Year 8 Term 1 Science

Home Learning

Name _____

Teacher _____

Class _____

Year 8 Home Learning Booklet – Term 1

Instructions:

- Complete 1 section per week
- Bring this booklet to the lesson specified by your teacher for them to check
- Your work will either be self-assessed or marked by your teacher

Home Learning Number	Day & Date to Hand In	Week	Period	Checked by Teacher
1		A B		
2		A B		
3		A B		
4		A B		
5		A B		
6		A B		

Periodic Table and GCSE Physics Equations are on pages 2 and 3

The Periodic Table

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	[285] **Cn** copernicium 112	[286] **Uut** ununtrium 113	[289] **Fl** flerovium 114	[289] **Uup** ununpentium 115	[293] **Lv** livermorium 116	[294] **Uus** ununseptium 117	[294] **Uuo** ununoctium 118

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.

GCSE Physics Equations 1

HT = Higher Tier only equations

kinetic energy = 0.5 × mass × (speed)^2	$E_k = \frac{1}{2} m v^2$
elastic potential energy = 0.5 × spring constant × (extension)^2	$E_e = \frac{1}{2} k e^2$
gravitational potential energy = mass × gravitational field strength × height	$E_p = m g h$
change in thermal energy = mass × specific heat capacity × temperature change	$\Delta E = m c \Delta\theta$
power = $\frac{\text{energy transferred}}{\text{time}}$	$P = \frac{E}{t}$
power = $\frac{\text{work done}}{\text{time}}$	$P = \frac{W}{t}$
efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$	
efficiency = $\frac{\text{useful power output}}{\text{total power input}}$	
charge flow = current × time	$Q = I t$
potential difference = current × resistance	$V = I R$
power = potential difference × current	$P = V I$
power = (current)^2 × resistance	$P = I^2 R$
energy transferred = power × time	$E = P t$

GCSE Physics Equations 2

	energy transferred = charge flow × potential difference	$E = Q\,V$
HT	**potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil**	$\boldsymbol{V_p\,I_p = V_s\,I_s}$
	$\text{density} = \frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$
	thermal energy for a change of state = mass × specific latent heat	$E = m\,L$
	weight = mass × gravitational field strength	$W = m\,\boldsymbol{g}$
	work done = force × distance (along the line of action of the force)	$W = F\,s$
	force = spring constant × extension	$F = k\,e$
	distance travelled = speed × time	$s = v\,t$
	$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$	$a = \frac{\Delta v}{t}$
	$(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$	$v^2 - u^2 = 2\,a\,s$
	resultant force = mass × acceleration	$F = m\,a$
HT	**momentum = mass × velocity**	$\boldsymbol{p = m\,v}$
	$\text{period} = \frac{1}{\text{frequency}}$	$T = \frac{1}{f}$
	wave speed = frequency × wavelength	$v = f\,\lambda$
HT	**force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length**	$\boldsymbol{F = B\,I\,l}$

Week 1 – Scientific Skills

1. The dependent variable is…

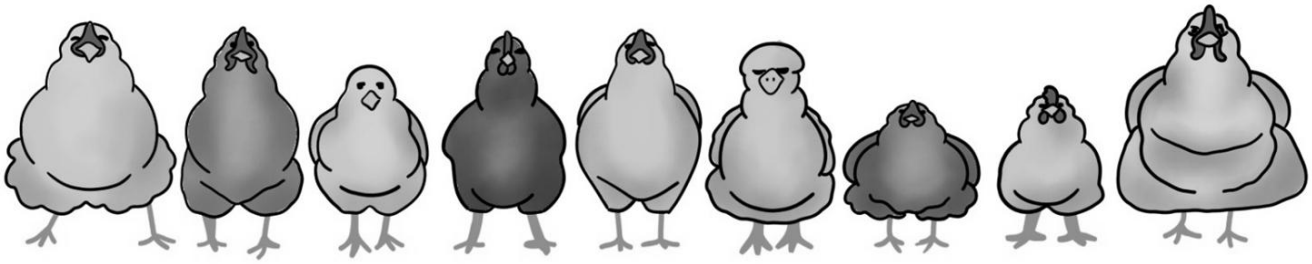
- ❑ The thing we change
- ❑ The thing we measure
- ❑ Something we keep the same

2. The independent variable is…

- ❑ The thing we change
- ❑ The thing we measure
- ❑ Something we keep the same

3. Choose the correct word:

Control/Wild variables are things in the experiment that we keep the **same/different**. This is so that we know that any change we **ignore/observe** is because of the thing we changed and **not/always** something else.



4. Charlie has a hypothesis that bigger chickens lay more eggs. To find out whether this is true, she measures the mass of her chickens and records how many eggs they lay in one week.

a) What is her independent variable? _____

b) What is her dependent variable? _____

c) Suggest three control variables which she needs to keep the same for her results to be valid?

_____

_____

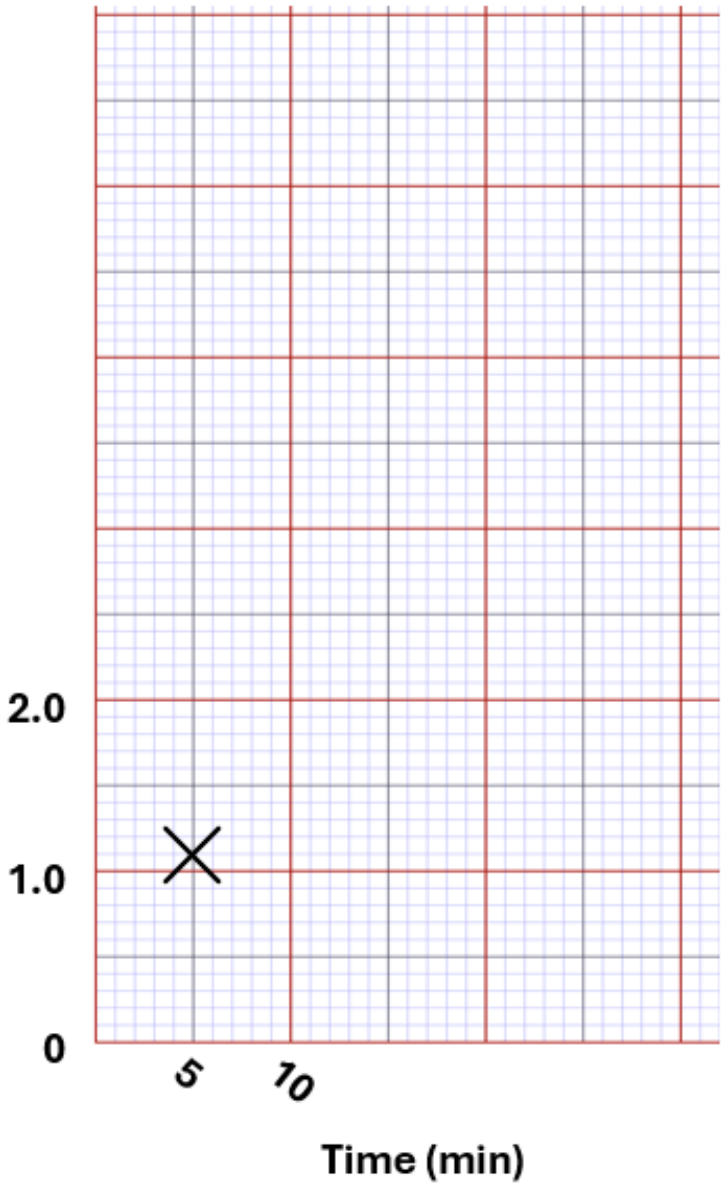
_____

5. Finish labelling the x- and y-axis

6. Plot your data. The first point has been done for you.

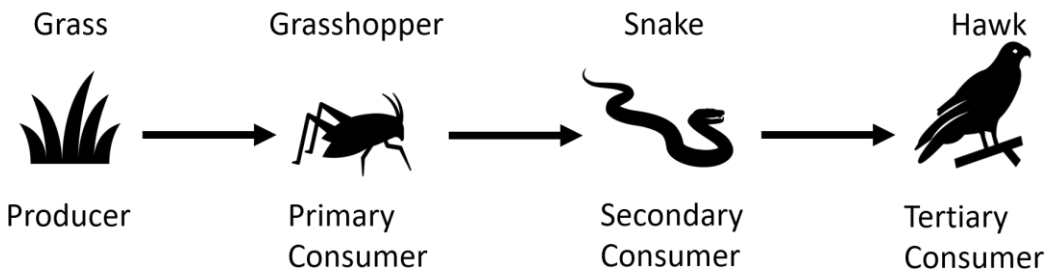
7. Draw a line of best fit using a ruler.

Time (min)	Distance (m/s)
5	1.1
10	2.1
15	3.3
20	4.2
25	5.2



Week 2 – Food Chains and Webs

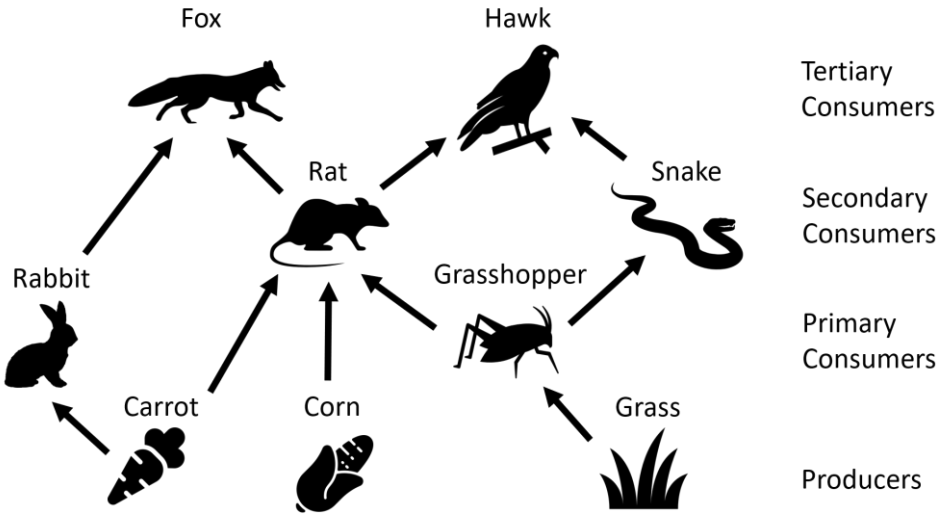
A **food chain** is a way of showing what eats what. For example, the diagram below shows that grasshoppers eat grass.



Below are some important definitions:

Producers	Organisms that make their own food through **photosynthesis**.
Primary consumer	Animal that eats the **producer**.
Secondary consumer	Animal that eats the **primary consumer**.
Tertiary consumer	Animal that eats the **secondary consumer**.
Herbivore	Animal that eats only plants.
Carnivore	Animal that eats other animals.
Omnivore	Animal that eats both plants and animals.
Predator	An organism that eats another organism.
Prey	The organism that a predator eats.

Usually, patterns of eating are more complicated than a simple food chain. A **food web** contains lots of food chains linked together.



Each part of a food chain/web is linked to others. For example, if all the carrots in the food web above died then there would be fewer rabbits (as they'd have less food to eat).

Q1. Describe what a producer is.

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Q2. Describe what a herbivore is.

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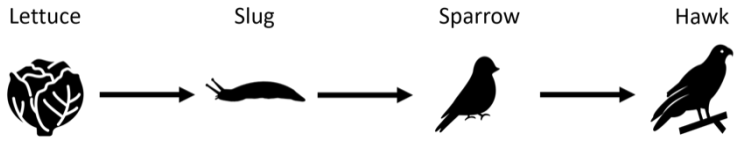

Use the food chain above to answer the following questions.

Q3. The producer is .....

Q4. The secondary consumer is .....

Q5. The prey of the hawk is .....

Q6. The predator of the slug is .....

Q7. State what would happen to the sparrow population if most of the slugs died.

.....

Q8. State what would happen to the lettuce population if most of the slugs died.

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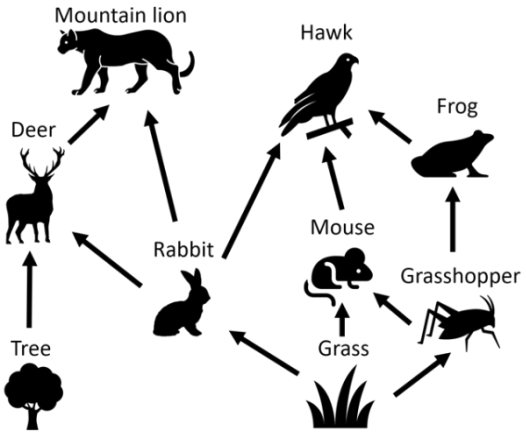

Use the food web above to answer the following questions.

Q9. Name a primary consumer.

.....

Q10. Name the predators of a rabbit.

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Q11. Name an omnivore.

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Q12. Name a carnivore.

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Week 3 – Relationships in an ecosystem

An **ecosystem** is a community of living and non-living things interacting with each other. Plants, animals and microorganisms depend on water, soil, climate and each other for survival. These interactions create a web of relationships that keep the ecosystem balanced and functioning.

In an ecosystem, all organisms are **interdependent**. This means they rely on each other to survive. For instance, plants need sunlight to make glucose through photosynthesis. Some animals depend on these plants for food, and predators rely on other animals as their food source. If one part of this chain is disturbed, it can impact the entire ecosystem.

One key example of interdependence is **pollination**. Many plants, including those that humans rely on for food, need insects like bees to pollinate them. Pollination is the process of transferring pollen from one flower to another, allowing the plant to produce seeds and fruit. Without pollinators, many plants would struggle to reproduce. This would affect the animals that rely on them for food.

Humans heavily depend on insect pollination for a lot of the food we eat, such as fruits, vegetables and nuts. Without pollinators, these crops would produce less food. This would lead to food shortages and higher prices. The health of ecosystems, therefore, has a direct impact on human food security.

However, the use of **insecticides** (chemicals designed to kill insects) can also harm beneficial insects like bees. When these chemicals reduce pollinator populations, it can lead to lower crop yields and disrupt the entire food chain. This reduction in pollinators can also decrease biodiversity, making ecosystems less resilient to other threats.

In addition to issues like insecticide use, ecosystems can also be disrupted by **invasive species**. An invasive species is a non-native organism introduced to an ecosystem, often causing harm. These species can outcompete native organisms for resources like food and habitat, disrupt food chains and reduce biodiversity.

For example, the introduction of grey squirrels to the UK from North America has led to a decline in the native red squirrel population. Grey squirrels compete with red squirrels for food and carry a disease that is deadly to red squirrels but not to themselves. This has significantly reduced red squirrel numbers and upset the balance of the local ecosystem.

Partonez, CC BY-SA 4.0, via Wikimedia Commons

Q1. The following statements are either true or false. State which are true and which are false.

a) Bees are an example of a pollinator.

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b) Invasive species are needed to keep ecosystems balanced.

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Q2. Describe why pollination is important for both plants and animals.

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Q3. Describe how the use of insecticides can affect an ecosystem.

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Q4. Describe what is meant by an ecosystem.

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Q5. Describe what is meant by an invasive species.

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Q6. State an example of an invasive species.

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Q7. Describe what is meant by interdependence in an ecosystem.

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Q8. Describe what might happen to the human food supply if pollinator populations decrease.

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Week 4 – Studying Ecosystems

When we study ecosystems, we often need to assess the number of different species in a specific area. It isn't possible to count every single one of an organism within a large area, so we instead carry out an estimate using **quadrats**.

A quadrat is a square frame, usually made of wood or metal, that is used to give a sample area within an ecosystem. The size of a quadrat can vary, but it's often 1m x 1m. The quadrats are placed randomly in an area they want to study and count the organisms within the frame. By doing this in multiple places within the area, we can estimate the population size.

To do this correctly, we should use the following method.

1. **Random Placement**. To avoid bias, the quadrat should be placed randomly in the area to be studied. This can be done by using a random number generator to determine coordinates within the area.
2. **Counting Organisms**. Once the quadrat is placed, all organisms within the frame are identified and counted.
3. **Repeating the Process**. The process is repeated multiple times in different parts of the area. A mean number of organisms can then be calculated per quadrat.
4. **Multiply mean by area**. The mean number of organisms per quadrat gives the number in each m^2. Multiplying this by the total area gives an estimate of the population size.

Example question

A field has an area of 10 000 m^2. Some students use quadrats of area 1 m^2 to estimate the number of daisies in the field. They find an average of 12 daisies per quadrat. Calculate an estimate for the total number of daisies in the field.

Step 1. Write down equation:

Total population = average number per quadrat × total area

Step 2. Insert variables into equation:

Total population = 12 × 10 000

Step 3. Calculate answer.

Total population = 120 000 daisies

By studying ecosystems, we can detect changes over time, such as a decline in a particular species or the impact of human activities like pollution or deforestation. This information can help us make decisions about how to protect and manage ecosystems.

Q1. The following statements are either true or false. State which are true and which are false.

a) To calculate the population of an organism within a large area, it's easiest to count them all.

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b) Quadrats usually have an area of 1 m^2.

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c) To calculate an estimate for the total population in an area, we can divide the average number per quadrat by the total area.

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Q2. A meadow has an area of 5000 m^2. Students use quadrats of 1 m^2 to estimate the number of clover plants in the meadow. They find an average of 20 clover plants per quadrat. Calculate an estimate for the total number of clover plants in the meadow.

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Q3. A field has an area of 2,500 m^2 and the average number of dandelions per m^2 quadrat is found to be 8. Calculate the estimated total number of dandelions in the field.

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Q4. After placing 15 quadrats in a 4,000 m^2 area, the average number of organisms counted per m^2 quadrat is 10. Calculate an estimate for the total population of the organisms in the area.

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Q5. Describe what a quadrat is and how it is used in studying ecosystems.

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Q6. Describe a reason why it's useful to assess ecosystem populations.

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Week 5 – Natural Selection

Natural selection is a process that explains how species change over time. In any group of organisms, there is always **variation**. Variation means that not all individuals are exactly the same. Some are taller, faster or stronger, while others might be smaller, slower or weaker. This variation is due to differences in their genes, which they inherit from their parents.

Because resources like food, water, and shelter are limited, not all individuals in a species can survive. This leads to **competition**. Organisms that have traits that give them an advantage in their environment are more likely to survive. The longer they survive, the more likely it is that they reproduce and pass on their genes. For example, in a population of rabbits, some might have thicker fur, which helps them survive in cold climates. Those with thicker fur are more likely to live longer, find mates and have offspring.

This idea, often summarised as "**survival of the fittest**", means that the individuals best suited to their environment are the ones most likely to survive. However, "fittest" doesn't necessarily mean the strongest or the fastest. It means the individuals whose traits are best matched to their environment.

For example, in a forest where the ground is covered with brown leaves, brown beetles might be less likely to be seen and eaten by predators than green beetles. As a result, the brown beetles are more likely to survive and reproduce, passing on their brown colour to their offspring. Over many generations, the population of beetles might become mostly brown.

Natural selection can lead to significant changes in a species over time. If a certain trait helps an organism survive, that trait becomes more common in the population. Over many generations, these changes can add up, leading to the development of new species.

Another example of natural selection is the giraffe. Giraffes are known for their long necks, which allow them to reach leaves high up in trees. Originally, giraffes had shorter necks, but in times of food scarcity, those with slightly longer necks were able to reach leaves that others couldn't. This gave them an advantage, as they were more likely to survive and reproduce. Over many generations, this led to the population of giraffes having longer and longer necks, which we see in giraffes today.

Q1. The following statements are either true or false. State which are true and which are false.

a) All individuals within the same species are exactly the same.

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b) Individuals that survive for longer are more likely to reproduce.

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Q2. Describe what is meant by “survival of the fittest”.

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Q3. Describe how variation within a species can lead to competition.

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Q4. Describe how giraffes evolved to have such long necks.

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Q5. Describe why brown beetles might survive longer in a forest compared to green beetles.

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Q6. In a population of birds, some have longer beaks and some have shorter beaks. The environment changes so that food is only available in deep crevices. State which birds are more likely to survive and explain why.

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Week 6 – Extinction

Extinction is the process where a species completely disappears from the Earth. This can happen when the environment changes in ways that make it difficult for certain species to survive. If a species can't adapt quickly enough to these changes, they may struggle to compete for resources like food and water. When this happens, fewer individuals survive to reproduce, and over time, the entire species can become extinct.

There are many ways the environment can change, leading to extinction. For example:

- **Climate change**. If the climate becomes too hot, too cold, too dry or too wet, some species might not be able to survive in the new conditions.
- **Habitat loss**. When forests are cut down or wetlands are drained, the animals and plants that lived there may have nowhere to go.
- **Pollution**. Chemicals released into the air, water and soil can harm or kill species that are sensitive to these pollutants.
- **Introduction of new species**. Sometimes, new species are introduced to an environment where they have no natural predators. These new species can outcompete native species for resources, leading to the extinction of the native species.

Biodiversity refers to the variety of all living things on Earth, including plants, animals and microorganisms. High biodiversity means that there are many different species living in an ecosystem. Maintaining biodiversity is important for several reasons:

- **Ecosystem stability**. Different species often depend on each other. If one species goes extinct, it can affect many other species in the ecosystem.
- **Resources**. Many of the resources we rely on, such as food, medicine and clean water, come from biodiversity. Losing species can reduce the availability of these resources.
- **Resilience to change**. Ecosystems with high biodiversity are often more resilient to changes, such as climate change, because they have more species that can fill different roles if some species are lost.

One way to help prevent the loss of species and maintain biodiversity is by using **gene banks**. Gene banks are places where genetic material (like seeds, sperm, eggs or embryos) is stored. This genetic material can be used to help protect endangered species or bring back species that have become extinct. Gene banks are important for several reasons:

- **Preservation and research**. By storing genetic material, scientists can preserve and study the genetic material in gene banks to learn more about how to protect endangered species.
- **Restoration**. In some cases, gene banks can be used to reintroduce species into the wild by breeding new individuals from the stored genetic material.

Q1. The following statements are either true or false. State which are true and which are false.

a) Ecosystems with a high biodiversity are often less resistant to change.

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b) If one species in an ecosystem goes extinct, it won't affect any other species.

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c) One way to help prevent extinction is to use gene banks.

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Q2. State four ways the environment can change, leading to extinction.

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Q3. Describe what is meant by biodiversity.

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Q4. Describe why maintaining biodiversity is important.

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Q5. Describe what a gene bank is.

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Q6. Explain how gene banks help in preserving species.

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Q7. Explain how habitat loss can lead to extinction.

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