blue-black colouring of iodine solution when dropped onto a slice of potato.

Do the test for starch on different foods, like the ones listed below and complete the table.

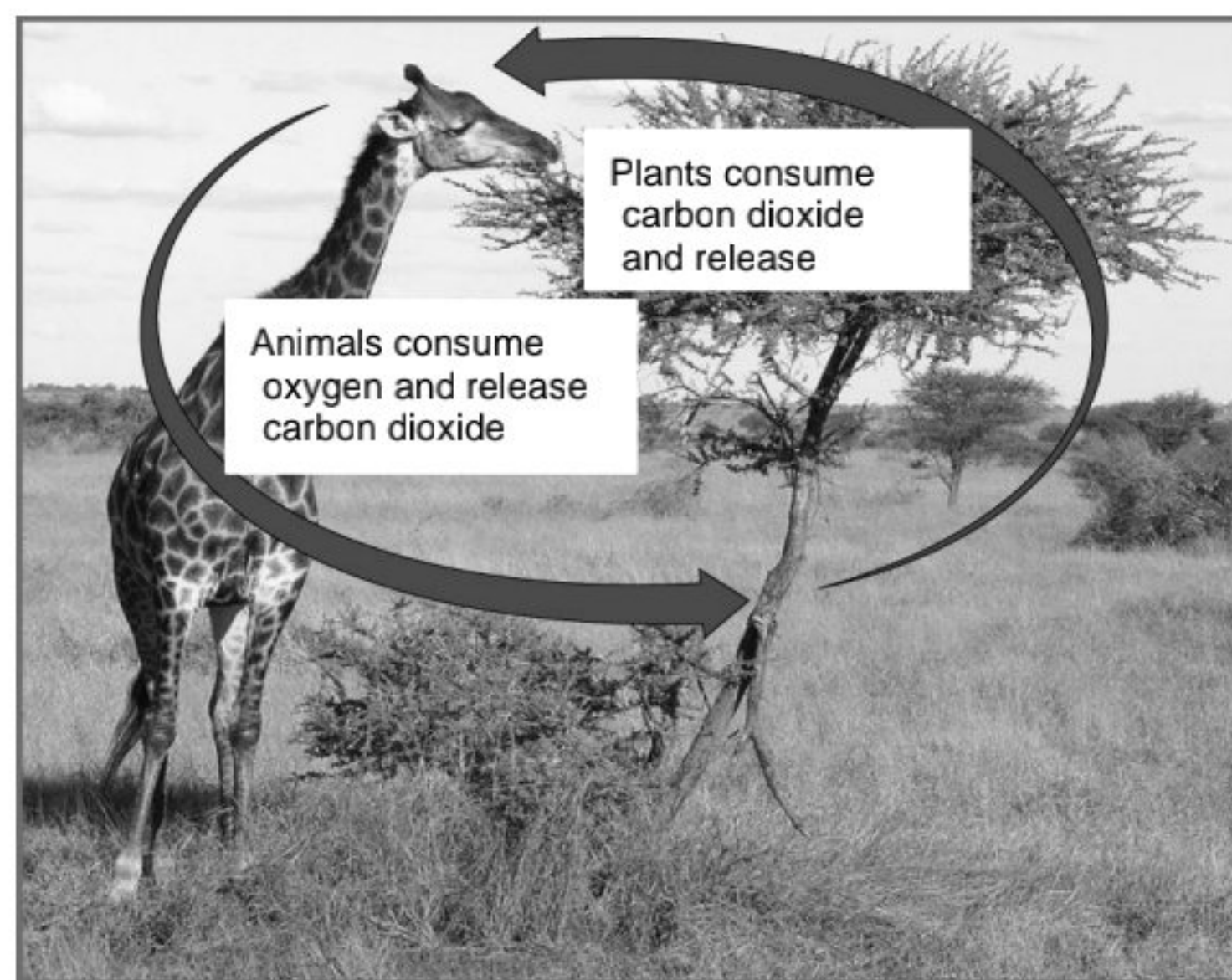
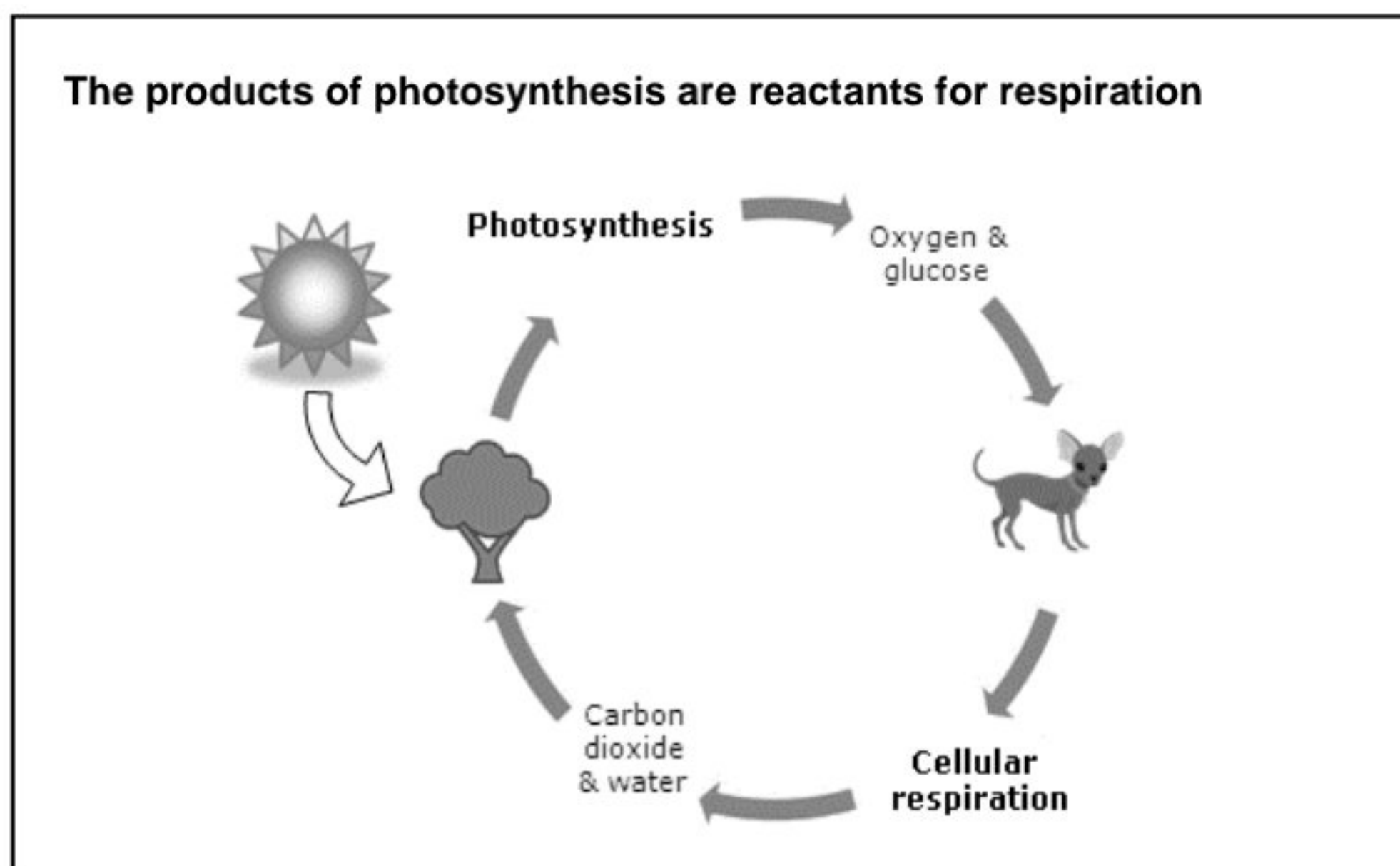
	Type of food	Contains starch (✓)	Does not contain starch (X)
3.1	Grapes		
3.2	Tomato		
3.3	Rice		
3.4	Banana		
3.5	Orange		
3.6	Cereal		
3.7			
3.8			
3.9			
3.10			



(1 mark per food type)

Respiration (CAPS p. 35)

- Food contains energy (potential energy). This energy can be released from food by a series of chemical reactions called **RESPIRATION**.
- Respiration (in all living organisms) is the process by which energy is released from food in a series of chemical reactions.
- Respiration takes place in the cells of organisms. (In the mitochondria in cells.)
- Respiration takes place all the time.
- This is how we present the respiration process (word equation):



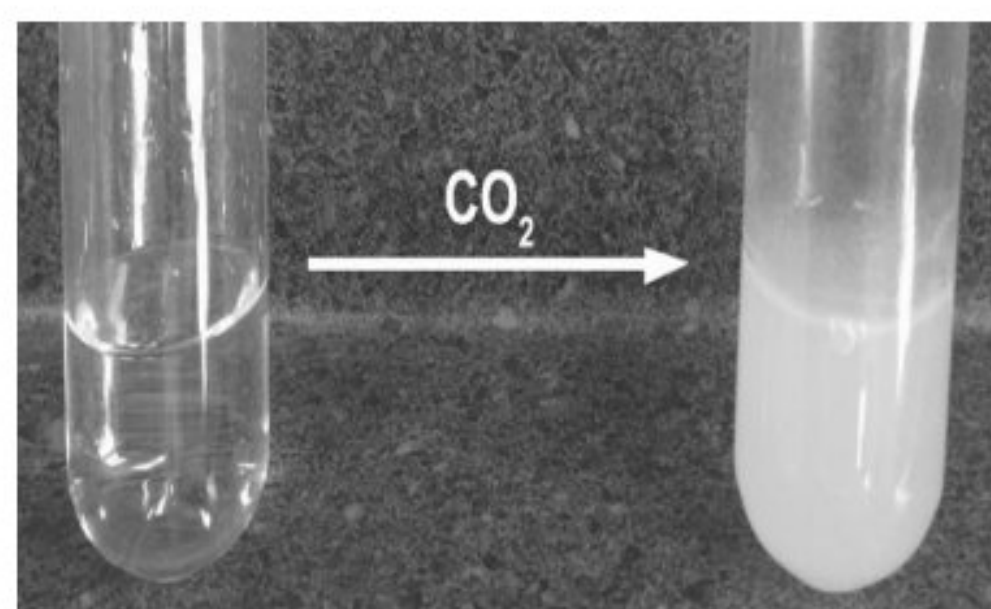
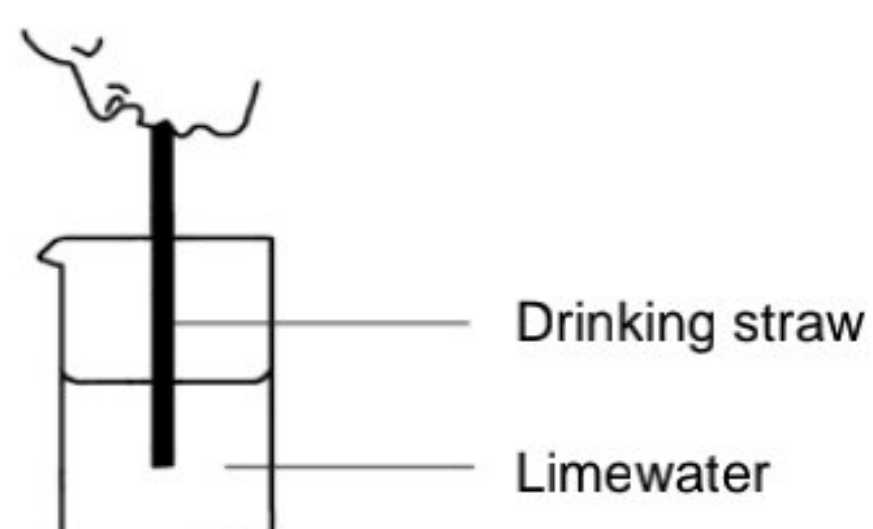
(No further details required)

What learners should know?

1. Writing about the requirements for and the products of respiration.
2. Test for the presence of carbon dioxide in exhaled air using clear lime water.
3. The process of respiration commonly written down as a word equation.

Activity 1 (Respiration)

- 1.1 Write down the requirements for respiration to take place. (2)
- 1.2 Which gases are released during respiration by:
- 1.2.1 animals? (1)
- 1.2.2 plants? (1)
- 1.3 Conduct the test for the presence of carbon dioxide in exhaled air using clear lime water. Exhale through a drinking straw into a test tube of clear lime water as shown below.



Write down your observations and conclusion. (4)

- 1.4 Compare photosynthesis with respiration in the table below.

	Photosynthesis	Respiration
Where the process takes place		
Requirements		
Gas products formed		
Other products formed		
The role of sunlight		
Energy conversion that takes place		

(12)

- 1.5 Match the term from Column C with the correct process in Column A or B. Write ONLY the LETTER from Column C in the correct column, A or B.

	Column A PHOTOSYNTHESIS	Column B RESPIRATION	Column C
1.5.1			A. Releases oxygen
1.5.2			B. Uses carbon dioxide
1.5.3			C. Releases energy
1.5.4			D. Stores energy
1.5.5			E. Uses oxygen

(5)
[25]

Interactions and interdependence within the environment (CAPS p. 36)

Introduction to ecology

Background knowledge (Gr. 5 - 7):

Grades 5 & 6: The concept of the ecosystem and feeding relationships; Food chains

Grade 7: Biosphere and biodiversity; Classification of living things (plants and animals) and their dependence.

Grade 8 Content:

Ecology: Is the study of interactions of organisms with one another and with the physical and chemical environment.

Scientists usually classify the study of ecological interactions into **four** levels:

- **Populations**
- **Communities**
- **Ecosystems**
- **Biosphere**

Important concepts related to ecology:

Ecosystem: It is a community of plants, animals and smaller organisms that live, feed, reproduce and interact in the same area and/or environment.

Habitat: Is the natural environment where an organism lives.

Biosphere: The biosphere is a narrow zone of the Earth where land, water and air interact with each other to support life. It is in this zone where life exists.

OR

The biosphere is a global ecosystem composed of living (biotic) and non-living (abiotic) factors from which they derive energy and nutrients.

Biotic: Is a living organism that shapes its environment. Works together with abiotic factors to create a unique ecosystem.

Abiotic: Is a non-living part of an ecosystem that shapes its environment. Works together with biotic factors to create a unique environment.

Community: The interaction of a group of various species in a common location.

Population: A group of individuals of the same species living and interbreeding within a given area at the same time.

Species: A group of organisms with the same biological characteristics.

Adaptation: It is the biological mechanism by which organisms adjust (change) to an environment or new environment

Extinct: (The moment of extinction is considered to be the death of the last individual of a species.) Breed and recovery lost forever. Organisms that died out.

What learners should know?

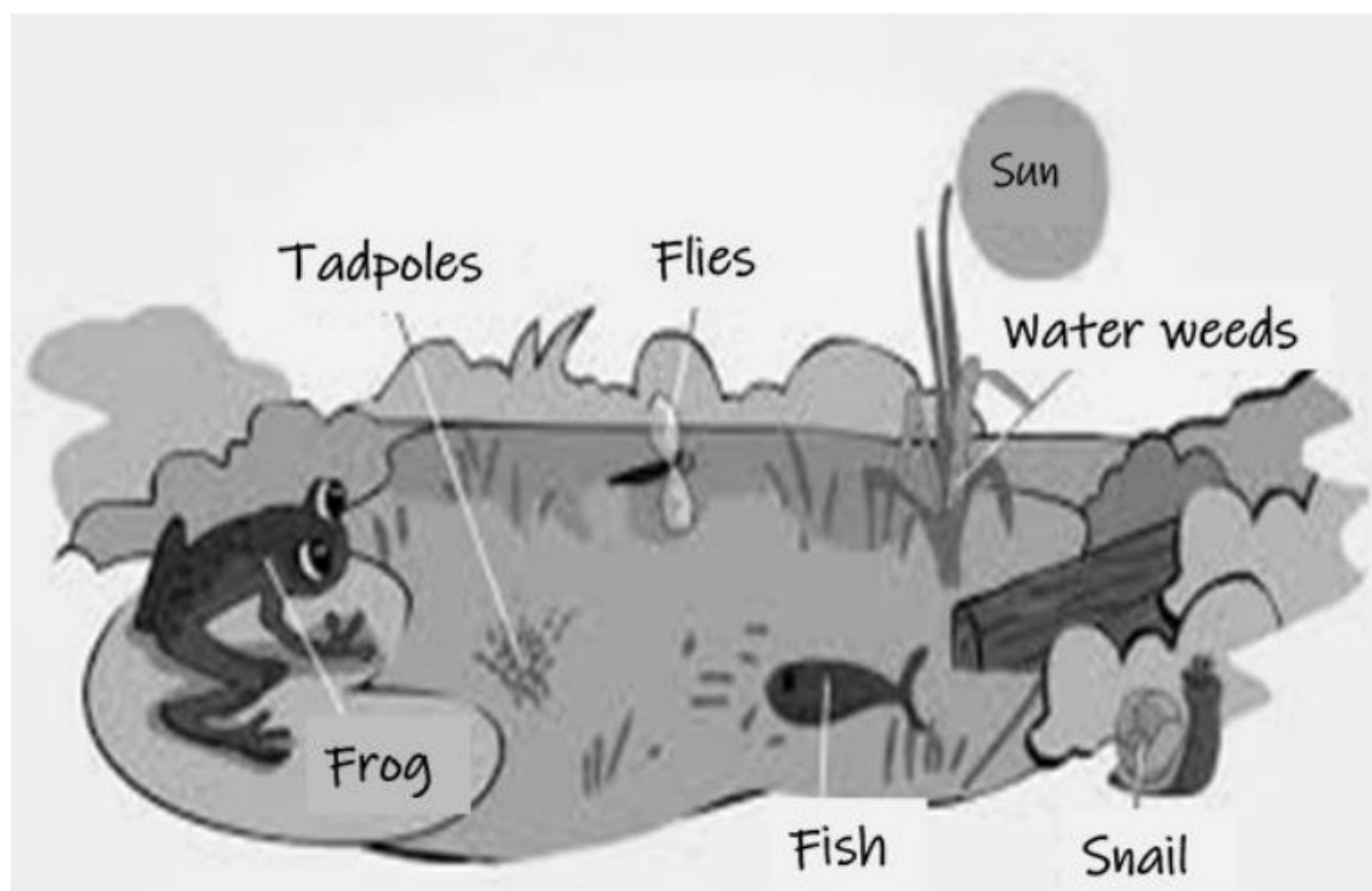
1. Distinguish between different ecosystems.
2. Distinguish between biotic (living) and abiotic (non-living) factors of an ecosystem.
3. Explain important concepts, like: Ecosystem, Habitat, Community, Population, Species, Adaptations, Extinct.

Ecosystems (CAPS p. 36)

- All ecosystems combined makes up the biosphere.
- An ecosystem consists of an ecological community that includes living organisms (biotic) such as plants and animals, together with the non-living organisms (abiotic) environment such as: Temperature, wind and water interacting as a system.
- The size of an ecosystem is not specifically defined, and it usually encompasses a specific limited area.
- Ecosystems are defined by the network of interactions amongst organisms and between organisms and their environment.
- Survival of individual organisms and populations depends on the ability to cope with changes (adapt) in its habitat (the place where an organism lives) or in the ecosystem.

What learners should know?

1. Distinguish between different ecosystems.
2. Distinguish between biotic and abiotic factors of an ecosystem.
3. Distinguish between insectivores, herbivores, omnivores, carnivores.
4. Explain the differences between a scavenger and a predator.
5. Evaluate the disruptions to an ecosystem e.g., floods & droughts. (Provide causes, effects and solutions.)

An ecosystem (a pond for example):

Living things in die ecosystem (Biotic factors):

Tadpoles, Frog, Fish, Snail and Flies (Animals)

Waterweeds, Grass (Plants)

Non-living things in the ecosystem (Abiotic factors):

Water, amount of sunlight, rocks, soil types, air and temperature.

Interaction:

The living and non-living organisms need one another to survive in this environment.

The fish **swims with its fins** and needs the **water and oxygen** in the water to survive.

The **green plants** need the sun to **produce food** and **release oxygen** into the water.

The **frog feeds** on the **flies** and **snails** around the pond.

The **snail** feeds on the **leaves of the plants** around the pond.

The **snail and frog** will **shelter** in the bushes or leaves of plants.

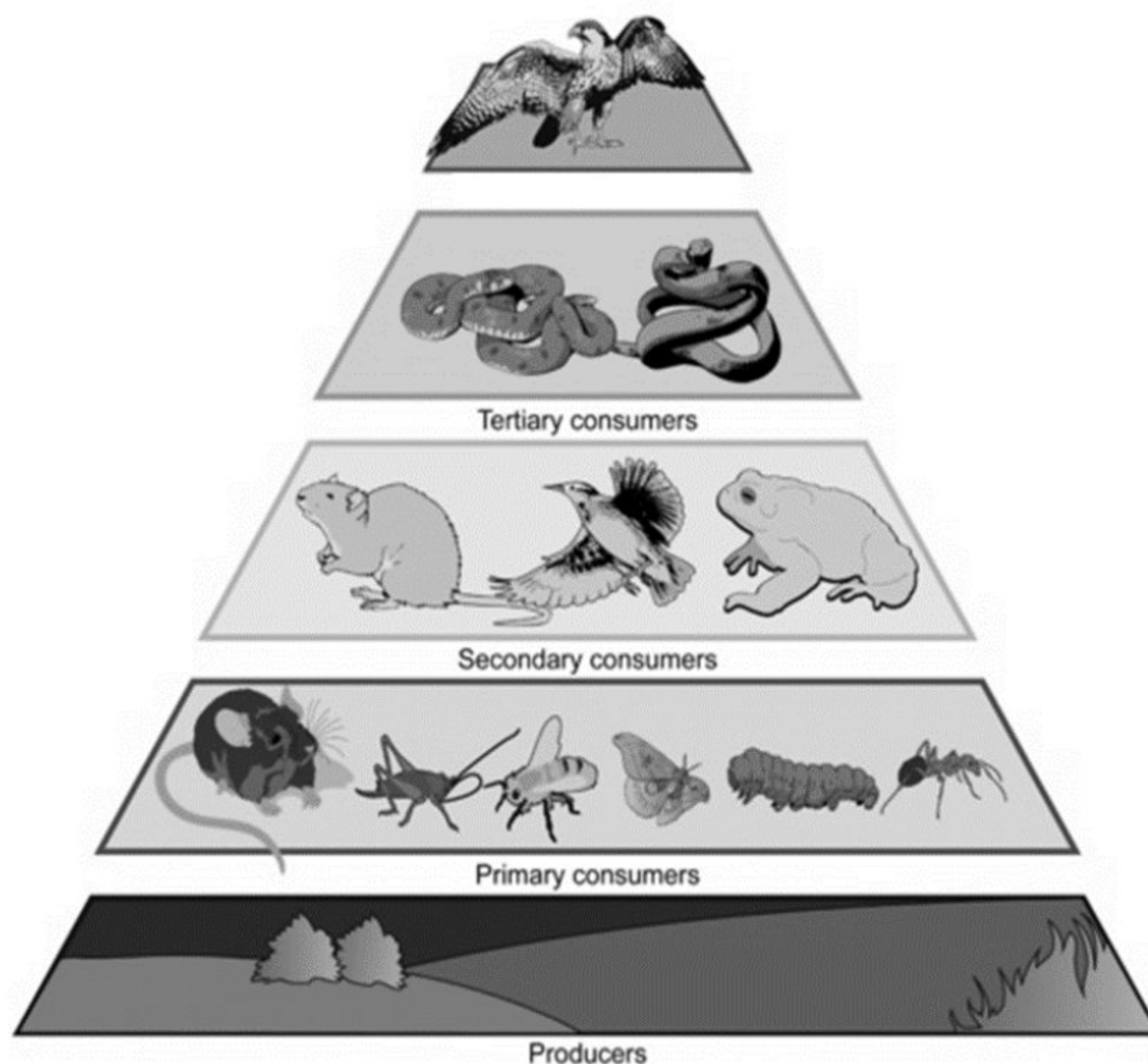
The organisms are all interdependent (dependent on each other) to survive in this ecosystem.

NOTE: Use question banks and previous papers (www.mindstream.co.za) to expose learners to many different ecosystems and questions on this topic.

Different pictures can be used to do an activity similar to the example above. Use different types of ecosystem e.g., forest, mountain, grassland or desert.

Feeding relationships (CAPS p. 37)

- Plants make their own food – they are **producers**.
- Animals and humans obtain their food directly (herbivores) or indirectly (carnivores) from plants - they are **consumers**.
- **Herbivores** - feed on plant material e.g., cows, sheep and horses.
- **Carnivores** – feed on other animals (living or dead) e.g., a lion.
- **Omnivores** – feed on animals and plants e.g. humans, pigs and baboons.
- **Insectivores** – feed mainly on insects.
- **Decomposers** – decompose or break down the remains of dead animals and/or plants. They recycle important nutrients in the soil, for e.g., bacteria & earthworms.
- **Predators** – hunt on other animals (prey) e.g., leopard, cheetah, and lion.
- **Scavengers** – eat dead animals and clean the environment e.g., hyena and vultures,

Consumers:

Trophic levels: Each stage of a food chain is called a trophic level.

What learners should know?

1. To draw and analyse energy pyramids.
2. Evaluate the impact of different factors e.g., loss of habitat, loss of species and change of weather conditions on ecosystems.
3. Evaluate the impact on a food web when one of the species is removed.
4. Distinguish between:
 - Producers
 - Primary consumers
 - Secondary consumers
 - Tertiary consumers

Activity 1 (Ecology)

Classify the organisms in the word bank according to their respective feeding groups, for e.g., cows are herbivores.

YOU MAY ONLY USE A WORD ONCE TO FILL ALL OPEN SPACES.

LEOPARD	VULTURE	ELEPHANT	CHAMELEON	SNAIL
FROG	EARTHWORM	BABOON	FUNGI	HUMANS

HERBIVORE	CARNIVORE	OMNIVORE	INSECTIVORE	DECOMPOSER

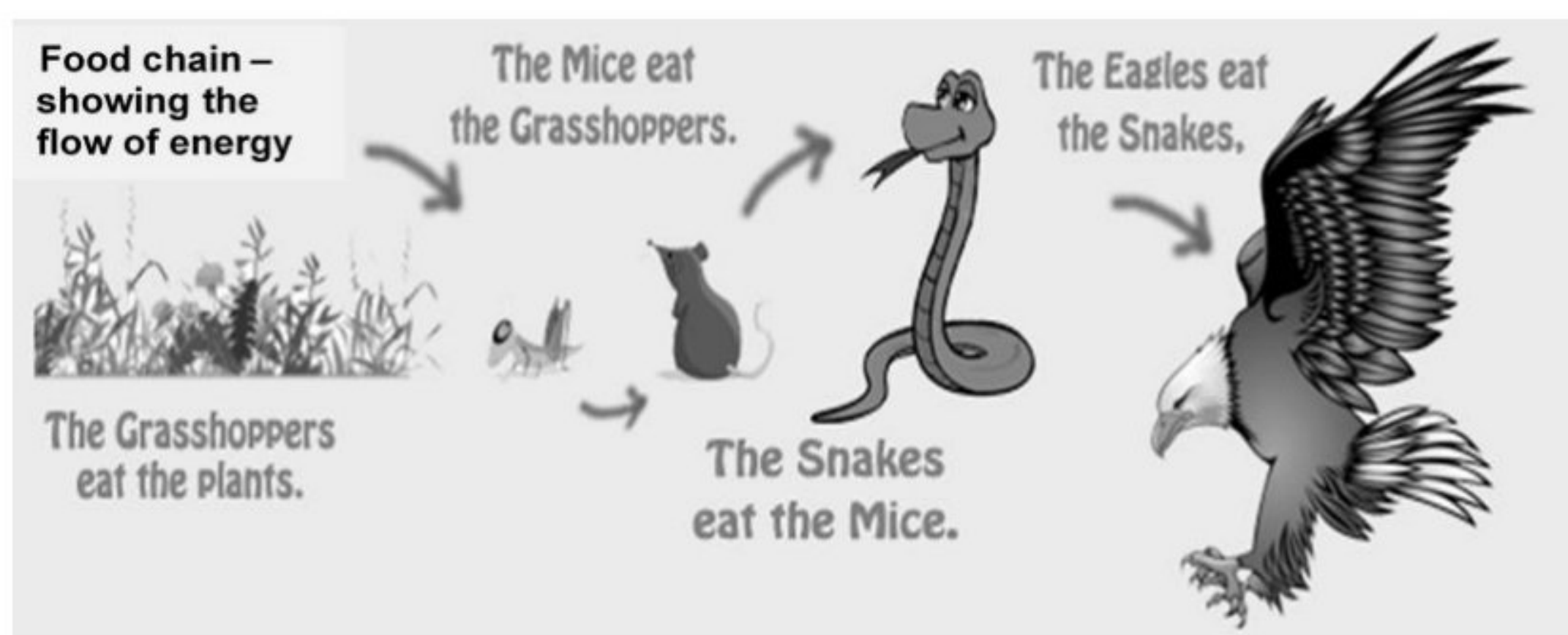
[10]

Interactions and inter-dependence within the environment (CAPS p. 38)**What learners should know?**

1. Plants capture energy from the sun through the process of photosynthesis.
2. Energy is passed along a food chain from producers to consumers.
3. The balance in the ecosystem can be disturbed by natural as well as human factors.
4. Should identify a food chain and/or food web (linking names with arrows) in different ecosystems.

Energy flow: Food chains & Food webs

- Plants and algae play an important role in the ecosystem as they capture energy from the Sun by the process of photosynthesis.
- This energy is passed along a food chain from the producers to the consumers. Decomposers, the last link in this transfer of energy, release energy as heat to the environment.
- Each stage of the food chain is called a **trophic level**.
- Energy transfer and energy loss occur at every trophic level (only 10% of the energy is passed on from one level to the next)
- Interlinked food chains together form **food webs**.



Plants → Grasshopper → Mouse → Snake → Eagle

Balance in an ecosystem (CAPS p. 38)**What learners should know?**

1. Explain important concepts related to ecology e.g., ecosystems, habitat, adaptations amongst animals and plants.
 2. Factors that contribute to imbalances in nature e.g. pollution, etc.
- An ecosystem can only accommodate as many organisms as its resources (food, water & shelter) can carry, otherwise the **balance** will be disturbed.
 - This balance can be disturbed by:
 - **Natural factors** that include extreme changes in weather patterns and climate e.g. floods, droughts and sudden temperature changes.
 - **Human factors** which can be the removing of organisms from the ecosystem by pollution and/or poaching of plants and animals.
 - These factors can contribute to an imbalance in an ecosystem, seriously impacting on its components and altering its nature.

Activity 2 (Ecology)

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A – D) next to the question number, e.g., 2.9 D.

2.1 A food chain will always start with a / an ...

- A top predator.
- B herbivore.
- C producer.
- D insectivore.

(1)

2.2 An omnivore will eat ...

- A meat only.
- B plants only.
- C dead animals only.
- D meat and plants.

(1)

2.3 Which one is the secondary consumer in the food chain?

Grass → Grasshopper → Frog → Snake

- A Grass
- B Grasshopper
- C Snake
- D Frog

(1)

2.4 What is a habitat?

- A A place where an organism naturally lives.
- B All the conditions that surround an organism.
- C All the populations of different organisms.
- D All the plants where organisms live.

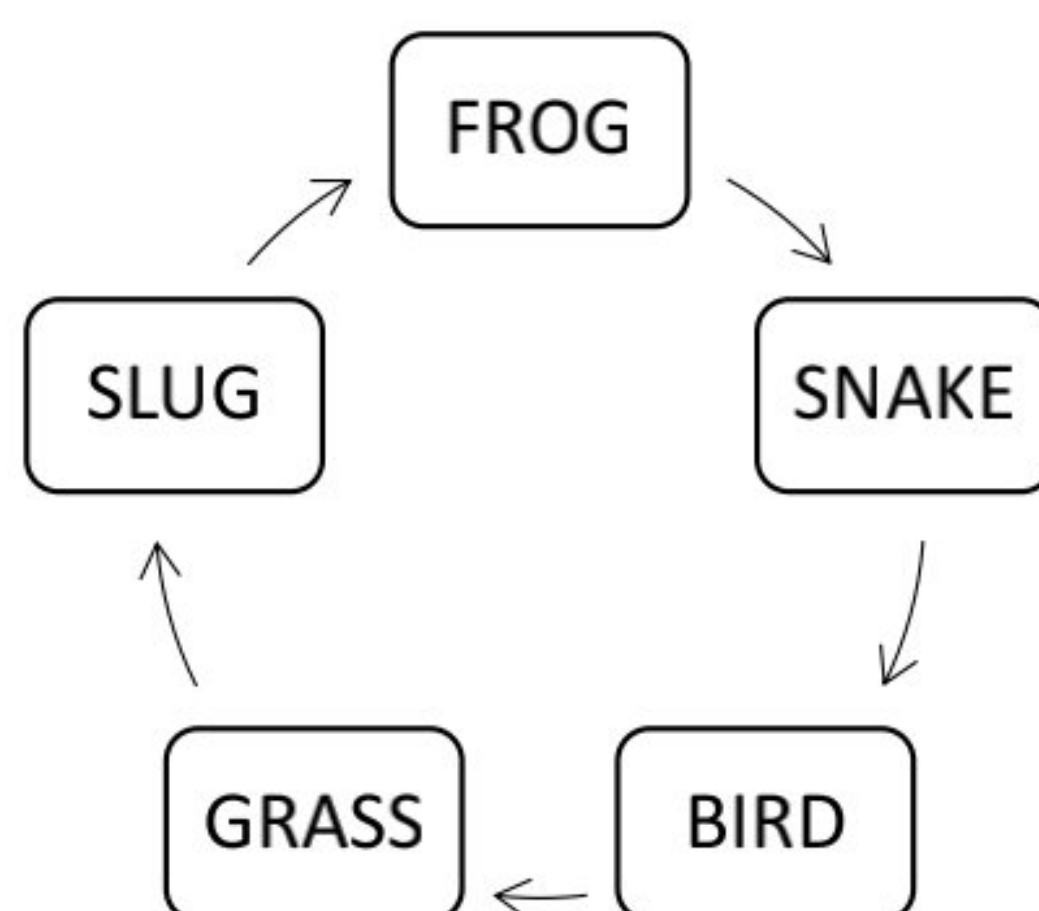
(1)

2.5 The last link in the transfer of energy in a food chain.

- A Producer
- B Carnivore
- C Decomposer
- D Scavenger

(1)

2.6 What will happen if all the frogs are removed from the food chain?



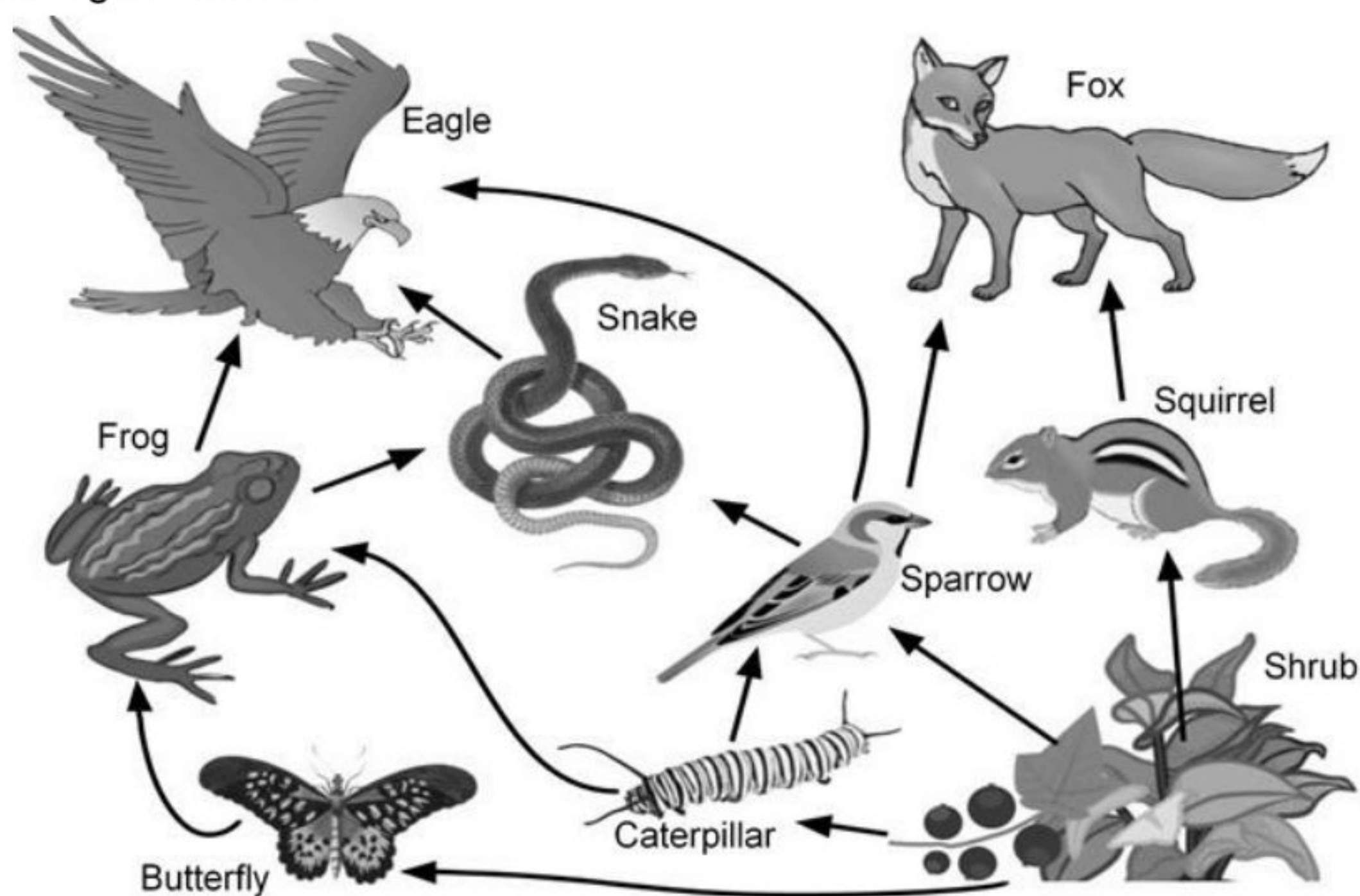
- A The snakes will increase.
- B The slugs will decrease.
- C The slugs will increase.
- D All animal totals will stay the same.

(1)

[6]

Activity 3 (Ecology)

Study the diagram below.



- 3.1 Provide a suitable heading for the diagram. (1)
- 3.2 Name an organism from the diagram above which is an example of each of the following:
- 3.2.1 Producer
 - 3.2.2 Primary consumer
 - 3.2.3 Secondary consumer
 - 3.2.4 Tertiary consumer
 - 3.2.5 Carnivore
 - 3.2.6 Insectivore
 - 3.2.7 Herbivore
- (7)
- 3.3 From the diagram above write down TWO different food chains. Both chains must contain FOUR organisms. (8)
- 3.4 What do the arrows in a food chain indicate? (2)
- 3.5 Explain the difference between a predator and a scavenger. (2)
- [20]**

Adaptations (CAPS p. 38)

Background knowledge (Gr 7):

Grade 7: Biosphere and biodiversity.
Diversity in plants and animals.
Variation exists within a specie.

- **Adaptation** is the change in the structural, functional and behavioural characteristics of an organism.
- **Adaptations** allow the organism to survive as it adapts to the changing conditions within the environment.
- Organisms that are unable to adapt to changes within the environment die out; they become **extinct**.

Activity 1 (Adaptation)

Look at pictures 1, 2 and 3 below. Identify an adaptation of each animal and explain the purpose of each adaptation.

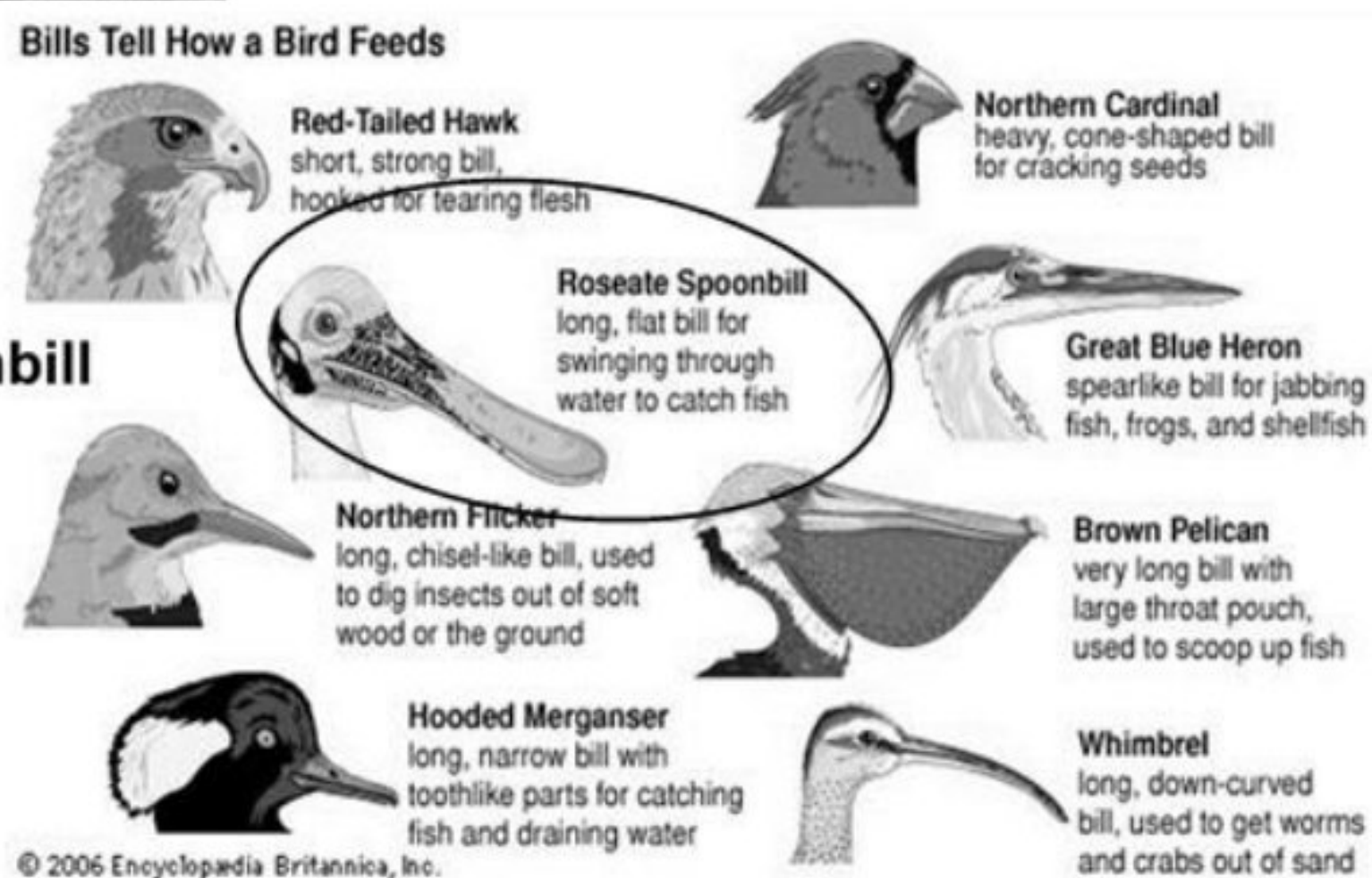
Picture 1: Elephant



Picture 2: Zebra



Picture 3: Spoonbill



Animal	Adaptation	Purpose of adaptation
Elephant		
Zebra		
Spoonbill		

(6)

Micro-organisms (CAPS p. 39)

Terminology:

Microscopic: When something is so small, it can only be seen under a microscope.

Virus: It is a sub-microscopic agent that infects the inside of living cells in an organism.

Bacterium: It is a type of biological cell which comes in a number of shapes and is found all habitats. (Plural: Bacteria)



Viruses and bacteria can cause diseases and even death.

Types of micro-organisms:

- Micro-organisms are living things.
- They are too small to see with the naked eye; microscope needed.
- There is a variety of micro-organisms, including Viruses, Bacteria, Protista and Fungi.
- **Micro-organisms can be:**
 - **Harmful** micro-organisms and cause diseases.
 - All these micro-organisms causing diseases are found almost anywhere e.g., ATM's, staircases, toilets, handrails, etc.
 - **Useful** micro-organisms for making some kinds of food e.g., yoghurt and medicines (penicillin).

Diseases caused by micro-organisms:

- **TB** (Tuberculosis caused by bacteria)
- **AIDS** (Caused by the HI-virus)
- **MALARIA** (caused by a protist, carried by mosquitos)
- **COVID** (**C**orona **v**irus **d**isease)
- Waterborne diseases such as **DIARRHOEA** and **CHOLERA** cause many child deaths.
- Effective methods of preventing the spread of diseases caused by micro-organisms include washing of hands and sterilising.

Activity 1 (Micro-organisms)

Discuss COVID-19 caused by the **CORONA-virus** under the following headings:

- | | | |
|-----|---|-----|
| 1.1 | Causes | (1) |
| 1.2 | Effects of illness on human body | (3) |
| 1.3 | Symptoms | (3) |
| 1.4 | Treatment | (2) |
| 1.5 | Precautions | (3) |
| 1.6 | Tabulate the differences between common flu and COVID-19. | |



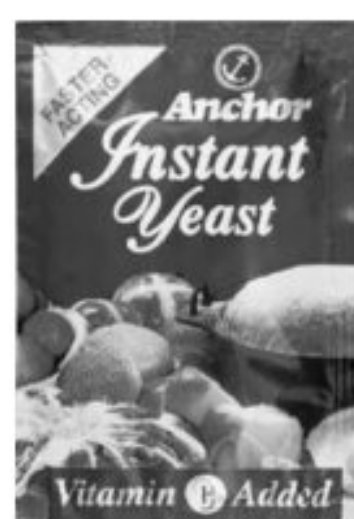
FLU	COVID

(3)
[15]

NOTE: Other options to investigate: TB or Malaria or HIV and AIDS.

Activity 2 (Micro-organisms) – Suggested informal practical investigation

You can observe micro-organisms by investigating the growth of yeast.



- Yeast is used to make bread rise and to ferment beer.
- There are many species of yeast, but the most common one used in cooking and baking is known as *Saccharomyces cerevisiae*, which is known as **brewer's yeast**. (See picture)
- As yeast grows, it uses sugar for energy and converts it into carbon dioxide and alcohol/acids; this is called **fermentation**.

2.1 Investigate the growth of yeast under different conditions

Either different temperatures **OR** different amounts of sugar can be used when growing the yeast. Do some research on a method that can be used.

(AIM: To determine how temperature affects the growth of yeast **OR** To determine how the amount of sugar affects the growth of yeast.)

Keep the following in mind when growing the yeast:

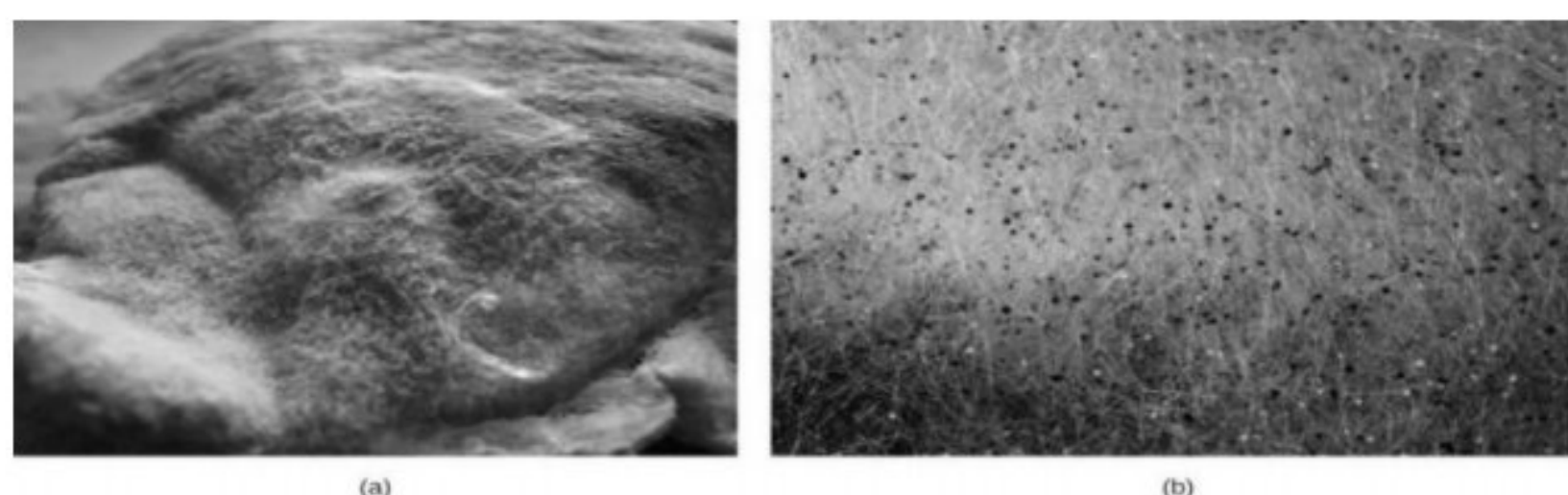
- ❖ 55°C – 60°C: Yeast cells die.
- ❖ 41°C – 46°C: Ideal temperature of water for dry yeast being reconstituted (to return, reconstruct) with water and sugar.
- ❖ 4°C: The temperature of a fridge – yeast will be too cold to work properly.

In the experiment you will trap the carbon dioxide released during the fermentation process. The more active the yeast, the more carbon dioxide will be produced by the yeast!

By introducing the variables of different temperatures OR different amounts of sugar, you will be doing **real science!!**

Conduct the investigation and record your observations and results.

2.2 Investigate the growth of bread mold under different conditions



Research and conduct an investigation and write a report, using the following headings:

- 2.2.1 Aim (To determine how the amount of moisture affects the growth of bread mould OR To determine how temperature affects the growth of bread mould)
- 2.2.2 Investigative question
- 2.2.3 Hypothesis
- 2.2.4 Method
- 2.2.5 Results
- 2.2.6 Conclusions

Activity 3 (Micro-organisms)

Answer the following questions:

- 3.1 Name four things that yeast need to grow. (4)
 - 3.2 Name TWO products released by yeast during fermentation. (2)
 - 3.3 Name TWO examples in which micro-organisms are used for processing food. (2)
- [8]**