

Checkpoint Science Scheme of Work

Biology – Year 1

Topic: Characteristics of living things

Aims

That pupils should be able to:

- Identify seven characteristics of living things
- Apply these to a wide range of different organisms

Links

Checkpoint curriculum – Bc 1

IGCSE Syllabus – Section I. 1, IGCSE Co-ordinated Science B1, IGCSE Combined Science Biology Topic one

Words

organism, feed, nutrition, movement, excretion, growth, reproduction, be sensitive

Activities

Objectives	Possible Activities	Health and safety/notes
Students should be able to: distinguish between living and non-living things.	Students can compare the characteristics of living things with e.g. a brick, a car, a computer. They should also compare living with non-living e.g. blocks of wood and stone	
state the similarities between a variety of animals.	Students compare different animals, real (if appropriate) or pictures, e.g. bird, cat, fish and write down all the things they have in common.	Achieve a list of things in common, they eat, breathe, move, get rid of waste, grow, sense, have young.
extend the similarities to plants.	Students should try to link the above points with plants such as investigating 'movement' in the direction of the sun.	When discussing feeding it must be clear that while plants take nutrients from the soil they make their own food. Introduce the term 'organism'.
Extend their ideas about eating	Students can discuss the food they eat and what its origins are. Compare the ways food is taken in by other living things.	Replace "eating" with "feeding" - different ways of taking in food. Introduce the term "nutrition".
extend their ideas about breathing and recognise the difference between "breathing" and "respiration"	Students can measure their breathing rate before and after exercise	The mechanism of breathing is not required. Relate this to "respiration".

extend their ideas about moving and sensing	Students can discuss why these activities are essential for survival (finding homes, avoiding danger, finding food).	
	Mention internal movement in various organs. Functions of skin, eye, ear, tongue, and nose can be demonstrated through a display of e.g. textured materials, optical illusions, some musical instruments, distinguishing crisp flavours, trying some kitchen odours.	This can help when explaining movement in plants.
extend their ideas about how animals grow and have young.	Through photographs, students can discover the changes that take place as humans/animals age, and relate growth and tissue replacement to nutrition. They can compare the replacement of older members of a group of animals with young in e.g. frogs or elephants	Introduce the word 'reproduction'
extend their ideas about expelling waste	Breathing into lime-water indicates carbon dioxide. Breathing on to a cold surface indicates water vapour.	Students should appreciate that 'excretion' removes poisonous substances from the body through the lungs, urine and the sweat glands.
recognise the seven characteristics of living things as movement, respiration, sensitivity (irritability), growth, reproduction, excretion and nutrition.		

Resources

www.enchantedlearning.com

Topic: Major Organ Systems

Aims

That pupils should be able to:

- recognise the positions and know the functions of the major organs of flowering plants
- recognise the positions and know the functions of the major organ systems of the human body.

Links

Checkpoint curriculum – Bp 1, Bh 1
IGCSE Biology Section

Words

Organ, function, organ system, digestion, nerve, circulation

Activities

Objectives Students should be able to:	Possible Activities	Health and safety/notes
identify some plant organs and consider their functions	Label a drawing of a complete flowering plant (common or easily reproduced). To ensure accurate labelling, students can be given a drawing and labels to stick on. Look at as many examples as possible.	Some plants may not be taken from the wild. Students should describe and know the function of flower, leaf, stem, root, bud.
state the position of the major organs in the human body.	Each group can draw (or be given) an outline of a body and try to draw on it the organs listed. Provide individuals with a page sized body outline and organs to cut out and stick on with guidance.	brain, stomach, lungs, liver, heart, kidneys
group organs into systems e.g. the circulatory system.	Students can measure pulse rate (wrist and/or neck) before and after exercise and relate it to increased heartbeat with which they will be familiar.	
describe the respiratory system and its function.	Lungs from a suitable source can show the spongy texture and branched tubes. The volume of air which a pupil can exhale can be measured. Include a diagram showing the relative positions of lungs, windpipe and heart.	Staff should follow correct procedure; students should not touch the sample. New mouthpieces for anyone blowing into equipment.
describe the nervous system and its function.	A short circus of investigations shows the limitations of some organs of the nervous system. 1. skin sensitivity with prods and a blindfold	These are instructive and fun to do but the conclusions are not to be learned. Do not use sharp points.

	<p>2. colour charts / distinguishing parallel lines at a distance</p> <p>3. find out where sweetness is tasted on your tongue</p> <p>4. find the direction of a quiet sound</p> <p>5. find the weakest solution of vinegar you can detect with your nose</p>	<p>Hand out very small/broken sweets with a clean spoon.</p> <p>This needs a blindfold and coins for chinking and a quiet place to work in.</p> <p>Include water as control.</p>
Describe the digestive system and its function.	<p>A body model can be used to show the arrangement of the organs listed.</p> <p>An idea of time scale for the passage of food should be given together with a brief outline of the processes in the mouth and stomach</p>	<p>mouth, gullet, stomach, small intestine, large intestine can be introduced here or left until 'digestion' unit.</p>
Identify organs which excrete waste products	<p>Sweating can be demonstrated using dry blue cobalt chloride paper.</p> <p>Students can compare daily water input and output figures.</p>	

Resources

www.middleschoolscience.com

Topic: Cells

Aims

That pupils should be able to:

- compare and contrast animal and plant cells
- describe the organisation of cells into tissues and organs
- use a microscope to see cells

Links

Checkpoint curriculum – Bc 2

IGCSE Biology Section II 1, 2, IGCSE Co-ordinated Science B 2, IGCSE Combined Science Biology Topic One

Words

microscope, magnification, cell, tissue, nucleus, cytoplasm, cell membrane, cell wall, vacuole, chloroplast

Activities

Objectives Students should be able to:	Possible Activities	Health and safety/notes
Use microscopes correctly	Time spent on a demonstration will avoid frustration and possible damage to microscopes. Show how to prepare and focus a good specimen without being misled by air bubbles or dust on the cover slip. Using graph paper will help to illustrate the magnification. Newsprint will show inversion. Any available prepared slides could be used to practice focussing and then try to guess what it is e.g. hair, insect wing, cross-section of plant stem.	A diagram can help in learning the important names, objective lens, eyepiece lens, focus control, slide, cover slip.
Explain simply the structure of animal cells.	Traditionally students have been able to use their own cheek cells to prepare slides. If regulations do not permit this, other appropriate animal cells may be used such as liver. Magnification can be found from the lenses and hence the size of the cell.	Note that there are likely to be regulations covering the use of any animal material for slide preparation. Observe nucleus, cytoplasm, cell membrane.
Explain simply the structure of plant cells.	Students should observe a plant cell, the thin skin from between the fleshy layers of an onion is ideal. Time will be needed for preparation of the slide, a second one stained with e.g. iodine or methylene blue, will help to show the value of this technique.	Observe cell wall, vacuole and nucleus if stained.

Observe chloroplasts	Students should investigate the green part of a plant, thin leaves from pond weed can be used to see cells. Ask what can be seen here which was not visible in an animal or onion cell.	Observe chloroplasts.
Appreciate the three dimensional nature of the cell.	Students can make model cells, both plant and animal, using assorted materials to represent parts of the structure.	
Understand that cells vary according to their function.	Through prepared slides, diagrams or photographs, students should observe some other cells and discuss how their structure aids their function. Functions need only be dealt with very simply at this stage	Red and white blood cells, nerve cells, root hair cells, leaf (palisade) cells.
Understand that groups of cells form tissues, groups of tissues form organs and groups of organs form organ systems.	This work can be related to unit 'organ systems'.	
Know that some living organisms are unicellular	Students should observe microbes, if a high powered microscope is available, such as yeast. At the same time some can be grown, in suitable conditions, producing carbon dioxide. Review the characteristics of living things and relate to yeast. Discuss the dangers of allowing bacteria to multiply in the same way as yeast.	This for interest and not essential for the syllabus.

Resources

<http://www.eduref.org>

Topic: Classification and variation

Aims

That pupils should be able to:

- be able to classify animals and plants into major groups
- observe variation within species
- understand variation between species

Links

Checkpoint curriculum – Bv 1, Bv 2, Bv 3

IGCSE Biology Syllabus I 2, IGCSE Co-ordinated Science B 1, IGCSE Combined Science Biology Topic Four

Words

species, vertebrates, invertebrates, microbes, fungi, bacteria, arthropods

Activities

Objectives Students should be able to:	Possible Activities	Health and safety/notes
understand that some living things are too small for us to see.	Students can observe and try to draw small organisms such as bread mould.	Microbes should not be grown without reference to safety regulations. Pupils who have not used a microscope before should be taught correct use.
understand that living things can be divided into major groups.	Students can compare the major divisions into plants (food producers), animals (food consumers) and other living things including microbes. A branched diagram can be used to introduce very simple keys.	The last group can be further divided into fungi and bacteria. <div style="text-align: center; margin: 10px 0;"> <pre> graph TD LT[Living things] --- H[] H --- P[Plants] H --- A[Animals] H --- O[other living things] </pre> </div>
sort animals into groups.	Working on a poster of, e.g. 20, varied animals, students can find a number of different ways of putting them into groups. They can discuss which way is the most useful, for instance, where they live, what type of food they eat, number of legs, etc.	Show that overlapping criteria (diet), or characteristics showing continuous variation (height), do not produce such well-defined groups as items which can be counted.

<p>identify classes of vertebrates.</p>	<p>In groups, students should pool their knowledge to try to complete a table of characteristics to distinguish the five classes and decide which need a closer look e.g. fish/shark/whale/dolphin.</p>	<p>Explain the term vertebrate first and provide a framework for the table for guidance.</p> <table border="1" data-bbox="1444 284 2042 480"> <thead> <tr> <th>Class</th> <th>Body Cover</th> <th>Limbs</th> <th>Young</th> </tr> </thead> <tbody> <tr> <td>Fish</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Birds</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Reptiles</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Amphibians</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mammals</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Class	Body Cover	Limbs	Young	Fish				Birds				Reptiles				Amphibians				Mammals			
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<p>identify groups of invertebrates.</p>	<p>These are less well known to students so they should investigate, using diagrams if necessary, a wide range and be able to identify those listed in notes opposite. Invertebrates such as earthworms wood lice etc can be studied, observing their responses to light, warmth, odour etc.</p>	<p>Jellyfish, flatworms, true worms (annelids), molluscs, echinoderms and arthropods. Note-The amount of detail taught is left to the individual centre. The only group tested at Checkpoint is 'arthropods'. Care must be taken that all animals are returned unharmed to their habitat.</p>																								
<p>identify arthropods as a group and divide this group into its classes.</p>	<p>Students should examine as many specimens as possible noting their similarities (exoskeleton and jointed legs) and differences (number of legs and presence of wings) .</p>	<p>Four groups of arthropods; crustaceans, spiders, insects and myriapods</p>																								
<p>Describe what is meant by a species.</p>	<p>Students could find out or be given information about a species which has or could become extinct and discuss the reasons. E.g. dinosaur, tiger</p>	<p>Where a species cannot change to respond to a change in the environment it dies out because interbreeding is not possible between species.</p>																								
<p>Describe examples of variation within species.</p>	<p>Students can study a single species of bean, flower, moth etc and discover variation between members. They might suggest advantages / disadvantages of these. They can measure variation in humans by measuring a quantity such as hand span, tongue rolling, height. Represent the results graphically.</p>																									

Topic: Habitats

Aims

That pupils should be able to:

- describe how organisms are adapted to their habitats
- be able to write simple food chains

Links

Checkpoint curriculum – Be 1, Be 2,
IGCSE Biology Section I 2, IGCSE Co-ordinated Science B 16, IGCSE Combined Science Biology Topic Five

Words

habitat, adaptation, predator, prey, producer, consumer

Activities

Objectives Students should be able to:	Possible Activities	Health and safety/notes
explain how organisms are adapted for day and night.	In groups, students should consider which animals are active in daytime and which in night-time and study their adaptations. Reasons are based on survival; food, water, shelter, protection from predation.	Examples will be depend on regions but should include a variety from the animal kingdom, frogs, lizards, owls, bats. Also include some plants, flowers opening in the day time.
explain how organisms are adapted for seasonal change.	Students compare photographs/pictures of animals and plants at different seasons and discuss how they survive e.g. hot/rainy season, summer/winter season and why particular measures have to be taken in extreme temperatures.	Examples may include hibernation, migration, coat colour change in animals. Deciduous trees, flowering times etc in plants.
explain what is meant by a habitat	Students should study and describe/draw a local small habitat such as a hedge, a tree, a pond etc. They try to identify as many living things there as possible and group them into green plants or fungi, herbivores or carnivores.	Make pictures available for identifying organisms. A comparison of town and country habitats e.g. for mice, could extend this investigation.
describe how organisms are adapted within their habitat.	Adaptations of plants and animals in more extreme habitats such as desert, mountain, arctic, underwater, etc should be examined	Physical differences, for plants; roots, leaves, for animals; skin, limbs, sense organs etc. Students will meet only a small variety but should

	through pictures or by fieldwork where practicable.	be able to suggest how a given adaptation helps an organism to survive.
draw a simple food chain.	Students can draw, or cut out supplied, shapes of plants and animal which can form three item food chains and hang them up so that the producer is the lowest item. Lots of pictures are available on web sites.	Emphasise that food is used for growth and energy so the direction of the passage of energy goes from producer to primary consumer to secondary consumer.