



<p>Fusion 1: B1.1 – Cells, Tissues and Organs</p> <p>National Curriculum Link up • 2.1a, b, c. 3.3a.</p> <p>Electronic resources: Learning objectives, Practical worksheets, Starter activity - Organs and their functions, Interactive Drag and drop connector - Organs and their jobs</p>		
<p>Learning Objectives Pupils should learn: Where our major body organs are and what they do. To describe ways in which microbes can be harmful and helpful. To use a magnifying glass.</p>	<p>Teaching / Learning activities Lesson structure Starter -Let's get organised. Give the pupils a set of cards which contains the names of some organs and their functions. Get the pupils to sort out the organ cards and place them to one side. Pupils are then to match the organs with function cards. Have a set of blank cards available for pupils to complete themselves as extensions. (5–10 mins) Main Count-out magnifying glasses, one between two. Ask the pupils to use them to examine skin on fingertips, fabric on uniforms and other objects around the room. Ask if they can see any microbes. Warn about looking at the Sun or light sources through magnifying glasses. Remind them of the character 'Sid' in the film <i>Toy Story</i> and what he did to Woody's forehead with a magnifying glass. Plenary - Small is beautiful. Describe in as much detail as possible one view through your magnifying glass. Use poetic language and imagination to encourage others to see the world a different way. Read out a number of examples from the group. (5–10 mins)</p>	<p>Teaching suggestions • Functional skills link-up. English Write clearly and coherently including an appropriate level of detail. (Level 1)</p>
<p>Learning Outcomes <i>All pupils should be able to</i> locate the major organs on a diagram, know that microbes can help or harm us. <i>Most pupils should be able to</i> locate the major organs, describe their functions, state some of the uses and hazards of microbes and use a magnifying glass. <i>Some pupils should also be able to</i> do the above with increased depth and detail. How Science Works Describe and record observations and evidence systematically. (1.2d)</p>		<p>Additional teachers notes Equipment and materials required Magnifying glasses. Frensel lenses of the type used in car or bus back windows can also be useful here. Safety Ensure that the pupils do not look at light sources or focus sunlight on inappropriate objects</p>



<p>Fusion 1: B1.2 – Using a Microscope</p> <p>National Curriculum Link up</p> <p>• 2.1c. 3.3a.</p> <p>Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop connector – Parts of a microscope, Simulation – The Microscope</p>		
<p>Learning Objectives Pupils should learn: How to focus a microscope. To calculate by how much a microscope magnifies. To record what they see through a microscope.</p>	<p>Teaching / Learning activities Lesson structure Starter - Cells sentences. Pupils should write down a sentence which contains the word ‘cells’. They then discuss their sentences, drawing out the common meanings of the word and separate this from the scientific meaning. (5 mins) Main Show the pupils a microscope. If possible use a Flexicam and digital projector to display details. Name each part in turn, explaining the name and giving ways of remembering them; e.g. the eyepiece is the piece next to the eye. Use a PowerPoint sequence to describe the safe use of the microscope in terms of focussing up to an object after looking from the side, and adjusting the height of the objective lens to just above the specimen. Check by questioning. Pupils are to fill in a worksheet to label the parts of the microscope and match the parts with their descriptions on a paired sheet. Explain the magnification system in terms of eyepiece power × objective power. Carry out a simple exercise on the board or on a PowerPoint to reinforce this. Plenary - Drag and drop labels. Pupils are to drag and drop the correct labels onto the correct places on a projected microscope diagram. To add competition the exercise can be timed. (5–10 mins)</p>	<p>Teaching suggestions</p> <ul style="list-style-type: none"> • Special needs. A series of ‘Can you tell what it is yet?’ cards showing small details of larger objects could be made. Alternatively, a sheet with a small round hole in it could be placed over a series of photographs and the pupils have to work out what it is by looking at a small part. This could be geared to the ability of the pupils by changing the nature of the photograph. • Extension. Pupils should be given an opportunity to look at the range of miniature sculptures made from grains of rice and sugar recently sold for £11.2 million, by the sculptor Willard Wigan, as reported by the BBC on 11 May 2007. A report could be drawn up of how he made his sculptures. • Learning styles. <i>Visual:</i> Looking at microscope slides and projected images. <i>Kinaesthetic:</i> Interacting with microscope and specimens. <i>Interpersonal:</i> Working as part of a group to set up slides for observation. • Functional skills link-up – mathematics. Use simple formulae expressed in words for one or two-step operations (level 1).
<p>Learning Outcomes <i>All pupils should be able to use a microscope effectively and safely and label some parts.</i> <i>Most pupils should be able to perform simple calculations regarding magnification.</i> <i>Some pupils should also be able to link the structure of microscopes with that of early models.</i></p> <p>How Science Works Describe and record observations and evidence systematically. (1.2d)</p>	<p>Additional teachers notes Pupils are to use microscopes to examine a wide range of common objects such as salt crystals and hair. If available, have a number of prepared slides of interesting specimens to look at such as fly’s wings, insect mouthparts, bees’ legs and stings. If time allows, pupils may make diagrams of what they see and state the magnification. During the practical, circulate and ensure that all pupils are able to focus their microscopes. Many pupils have difficulty in using a microscope for the first time. Try getting them to look with both eyes open and focus their slide yourself, ask them to look at it and then defocus it either down or up and ask them to put it back into focus. Tell the pupils not to put fingers on lenses.</p> <p>Safety Demonstrate safe handling using body and base.</p>	



<p>Fusion 1: B1.3 – Looking at Animals Cells</p> <p>National Curriculum Link up</p> <ul style="list-style-type: none"> • 3.3a. <p>Electronic resources: Learning objectives, Practical worksheets, Plenary activity – Animal Cells, Homework activity – All about animal cells</p>		
<p>Learning Objectives Pupils should learn: The parts of an animal cell we can see through a microscope. The jobs of the parts of an animal cell.</p>	<p>Teaching / Learning activities Lesson structure Starter - Cell parts functions. Show the class a small piece of paper and tell them you have a set of plans on how to build a new organism. Roll it up and place it inside a plastic film container, then place inside an un-inflated wide necked balloon. Using a funnel, partially fill the balloon with gooey liquid and tie off the top. Tell the class that the liquid contains the substances needed for life. Ask them to write down what each bit does – the plans, the container, the life sustaining goo and the balloon. (10–15 mins) Main Demonstrate how to make the slides. Each pupil should have half a cotton bud. They should be instructed to wipe the inside of their mouth, then wipe the bud onto the slide, then immediately place the bud into a beaker of disinfectant. The slides should be placed in a beaker of disinfectant on completion of the practical. Students should record their observations as a labelled diagram including the magnification of the microscope. Plenary - Pin the label on the cell Fill in a worksheet relating parts to functions. Many may be able to copy and complete the table in Summary question 1. Blindfold a pupil and, with a helper to stop them from bumping into things, play a game of ‘Pin the label on the cell’ using key word cards and a big drawing on the board. (10–15 mins)</p>	<p>Teaching suggestions</p> <ul style="list-style-type: none"> • Special needs. Play snap using cards with arrowed diagrams of the parts of animal cells, descriptions of their functions and their names. • Extension. Provide computer access and ask the pupils to find out more about the structure of the cell membrane, the cytoplasm and the contents of the nucleus, linking this to function. • Learning styles <i>Visual:</i> Observing cells. <i>Auditory:</i> Discussing the features. <i>Kinaesthetic:</i> Carrying out the practical. <i>Interpersonal:</i> Group involvement in setting up the practical. <i>Intrapersonal:</i> Contemplating the large number of cells we are made up of.
<p>Learning Outcomes <i>All pupils will be able to</i> examine cheek cells and with help label an animal cell. <i>Most pupils will be able to</i> label an animal cell and describe the functions of the parts and state which parts are only in animal cells. <i>Some pupils will also be able to</i> draw links between the structures of cell organelles and their functions. How Science Works Describe and record observations and evidence.</p>	<p>Additional teachers notes Equipment and materials required Cotton buds (cut in half), microscope slides, cover slips, seeker (or pencil), small pots of disinfectant (sodium chlorate(I)), microscopes, dilute methylene blue, digital microscope and Flexicam (if available). Safety Eye protection should be worn at all times. According to your local authority guidelines, you may wish the pupils to wear disposable gloves. Take care with dilute methylene blue as it will permanently stain skin and eye tissues. Follow CLEAPSS guidance in handbook/CD-ROM section 14.4.2. Sodium chlorate(I): CLEAPSS Hazcard 89, Recipe card 62, handbook/CD-ROM 15.12.3. Dilute methylene blue: CLEAPSS Hazcard 32.</p>	



<p>Fusion 1: B1.4 – Looking at Plant Cells</p> <p>National Curriculum Link up</p> <ul style="list-style-type: none"> • 3.3a. <p>Electronic resources: Learning objectives, Practical worksheets, Plenary activity – Plant Cells, Video – Leaf and plant cell structure</p>		
<p>Learning Objectives Pupils should learn: The parts of a plant cell they can see through a microscope. How to make a slide of a plant cell. The differences between animal and plant cells.</p>	<p>Teaching / Learning activities Lesson structure Starter - Boneless Bertie Bring in an herbaceous (non-woody) plant such as a geranium, about 20cm high. Hold it next to a pupil's upright arm. Ask the pupils to discuss what would happen if you took all of the bones out of the volunteer's forearm. Share ideas from around the class in a discussion. (10–15 mins) Main Demonstrate each of the stages in preparing an onion epidermal cell slide, asking pupils to recap each stage to check and to reinforce learning. Cut a section of onion about 1 cm square. Using forceps, remove and place the section of epidermis onto a small drop of water in the centre of a microscope slide. Add a drop of iodine and cover with a cover slip. Mount the slide on the stage of a microscope and reinforce the correct method for focussing. Pupils should draw a half A4 size plain paper drawing of what they see. At the end of the practical, through questioning check that pupils have seen each of the features and can identify them. Plenary - What a flop! Show a wilted plant and ask pairs of pupils to discuss and explain why this happens. Have a list of key words on the board for them to tick off in their answers. Carry out a class discussion of their answers to finish. (5–10 mins)</p>	<p>Teaching suggestions</p> <ul style="list-style-type: none"> • Special needs. Physical assistance may be needed for the practical. Give the pupils laminated large A4 diagrams with sets of labels of each part to place on repeatedly for reinforcement. • Extension. Get the pupils to draw out a list of job descriptions for each of the plant parts. Make them humorous and inventive and as detailed as possible. They could also dehydrate some red onion in salt solution to show plasmolysis. • Learning styles <i>Visual:</i> Looking at plant cells. <i>Auditory:</i> Listening to exposition and discussing with peers. <i>Kinaesthetic:</i> Making the slide. <i>Interpersonal:</i> Working as part of a group. <i>Intrapersonal:</i> Developing confidence in use of microscopes. • Homework. Show the pupils some model cells or photographs of them. Ask them to make one for display.
<p>Learning Outcomes <i>All pupils will be able to set up a slide and with help label a plant cell.</i> <i>Most pupils will be able to set up a slide well, label a plant cell and describe the functions of the parts.</i> <i>Some pupils will also be able to draw links between the structures of the cell organelles and their functions.</i> How Science Works Describe and record observations and evidence systematically. (1.2d)</p>	<p>Additional teachers notes Equipment and materials required Class set of scalpels, white tiles, forceps, slides, cover slips, seekers or mounted needles, iodine solution, pipettes, paper towels, onion, beakers of water. Support Have beakers of water set up around the room for disposal of the slides and bins for the onion debris at the end of the lesson. One of the major difficulties is that the pupils get the layer of epidermis folded over on itself. Use a seeker to disentangle layers while holding one end down with forceps. Again enable the pupils to identify air bubbles. Safety Take care that pupils wear eye protection while handling iodine and show caution when handling the fragile glass cover slips and scalpels.</p>	



<p>Fusion 1: B1.5 – Special Cells</p> <p>National Curriculum Link up</p> <ul style="list-style-type: none"> • 3.3a. <p>Electronic resources: Learning objectives, Practical worksheets, Extension activity – Stem cells, Homework activity – Specialised cells, Video – Types of animal cells and their functions, PowerPoint – Animal and plant cells</p>		
<p>Learning Objectives Pupils should learn: That different cells have different functions. How the structure of the specialised cells relates to their function.</p>	<p>Teaching / Learning activities Lesson structure Starter - Footwear features Pupils are given one minute in pairs to write down as many types of footwear as they can. Get a list from the pupils by questioning, choose suitable examples to write on the board. Get the pupils to write down a feature of each type of footwear that suits it for its purpose. Use the vocabulary to be used later regarding cells (characteristic, adaptation, specialised). (10–15 mins) Main Talk through PowerPoint slides of each specialised cell, showing it first then asking the pupils to guess, comment and describe the function and adaptations of each cell. Specialised cells to be covered: root hair cell, palisade cell, sperm cell, nerve cell, red blood cell and lung epithelial cell. Introduce the practical and tell the pupils which features to look out for on each slide or specimen. The specimens and slides can be arranged in a circle of previously focused microscopes and the pupils can circulate around them. Alternatively the specimens and slides can be placed at convenient points around the lab for collection and return. Plenary - Floor dominoes Play a game of floor dominoes using A4 sheets with pictures of the specialised cells on one end and descriptions of their adaptations on the other end. A playing card size version might also be of use. (10–15 mins)</p>	<p>Teaching suggestions</p> <ul style="list-style-type: none"> • Special needs. Draw out some specialised cell pictures with their names beside them. Place them into a cardboard frame with five flip-up sections on one end, covering the name of the cell type. Pupils get six points for getting the name right without lifting any of the flaps and lose one point for each section they have to flip up to reveal part of the name. They could also make a model of a specialised cell using for example, Plasticine. • Extension. Provide the pupils with Internet access and point them at suitable interactive websites so as to carry out their own research on specialised cells and test themselves. • Learning styles <i>Visual:</i> Observing slides and PowerPoint. <i>Auditory:</i> Listening to exposition. <i>Kinaesthetic:</i> Playing the floor dominoes plenary game. <i>Intrapersonal:</i> Considering the very small size, very great number and complexity of the cells of the body.
<p>Learning Outcomes <i>All pupils will be able to</i> describe at least one specialised animal cell and one specialised plant cell. <i>Most pupils will be able to</i> describe a range of specialised cells and relate their structure to function. <i>Some pupils will also be able to</i> describe a wide range of specialised cells and in detail relate their structure to function</p>	<p>Additional teachers notes Using microscopes, specimens and prepared slides examine root hair cells. Specimens could include root hairs (these look particularly good if binocular microscopes are available), nettle stinging cells (warn regarding abuse of these). Commercial slides could include sperm, eggs, nerve cells (giant axons are good), leaf palisade cells, red blood cells. Diagrams may be drawn if time allows but are not essential. Support Set up cress to germinate in small Petri dishes with damp cotton wool in the bottom several days before the practical so as to give them time to develop root hairs. Cover them with cling film to keep the moisture in. Do not touch the root hairs or they will be damaged. If slides are not available the Internet has suitable images.</p>	



Fusion 1: B1.6 – Cells, Tissues, Organs and Systems		
National Curriculum Link up • 3.3a.		
Electronic resources: Learning objectives, Practical worksheets, Extension – Cells, tissues and organ systems		
Learning Objectives Pupils should learn: What tissues are and be able to name some. How tissues group together to form organs. What is meant by an organ system.	Teaching / Learning activities Lesson structure Starter - What do we need tree Draw the word 'live' in the top centre of the board. Below it draw a series of lines coming down from the centre and ask the pupils what we need to live. Write down their suggestions as the next layer down, pick one and do the same again. Encourage pupils to draw out their own version. (5–10 mins) Main Show the pupils a PowerPoint slide of the various levels of organisation within the human body. Starting from cells of the same type working together forming a tissue, progress to various tissues working together to make something happen in an organ and finally describe how a number of organs work together in an organ system. While talking about organs you may hand around some organ donor cards. For further discussion opportunities describe to the pupils the spoof reality TV show that was carried out by the makers of <i>Big Brother</i> , where a dying woman was supposed to choose from between several would-be recipients who would get her kidneys and therefore survive. Plenary - Hierarchy voting Describe examples of cells, organs, tissues or systems. Pupils have to vote for which classification they belong to. Share class views and correct any misconceptions. (5–10 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Felt tabards can be bought which come with sets of fabric organs. These attach by means of Velcro and provide an enjoyable physical interactive learning experience. They are referred to as 'inside-out organs tunics'. • Extension. Provide the pupils with computer and Internet access and allow them to look for websites which display appropriate information about organs. • Learning styles. <i>Visual:</i> Observing the PowerPoint slide show of the hierarchical arrangement. <i>Auditory:</i> Discussing words involved in the starter activity. <i>Interpersonal:</i> Discussing the hierarchy with others in the group. <i>Intrapersonal:</i> Identifying the positions of organs within their own body.
Learning Outcomes <i>All pupils will be able to name some tissues, some organs and some systems.</i> <i>Most pupils will be able to put cells, tissues, organs and systems into hierarchical order.</i> <i>Some pupils will also be able to give detailed ways of how to distinguish between layers of the hierarchy and give details of system functions.</i>	Additional teachers notes If time allows it would be stimulating to show the pupils examples of some organs. It may not be appropriate to do dissection at this stage, but to bring in some fresh organs from a butcher would be beneficial. If you ask at a butchers shop for a fresh lamb's pluck, they may be able to get in a heart and lungs still joined. Find out on which day the animal is slaughtered and use the same day if possible. Allowing the pupils to touch the organs adds zest, but can only be used if local authority and school health and safety allow. It would also be good to show pupils examples of plant organs. Safety Risk assess and carry out hygienically, being careful with disposal. See information in CLEAPSS handbook/CD-ROM section 14.7.2. Pupils should wash their hands with soap after touching the organs.	



Fusion 1: B1.7 – The Skeleton National Curriculum Link up • 3.3a.		
Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop connector – The skeleton		
Learning Objectives Pupils should learn: The four functions of the skeleton. What makes bones strong.	Teaching / Learning activities Lesson structure Starter -Bone thief disease Ask pupils to write a short piece from a horror story where the touch of an infected person spreads an unknown and deadly disease dissolving your bones as it goes. Volunteers are to read their stories. (10–15 mins) Main - To show support, get the pupils to put their hands up in the air and imagine what would happen if their bones disappeared. Show the pupils a bone and ask what you need for strong healthy bones. Discuss what is in milk that helps make healthy bones (protein and calcium). Ask if anyone has been sick recently. Ask what it tasted like. Draw out that stomachs contain acid. Ask if anyone has seen a dog eating bones. Draw out that although dogs eat bones their excreta don't contain bones. Draw out that the bones must be broken down by acid in the stomach. Show pictures of a child with rickets. Explain that it is caused by lack of vitamin D which helps your body to absorb calcium. Plenary - Skeleton diagram Provide the pupils with a skeleton diagram to colour code the areas that are used for each function. (5–10 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Make an A3 or larger size skeleton diagram with predetermined colour codes for functions and a key. Cut the bones into several major sections and put Velcro tabs at the correct places to join it back together. Pupils should assemble the skeleton and state which function different parts have as they are pointed to. Alternatively assemble a digital skeleton from a suitable Internet site. • Extension. Repeat the rod strength test practical with tubes of various diameters and work out a formula to relate diameter to strength. Higher attaining groups may weigh the bones before and after immersion and burning. They could calculate percentage weight loss. • Learning styles <i>Visual:</i> Observing demonstrations. <i>Auditory:</i> Listening to discussions. <i>Kinaesthetic:</i> Carrying out the practical. <i>Interpersonal:</i> Group work for the practical. <i>Intrapersonal:</i> Imagining a boneless body.
Learning Outcomes <i>All pupils will be able to name the four functions of bones and that they contain calcium.</i> <i>Most pupils will be able to name the four functions of bones and link this to protein and calcium content, including the importance of vitamin D and know that hollow shapes are strongest.</i> <i>Some pupils will also be able to relate the diameter of a rod to strength for a given amount of material.</i> How Science Works Describe an appropriate approach to answer a scientific question using a limited range of information and making relevant observations. (1.2a)	Additional teachers notes Investigating bone: removing the calcium salts Equipment and materials required For each group: 250 ml beaker, a small piece of bone such as sections of ribs (to fit beaker), a bottle of dilute (1 mol/dm ³) hydrochloric acid, labels, forceps or tongs, paper towels, seeker. Optional: electronic balance. Safety 1 mol/dm ³ hydrochloric acid is an irritant: CLEAPSS Hazcard 47A. Investigating bone: removing the protein Equipment and materials required Crucible with lid, pipe-clay triangle, tongs, Bunsen burner, small piece of bone, forceps, paper towels, seeker.	



Fusion 1: B1.8 – Joints and Muscles		
National Curriculum Link up • 3.3a.		
Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop – Joints and muscles		
Learning Objectives Pupils should learn: How our skeletons move. How our joints work.	Teaching / Learning activities Lesson structure Starter - Joint names Show the pupils a model skeleton and question them about the names of the joints. Get a series of volunteers to show the rest of the class how each joint moves. (5–10 mins) Main - Get a volunteer to roll up their shirt sleeves and raise and lower a small weight. Impersonate an angry person shouting ‘Don’t antagonise me!’ Introduce the concept of an antagonistic pair as working against each other, one contracting as the other relaxes. Show an animation of an antagonistic pair of muscles in action. If available, use a model to reinforce this. Identify where other antagonistic pairs are. Discuss the parts and function of cartilage, ligaments and synovial fluid. You may wish to illustrate this by dissecting a chicken leg. Plenary - Joint questions Split the class into groups of three or four. Within each group get each pupil to write one question about joint types, one about synovial joints and one about antagonistic muscle pairs onto a sheet of paper. When all have finished pass the pieces around the room. Have a small prize for the best question set as voted for at the end. (10–15 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Provide the pupils with sets of coloured cards, one colour for each joint type, one letter per card. The pupils are to shuffle the pack and spell out the type names. Timing and repeating giving achievable targets and rewards will be motivating. • Extension. Pupils to research into hydrostatic skeletons and endoskeletons. Focus on how size and complexity of the body plan restricts skeleton type suitability. Link to why we don’t get giant insects. • Learning styles <i>Visual:</i> Observing dissection. <i>Auditory:</i> Listening to discussions. <i>Kinaesthetic:</i> Getting involved in the dissection. <i>Intrapersonal:</i> Writing individual questions. • Functional skills link-up. English Write clearly and coherently including an appropriate level of detail. (Level 1)
Learning Outcomes <i>All pupils will be able to state that muscles can only pull bones.</i> <i>Most pupils will be able to describe how a pair of antagonistic muscles works.</i> <i>Some pupils will also be able to describe how a pair of antagonistic muscles work in detail and relate joint structure to function.</i>	Additional teachers notes Equipment and materials required Large wooden dissecting board, half a fresh chicken (preferably with claws on), scalpel, dissecting scissors, seeker, bag for disposal. A Flexicam and projector will help pupils to see. Details Get a half bird fresh from a reputable butcher. Remove the skin and using scissors and scalpel expose the outside of the hip and knee joints. Demonstrate the movement range of each. Be careful of bone splinters. Dissect the joints, expose the cartilage and identify the ligaments. Show how the muscle sheath becomes the tendon. Pull on some tendons to move the leg introducing the word. At the end of the dissection (not before) allow the pupils to feel the surface of the cartilage and then tell them to wash their hands thoroughly.	



Fusion 1: B1.9 - Microbes National Curriculum Link up • 3.3a, c.		
Electronic resources: Learning objectives, Practical worksheets, Plenary activity – Microbes, Homework activity - Microbes		
Learning Objectives Pupils should learn: The four types of microbe. How we can see microbes. What microbes look like.	Teaching / Learning activities Lesson structure Starter - Warding it off Show the pupils an orange with cloves in it and hand around a container of pot pourri for them to sniff. Show them an image of a Middle Ages doctor's long-nosed face mask used to keep bad odours away. Show images of the tattoos on the ice mummy found in the Alps. Explain that these were to keep away diseases. Pupils are to write a message to these people to tell them why they were wrong and what really causes diseases. (10–15 mins) Main – Define 'microbes' as being another name for micro-organisms and explain that this means living things that are too small to see with the naked eye. Draw a gravestone on the board and write on it 'R.I.P. Germs', explaining that in this science topic 'germs' is a word we will not use. Draw out by questioning from the pupils what they know about microbes so far and summarise this on the board. From the starters, disease causing organisms will be identified. Discuss that there are microbes which do not cause diseases and there are ones which can be useful to us. Allow students to use microscopes to observe microbes. Discuss the general features of each microbes and some diseases caused by them and uses of them. Plenary - Net search for microbes In pairs pupils use the Internet to research types of microbe. Assign each group to one type, ensuring balanced overall coverage. Produce a PowerPoint slide for each type. E-mail home and complete for homework. (10–15 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Carry out a life skills exercise on ways of ensuring that microbes are not transferred from person to person (hand washing, good hygiene practices), modelling the practices and then pupils emulating this. • Extension. Pupils should extend the disease and causal organism list in the starter 'How many diseases'. Have a range of books on microbes from the library to refer to. • Learning styles <i>Visual:</i> Microscopic observation. <i>Auditory:</i> Listening to exposition. <i>Kinaesthetic:</i> Carrying out the practical. <i>Interpersonal:</i> Group work setting up and observing through the microscopes. <i>Intrapersonal:</i> Considering the scales involved.
Learning Outcomes <i>All pupils will be able to name the four types of microbe.</i> <i>Most pupils will be able to name the four types of microbe and give examples and features of each.</i> <i>Some pupils will also be able to name the four types of microbe and give several examples and detailed features of each, including similarities and differences.</i> How Science Works Describe and record observations and evidence systematically. (1.2d)	Additional teachers notes Equipment and materials required Microscopes, slides, hand lenses, Petri dishes of mouldy foods (lids taped in two places but not sealed), Petri dishes of <i>Micrococcus luteus</i> culture (lids taped in two places but not sealed). Safety Dispose of the plates hygienically after the practical: CLEAPSS handbook/CD-ROM section 15.2.14.	



<p>Fusion 1: B1.10 – Growing Microbes</p> <p>National Curriculum Link up</p> <ul style="list-style-type: none"> • 3.3a. <p>Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop shuffle – Aseptic technique</p>		
<p>Learning Objectives Pupils should learn: How we can grow bacteria. How to measure factors affecting the growth of yeast.</p>	<p>Teaching / Learning activities Lesson structure Starter - Rotten racers Show the pupils, or ask them to imagine, two ripe peaches in perfect condition. If people were to race to see who could make the peach go rotten first, how could they go about doing this? Discuss and debate. Draw out ideal conditions for microbial growth. (10–15mins) Main - Introduce the key terms and equipment for ‘Growing Bacteria’ practical. Pass around a Petri dish and ask the pupils to say the name out loud. Pass around one containing nutrient agar and allow the pupils to touch it, but not to scoop it out. When it comes back to the front ask who would like to lick it? When you get a ‘yuk’ reaction, ask why not? All the fingers will have had bacteria on them. Ask what would happen if we put this plate somewhere where the bacteria would grow fast. Ask if anyone in this class was in an incubator as a baby. Do they know of anyone who was? Have they seen how eggs are made to hatch? Introduce the term ‘incubation’. Plenary - Flow diagrams Get the pupils to create a flow diagram showing what happens to the rate of growth under different conditions (warmer or colder, more or less sugar). An outline on the board will help this. Discuss the flow chart in the light of the results and summarise. (10–15 mins)</p>	<p>Teaching suggestions</p> <ul style="list-style-type: none"> • Special needs. Demonstrate each stage of the practicals and ask the pupils to take digital photographs. Use these with prompt cards later on to make a display. • Extension. Pupils can set up a data-logger to record the temperature of the two incubation sites. Each day they record the temperature and the number of colonies or, if dense, the percentage coverage. They plot this against time for each site and work out how the growth rate is linked to temperature. They need to get a numerical value, such as how many percent more colonies/cover the warm one has. Does this change over time? • Learning styles <i>Visual:</i> Observing demonstrations. <i>Auditory:</i> Listening to exposition and discussion. <i>Kinaesthetic:</i> Carrying out the practical. <i>Interpersonal:</i> Group work. <i>Intrapersonal:</i> Reflecting on ideas learned.
<p>Learning Outcomes <i>All pupils will be able to</i> describe in simple terms how to grow bacteria. <i>Most pupils will be able to</i> describe how to grow bacteria and be able to measure factors affecting the growth of yeast. <i>Some pupils will also be able to</i> describe in detail how to grow bacteria and be able to measure factors affecting the growth of yeast with precision and accuracy. How Science Works Recognise the range of variables involved in an investigation and decide which to control. (1.2b)</p>	<p>Additional teachers notes Growing bacteria Equipment and materials required For each group: two Petri dishes and lids – filled to 1/3 depth with nutrient agar and left to set, Chinagraph pencil or OHP pen, wire loop, Bunsen burner, bench mat, culture of <i>Micrococcus luteus</i> or other suitable microbe, alcohol or sterilising fluid, cotton wool, Sellotape strips. Safety Ethanol (alcohol) is highly flammable and harmful, make sure there are no naked flames: CLEAPSS Hazcard 40A. See CLEAPSS handbook/CD-ROM section 15.2. Autoclave before disposal.</p>	



<p>Fusion 1: B1.11 – Useful Microbes</p> <p>National Curriculum Link up</p> <ul style="list-style-type: none"> • 3.3a. <p>Electronic resources: Learning objectives, Practical worksheets, Simulation – Making yoghurt, Plenary / Additional Support – Anaerobic respiration, Interactive – Useful microbes</p>		
<p>Learning Objectives Pupils should learn: How microbes can be used to make food and other products.</p>	<p>Teaching / Learning activities Lesson structure Starter - Wipe out! Ask pupils to imagine that all the micro-organisms on the planet died due to a blast of cosmic radiation (anything visible to the naked eye was unaffected). What effect would this have? Discuss this and describe this situation in whatever way you prefer. Read out volunteers' work. As a backing track the Beachboys 'Wipe-out' could be used from the album <i>Still Cruisin</i>. (10–15 mins) Main - Bring in a loaf of bread, empty wine, beer and spirits bottles and a jar of Marmite (preferably the special edition Guinness Marmite in the black and white jar), some blue cheese, some mycoprotein such as Quorn, a pot of natural yoghurt and a bottle of Yakult or similar bacterial drink. Hand these around and discuss them, emphasising that eating in the laboratory is not permitted. Be aware of potential blue cheese allergies. Explain the production of each of the examples above. Show the pupils a pot of yoghurt. Get the pupils to read the names of the bacteria written on the side of the pot. Set up the yoghurt making practical, if possible in a domestic science room so that it may be permissible for the pupils to taste their products. Plenary - Wipe out remixed If the pupils carried out the 'Wipe-out!' starter, they can add to their notes using knowledge gained during the lesson. (5–10 mins)</p>	<p>Teaching suggestions</p> <ul style="list-style-type: none"> • Special needs. Pupils can carry out a simple card sort exercise to arrange the parts of the equation for anaerobic respiration. This can be carried out using laminated cards and can be scaled as appropriate. • Extension. Pupils may wish to extend their understanding of the topic by looking in detail at the importance of keeping a pure strain of microbes for a particular food product, for example a particular yeast for brewing a beer. You may like to get them to set up some barley to germinate, testing it for sugar at various points during the process. They may also wish to look into the claims of probiotics through Internet searches. Give the pupils the formula for glucose, ethanol and carbon dioxide and ask them to work out how many of each molecule are on each side of the equation. • Learning styles <i>Visual:</i> Observing a presentation. <i>Auditory:</i> Discussing the types and uses of microbes. <i>Kinaesthetic:</i> Carrying out the practical. <i>Interpersonal:</i> Group work during the practical. <i>Intrapersonal:</i> Appreciating the wide range of impacts microbes have on our lives.
<p>Learning Outcomes <i>All pupils will be able to name some products made using microbes.</i> <i>Most pupils will be able to describe how a range of products are made using microbes.</i> <i>Some pupils will also be able to describe in detail how a wide range of products are made using microbes.</i> How Science Works Describe and record observations and evidence systematically. (1.2d)</p>	<p>Additional teachers notes Equipment and materials required Full-fat milk (150 ml per pupil), measuring cylinder (200 ml), optional dried milk powder, hot plate, live natural yoghurt (1 teaspoon per 250 ml), teaspoon, sterile yoghurt pots, cling film, universal indicator solution (flammable), pH probe and data-logger. Safety If possible, make yoghurt in domestic science (home economics) room.</p>	



<p>Fusion 1: B1.12 – Harmful Microbes</p> <p>National Curriculum Link up</p> <ul style="list-style-type: none"> • 3.3a, c. <p>Electronic resources: Learning objectives, Practical worksheets, Animation – The determined microbe, PowerPoint – How does Yellow Fever spread, Starter activity – What have you had, Extension – Body defence, Homework activities – Spread of disease, Our immune system, Level Assessed Task – Smelly breath</p>		
<p>Learning Objectives Pupils should learn: Which diseases are spread by microbes. How diseases are spread. How the body defends itself against disease.</p>	<p>Teaching / Learning activities Lesson structure Starter - Diseases – map of what I know... Divide the class into groups of about four. Give each group a large A3 size sheet of paper. Ask them to start with the word ‘diseases’ in the centre of the page and draw out collectively a concept map of their knowledge of the topic showing the words involved and how they are linked together, labelling each link. Allow about eight minutes for drawing out, then five minutes circulating looking at other groups’ material, then a brief summary from the front. (10–15 mins) Main - Read through the section entitled ‘Spreading diseases’ in the pupil book. Divide into groups of about three. Give each group of the pupils a set of blank cards with the word ‘Chance?’ written on the back. Their task is to write up scenarios where people catch a disease and the circumstances under which this takes place. Emphasise that these must be realistic but not offensive. These cards can be shuffled and read out to the class. De-personalise this by having the chance cards apply to fictional characters. Plenary - Key word charades Provide a set of key word cards from the lesson, including all the key words in the pupil book, the methods of infection (do not allow sexually transmitted diseases for reasons of decency), the names of the diseases featured and the barriers to infection discussed. Place them face down on the front desk. Get a pair of volunteers to come to the front. They are to choose a card, look at it and place it face down to one side. They must then act out the key word together while others guess. Do not allow shouting out. (10–15 mins)</p>	<p>Teaching suggestions</p> <ul style="list-style-type: none"> • Special needs. Pupils can carry out an interactive whiteboard exercise with drag and drop category boxes for diseases, methods of infection, ways of spreading microbes and types of microbe. Each key word in turn appears in the centre of the screen and the pupil has to choose which bin to put it in. An option to colour code these could help when learning difficulties are more pronounced. • Extension. With higher attaining pupils you should discuss some of the ethical issues surrounding infectious diseases. They could research the controversy over the claimed link between MMR jabs and autism, evaluating the evidence. They could look at the ethical issues regarding objection to the use of condoms and the consequences of unprotected sex leading to high HIV infection rates in sub-Saharan Africa, including looking at other means of prophylaxis. • Learning styles <i>Visual:</i> Creating and decorating a concept map. <i>Auditory:</i> Explaining the barriers to infection. <i>Kinaesthetic:</i> Making and playing with the ‘Chance’ cards. <i>Interpersonal:</i> Playing the ‘Key words charades’ plenary. <i>Intrapersonal:</i> Considering the objectives and checking their own learning outcomes. • Functional skills link-up. English Read and understand texts (explanatory) in detail. (Level 1)
<p>Learning Outcomes <i>All pupils will be able to name some diseases spread by microbes.</i> <i>Most pupils will be able to name a range of diseases spread by microbes and describe how they are spread and how the body defends itself.</i> <i>Some pupils will also be able to name a wide range of diseases spread by microbes and describe in detail how they are spread and how the body defends itself.</i></p>		<p>Additional teachers notes</p>

