



Fusion 1: B2.1 – Reproduction		
National Curriculum Link up •3.3b, c.		
Electronic resources: Learning objectives, Practical worksheets, Homework activity – How organisms reproduce, Webquest – How do animals care for their young?, SEN Lesson support activity - Fertilisation		
Learning Objectives Pupils should learn: What fertilisation means. Where fertilisation happens in animals.	Teaching / Learning activities Lesson structure Starter - Youngest you Pupils should imagine that they have a device that will take them back in time. Unfortunately it is a prototype and your body does not stay the same as it is now, it gets younger as you go back in time. Ask: if you did this, when would you stop being you? Pupils should write down their idea and share it with the group. (5–10 mins) Main Give each group a box of dice and a container to shake them into. Using a projected large calculator, show them the probability of throwing a six, two sixes in a row, etc. Show the pupils the probability of them surviving to a breeding age in a variety of animals. If they were a sunfish (one in 100 000 000); a frog (1 in 8000); a duck (1 in 6); a human (99 out of 100). Using several dice at once, try to throw eight sixes in a row. You would need to be this lucky to survive to breed as a sunfish. Try to throw five sixes in a row. You would have to be this lucky to survive as a frog. Try to throw a six to survive as a duck. To die as a human you have to throw three sixes in a row. Discuss the activity – who died and who survived? Link this with the degree of parental support each species gives to its offspring and complete the appropriate worksheet section. As an extension, draw out a graph using Simple Data Handling or Excel to show the relationship between the number of offspring and their survival rate. Plenary - In or out? Pupils should complete the ‘Comparing fertilisation’ table. They then comment on it and discuss. (5–10 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Use Plasticine models of sperm and egg in conjunction with a torso model or large A3 diagram to show the process of fertilisation. With guidance they could produce a simple animation. • Extension. Give Internet references or library books so that pupils can look at more extreme methods of protecting offspring, such as: the mouth brooding or the marsupial frog genus. • Learning styles. <i>Auditory:</i> Describing different types of strategy. <i>Kinaesthetic:</i> Dice throwing activity. <i>Intrapersonal:</i> Group working on dice game. • Homework. The pupils could find out the numbers of offspring of a range of animals to create a collective collage display. • Functional skills link-up – ICT. Access, navigate and search internet sources of information purposefully and effectively. (Level 1)
Learning Outcomes <i>All pupils should be able to</i> define fertilisation as the joining of sex cells. <i>Most pupils should be able to</i> define fertilisation, provide examples and differentiate between internal and external fertilisation. <i>Some pupils should also be able to</i> evaluate the effectiveness of various fertilisation strategies and relate this to body structure and behaviour. How Science Works Describe patterns and trends in secondary data ... (if using the numbers of offspring extension). (1.2f)	Additional teachers notes Equipment and materials required Equipment and materials required Boxes of dice and throwing trays, list of powers of 6 (6, 36, 216, 1296, 7776, 46 656, 279 936, 1 679 616).	



<p>Fusion 1: B2.2 – Sex Organs</p> <p>National Curriculum Link up •3.3b.</p> <p>Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop - Reproductive systems, Animation – The incredible journey, Homework activity – How organisms reproduce, Webquest – How do animals care for their young?, SEN Lesson support activity - Fertilisation</p>		
<p>Learning Objectives Pupils should learn: The functions of women’s sex organs. The functions of men’s sex organs.</p>	<p>Teaching / Learning activities Lesson structure Starter - Why have two sexes? Discuss stereotyping on gender grounds. What are the significant differences between males and females and what importance do they have? (5–10 mins) Main Using PowerPoint diagrams go through the structure of the male reproductive system. Ask the pupils to fill in the labels on unlabelled diagrams as you go. Go through the same process with the female system. Initially use front and side views of the system, annotating them as the terms are introduced. While showing these diagrams it is important to emphasise that every set of genitals, either male or female, is unique so there is no ‘normal’ shape, size or colour. The arrangement is generally the same, but the individual parts will differ greatly in appearance. This is a good opportunity for pupils to ask questions that may be worrying them. Introduce ground rules, scientific terms only, no personal comments or references to known individuals. Give the pupils a sheet summarising the functions and get them to fill in a table matching the functions to the parts. Plenary - Mixed up bits Ask the pupils to solve a list of anagrams of the names of parts that they have been studying such as the following: SPINE (penis) RUM COST (scrotum) SETSIT (testis) VIANAG (vagina) REXVIC (cervix) SUTURE (uterus) CUTVOID (oviduct) VAYOR (ovary) SNAGLD (glands) PETERS BUM (sperm tube) As an extension, pupils can make up their own anagrams of the names of the parts. These could be on sets of cards if required, or as a digital anagram sorter. (5–10 mins)</p>	<p>Teaching suggestions</p> <ul style="list-style-type: none"> • Special needs. Use cut-and-stick labels onto a large A4 or even A3 diagram of each gender’s sexual anatomy. • Extension. Pupils could use recording apparatus such as a dictaphone or a microphone into a PC or laptop to record a summary of the parts and their functions discussed in the lesson. They could extend the content based on a more advanced text such as the AQA GCSE Science series. • Learning styles. <i>Visual:</i> Looking at the diagrams of the anatomical parts. <i>Auditory:</i> Talking to peers about the meaning of words and phrases. <i>Kinaesthetic:</i> Manipulating letter cards sets if the ‘Mixed up bits’ plenary is used. <i>Interpersonal:</i> Group discussion about the meanings of the key words. <i>Intrapersonal:</i> Evaluating own knowledge of sexual anatomy and improving it. <p>• Functional skills link-up – ICT. Select and use software applications to meet needs and solve problems (audio). (Level 2) See Extension work.</p> <ul style="list-style-type: none"> • Homework. Pupils could revise for a short slip test (a verbal test needing a number of single word answers, these usually written on slips of paper) on the parts and their functions. They could be given a blank grid to fill in a word search for their peers to use.
<p>Learning Outcomes <i>All pupils should be able to name some of the major parts of the male and female reproductive systems and describe their functions in simple terms.</i> <i>Most pupils should be able to name all of the parts of the male and female reproductive systems and describe their functions.</i> <i>Some pupils should also be able to describe the male and female reproductive systems in detail including alternative names and be able to give descriptions of their functions.</i></p>	<p>Additional teachers notes If available show a good quality sex education video (view first and check for suitability). Liaison with the PSHE department will be helpful, as will familiarity with the school’s and local authority’s policies on sex education.</p>	



Fusion 1: B2.3 – Fertilisation in Humans		
National Curriculum Link up •3.3b.		
Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop – The journey of the sperm, Plenary activity – Human reproduction memory game		
Learning Objectives Pupils should learn: How sex cells are adapted to their jobs. How a sperm and an egg get together. What happens in fertilisation.	Teaching / Learning activities Lesson structure Starter - Situations vacant Have a brief discussion about the roles of the sperm and the egg, and then suggest to the pupils that they write a job description for each. Choose some pupils to read out their descriptions. (5–10 mins) Main Discuss the detailed structure of a sperm and an egg. It could be instructive to provide paper scale models of a sperm and an egg. In humans, a sperm cell has a head measuring 5 µm by 3 µm and a tail 50 µm long. A human ovum measures on average 145 µm in diameter, so the diameter of the model egg needs to be about 30 times larger than the head length of the model sperm. Using diagrams of the male and female reproductive systems discuss where eggs and sperm are formed, where fertilisation takes place and then consider how far each type of sex cell has to travel. This could reinforce the differences in structure, and the need for motility of sperm. Discuss the difference in numbers of sex cells produced –usually only one egg released per month, but millions of sperm produced in the testes. Get pupils to suggest reasons why there are such big differences in numbers. Plenary - Situations vacant – re-advertisement Review the ‘Situations vacant’ starter by asking the pupils if they would alter their job descriptions. (5–10 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Model fertilisation using role play: represent the egg by having a circle of pupils with one in the centre. Have several others around the outside to represent the sperm, circling around the egg. The pupil representing the nucleus of the egg chooses one ‘sperm’ to get hold of the ‘egg’ and then the others lock arms tightly representing the membrane so that no more ‘sperm’ can get in. The pair in the centre can give the new child a name. Repeat this several times to reinforce the message and get the pupils to state what is happening at each stage. • Extension. Give the pupils a list of the key terms and get them to play a linking game, where they have to choose a minimum of two terms and a maximum of four and link them in a coherent sentence. Impose a strict time limit and give points for each correct link. If any single terms remain, give one point for a correct definition. • Learning styles <i>Auditory:</i> Listening to exposition. <i>Kinaesthetic:</i> Role-play exercises <i>Interpersonal:</i> Group conversations on the topic. <i>Intrapersonal:</i> Reflecting on own understanding and re-evaluating. • Homework. Pupils to do the ‘Using Quia’ plenary.
Learning Outcomes <i>All pupils should be able to</i> describe some basic features of sperm and eggs and be able to outline the process of how fertilisation takes place in humans. <i>Most pupils should be able to</i> describe adaptations of sperm and eggs and be able to describe the process of how fertilisation takes place in humans. <i>Some pupils should also be able to</i> relate structure to function and be able to describe the processes which lead up to fertilisation in detail. How Science Works Use key scientific vocabulary and terminology in discussions and written work. (1.1c)	Additional teachers notes Use a PowerPoint slide to illustrate and label the sperm and egg step-by-step, adding a function to each of the parts named. Show video footage of fertilisation taking place, talking over the role of the enzymes in helping the head of the sperm to penetrate the egg. Discuss the result of fertilisation.	



Fusion 1: B2.4 – Pregnancy National Curriculum Link up •3.3b.		
Electronic resources: Learning objectives, Practical worksheets, Animation – Fetus Development, SEN activity – How a baby develops, Homework activities A and B		
Learning Objectives Pupils should learn: What the fetus needs and how it gets it. How the fetus is protected. How the fetus develops. What the mother needs to do to care for the fetus.	Teaching / Learning activities Lesson structure Starter - Before I was born Give each pupil a photocopied tiny set of footprints, about half a cm long. Ask them to consider that their feet were once that size. Ask them to consider what they feel about that fact, and then encourage them to share their thoughts with a small group, then with the class. (10–15 mins) Main Using PowerPoint describe how the pupils developed before their birth. Introduce and define the words ‘embryo’ (in humans from conception to about the eighth week of pregnancy) and ‘fetus’ (a developed embryo which has all the features of its adult form). Ask the pupils to complete a sentence: ‘The difference between an embryo and a fetus is ...’ Allow students to complete a model placenta by getting each group to fill one 15 cm sections of Visking tubing with a solution of food colouring and a second with water. The coloured solution represents useful substances in the mother’s blood; the colourless water represents the fetus’s blood. Tie off the ends. Lay the tubes alternately side-by-side in a shallow tray, so that they are in contact with each other, simulating the placenta. Allow diffusion to take place (at least half an hour), then examine the contents. Discuss the strengths and weaknesses of the simulation. Plenary - True or false Divide the class into groups of four. One pair is to set the other pair a series of five questions based on the lesson to which there can be true or false answers. Allow five minutes for construction of the questions, five minutes for asking each other, and five minutes for feedback. (15 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Use a model womb if available. Lay out a set of laminated scale diagrams in order of age. • Extension. “Embryonic haiku” Explain what a ‘haiku’ is (a short poem of three lines, these generally being of five syllables, seven syllables, then five syllables again). Give an example, e.g. A heron rises In the middle of the swamp Under the full moon. Pupils to create a haiku poem based on consideration of the life of an embryo. • Learning styles <i>Visual:</i> Observing PowerPoint. <i>Auditory:</i> Taking part in discussions. <i>Kinaesthetic:</i> Carrying out practical activities. <i>Intrapersonal:</i> Considering life before birth. <ul style="list-style-type: none"> • Homework. Answer the Summary Questions from the pupil book. Write a ‘before I was born’ story.
Learning Outcomes <i>All pupils should be able to</i> state in simple terms what a fetus needs, how it gets it, how it is protected and how it develops. <i>Most pupils should be able to</i> state the above clearly and fully. <i>Some pupils should also be able to</i> state the above in detail and relate this knowledge to anatomy and physiological systems. How Science Works Recognise and explain the value of using models and analogies to clarify explanations. (1.1a1) (See Main Lesson – modelling placenta.)	Additional teachers notes Equipment and materials required Per group: 2–25 cm Visking tubing, 250 cm ³ coloured glucose solution, strong thread or thin string, plastic tray, food colouring, beaker for water bath, Bunsen burner, tripod and gauze.	



<p>Fusion 1: B2.5 – Birth</p> <p>National Curriculum Link up •3.3b.</p> <p>Electronic resources: Learning objectives, Practical worksheets, Animation –Human birth, Plenary activity – Pregnancy and birth, Extension activity – Make up your own concept cartoon</p>		
<p>Learning Objectives Pupils should learn: What happens when a baby is born. What can go wrong during childbirth.</p>	<p>Teaching / Learning activities Lesson structure Starter - 12 word birth Pupils are to describe their understanding of how they were born in 12 words exactly. They are to work in silence individually at first, then to share and check with their neighbours. Ask for some examples to be read . (5–10 mins) Main Using a series of PowerPoint slides give an exposition on the sequence of stages in a normal birth. Encourage the pupils to predict what will happen in each stage. Flag up any new key words and place printed laminated cards of the new key words onto the side of the board as they emerge during the discussion. If an anatomical model of a pregnant woman at full term is available, take a break from the PowerPoint and gather the pupils around the model, getting them to describe what the parts are, using the key words on the board. Write the word ‘problems’ on the board and encourage the pupils to tell what they know about birth problems. Try to draw out descriptions of breech birth, Caesarian section (make a link to <i>MacBeth</i> if they are studying it and to <i>Julius Caesar</i>) and premature births, again using PowerPoint to illustrate the knowledge covered. Plenary - Broken birth sentences Give the pupils a series of sentences summarising the birth process. Each one should be broken into several smaller phrases and mixed up. The pupils are to reassemble first each sentence and then the whole passage. This can be carried out in small groups. (10–15 mins)</p>	<p>Teaching suggestions</p> <ul style="list-style-type: none"> • Special needs. Give the pupils a baby model, and film them using a video camera. Get them to show which position the baby is normally in before birth, where the cord can cause problems, where the cord is attached. Give them a second doll and ask them to state what two babies born at the same time are called and how they can come about. If both dolls are the same, get them to talk about identical twins. If they are different, non-identical twins can be discussed. • Extension. Using the Internet to locate the data, pupils should prepare a statistical report on the causes of multiple births and their probabilities and how these vary with time, age of the mother, genetic pre-disposition and geographical location. Pupils should use full scientific descriptions of the types of twin (e.g. mono-zygotic and di-zygotic). • Learning styles <i>Visual:</i> Observing the photographs of various parts of the birth process. <i>Auditory:</i> Listening to exposition. <i>Interpersonal:</i> Discussion on twins and on birth difficulties. • Homework. Complete the in-text questions and Summary Questions 1–4 from the pupil book. Compile a list of 16 questions with single-word answers from which a crossword can be compiled.
<p>Learning Outcomes <i>All pupils should be able to</i> describe in simple terms what happens during a normal birth and name a complication. <i>Most pupils should be able to</i> describe a normal birth and what may go wrong. <i>Some pupils should also be able to</i> describe in detail a normal birth and give full descriptions of what may go wrong using several examples. How Science Works. Use key scientific vocabulary and terminology in discussions and written work. (1.1c) Describe patterns and trends in secondary evidence ... (1.2f) (See Extension activity.)</p>	<p>Additional teachers notes This is a good opportunity for an open discussion time, as the pupils will have stories about themselves or their relatives that they wish to share. Be aware that some issues may be sensitive for pupils who may have had an upsetting recent experience personally or in their family.</p>	



<p>Fusion 1: B2.6 – Growing Up National Curriculum Link up •3.3b.</p>		
<p>Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop – What do new babies need?</p>		
<p>Learning Objectives Pupils should learn: What new babies need. How humans and other animals grow. The changes that take place at puberty and how they are controlled.</p>	<p>Teaching / Learning activities Lesson structure Starter - Answers and questions Provide the pupils with 10 words from the previous work on gamete formation, conception and birth. Pupils are to provide the questions to these answers. (10 mins) Main Show video footage of a newborn baby. Ask the pupils to put the words ‘(name’s) needs’ in the centre of a sheet of paper and either draw or write down what they think the baby will need in its first few months. Discuss these needs and collect suggestions on the board. Discuss the need for food. Show a PowerPoint slide of the human mammary gland in section and describe its function. Is breast best? Discuss the reasons for breast feeding and some of the drawbacks. If available, an audio or video recording of some young mothers discussing their experiences of breast feeding would be useful. Pupils can make notes on the benefits and drawbacks of each type of infant feeding. Show the pupils a video of other pupils discussing the physical changes that they experienced as they went through puberty, discussing their thoughts, worries and expectations. Explain these changes are caused by hormones, where these hormones are made and give essential personal hygiene advice. Plenary - All change! Ask the pupils to draw out a table of puberty changes with three columns labelled ‘males’, ‘females’ and ‘both’. Pupils to fill this in, discussing it with a partner. Then review the class responses. (5–10 mins)</p>	<p>Teaching suggestions • Special needs. Give the pupils cards with the words and/or pictures ‘boys’ and ‘girls’. The teacher or the learning assistant describes a body change which occurs in puberty and the pupils have to hold up a boy card, a girl card or both (if applicable). Seek consensus and record the findings in an appropriate manner, such as stickers in the appropriate parts of the exercise book or worksheet. • Extension. Pupils use the information provided in Summary Question 2 regarding growth rates to work out the rate of growth in terms of percentage increase over every three year period (0–3, 3–6, etc.). They can then compare this with overall height increase in centimetres during each of these periods. They write a paragraph summarising the interpretations of the graphs and giving considered opinions on any differences seen between the sets of figures. • Learning styles. <i>Visual:</i> Observing the sections of video. <i>Auditory:</i> Listening to the exposition and video clips of conversations. <i>Interpersonal:</i> Taking part in the discussions. • Functional skills link-up – ICT. Create and develop charts and graphs to suit requirements, using suitable labels. (Level 1) See Summary Question 2.</p>
<p>Learning Outcomes <i>All pupils should be able to</i> describe what new babies need, growth and puberty changes in simple terms. <i>Most pupils should be able to</i> do the above using full descriptions. <i>Some pupils should also be able to</i> state the reasons why the above are necessary and interrelate the concepts involved. How Science Works Identify a range of data and other evidence to back an argument and a counterclaim in less complex and/or familiar contexts, e.g. advantages and disadvantages of breastfeeding and using formula milk. (1.1a3)</p>	<p>Additional teachers notes PSHE link: ‘Baby think it over’ virtual infant simulators may be available from the PSHE dept. Some of these are designed to mimic the attention needed by a young child. Looking after one for a weekend can be an illuminating experience, especially for anyone who may be contemplating starting a family early.</p>	



Fusion 1: B2.7 – Periods National Curriculum Link up •3.3b.		
Electronic resources: Learning objectives, Practical worksheets, Animation – Menstrual Cycle, Extension activity – Whoops – teacher made a mistake!		
Learning Objectives Pupils should learn: How a woman’s body controls the time when eggs are released. Why women have periods.	Teaching / Learning activities Lesson structure Starter - Reasons for periods discussion Most pupils know vaguely that something called periods occurs when girls start to mature. Without giving any information yourself, lead a discussion on why periods happen. (5–10 mins) Main Get the pupils to carry out the ‘Producing Periods’ activity. Explain the reasons for the limited dates in a woman’s cycle when she can get pregnant (approximately days 11–15). Ask the pupils to write down the title ‘Could she get pregnant?’ into their exercise books and to copy down a list of girls’ names (get the pupils to choose these) from the board. Carry out an exercise where two dates are identified, the first one being for the date during the month of September when the woman starts her period and the second one being for the date when she has sexual intercourse without using contraceptives. Refer the pupils to the calendar sections of the pupil book. The number generation can be done by drawing numbers from 1 to 30 from a hat. Assume that sperm can live inside a woman for an average of 3 days. Continue generating pairs of dates until all the girls on the board are pregnant. If the pupils are working in groups, tick off their girls’ names as the pregnancies occurs. Warn the pupils that variation can occur in ovulation dates and reliance on having sex only during unfertile dates is not a very reliable method of birth control. Plenary - Spot the blot Give the pupils a short passage of text describing the menstrual cycle. This will have a number of errors in it. Pupils are to highlight or circle these, number them and write in the corrections below. Ask the pupils carry out a peer marking exercise on the sheets. (10–15 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Give the pupils an exercise to draw lines between words and their simple meanings. • Extension. Pupils can use the Internet to look up ectopic pregnancy and be prepared to talk about it if required. • Learning styles <i>Auditory:</i> Participating in discussions. <i>Interpersonal:</i> Group discussions. <i>Intrapersonal:</i> Consideration of the issues involved, either for themselves if female or for their girl peers if male. <ul style="list-style-type: none"> • Functional skills link-up – English Understand texts in detail. (Level 1) • Homework. Pupils can answer the in-text questions and Summary Questions from the pupil book. Pupils can produce a public information leaflet entitled ‘The facts about menstruation’ aimed at premenstrual girls as a discussion aid.
Learning Outcomes <i>All pupils should know</i> the meanings of the words ‘menstruation’, ‘ovulation’ and ‘periods’. <i>Most pupils should be able to</i> describe these processes. <i>Some pupils should also be able to</i> describe these processes in detail and be able to link them to specific hormones.	Additional teachers notes Show some tampons and sanitary towels. As a link with PSHE it may be suitable to discuss hygiene and to go over some of the problems which can be associated with unwise use of tampons, such as toxic shock syndrome caused by <i>Staphylococcus aureus</i> .	



Fusion 1: B2.8 – In Control		
National Curriculum Link up •3.3b, c.		
Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop – Contraception and fertility, Plenary activity – What do you know about contraception?		
Learning Objectives Pupils should learn: How women can avoid getting pregnant if they don't want to. How women can be helped to have a baby.	Teaching / Learning activities Lesson structure Starter - True or false? Give the pupils a list of five which contain some true ones and some common myths or misunderstandings. e.g. 'You can't get pregnant if you have a shower after having sex.' [false] 'Birth control pills stop you being moody before periods.' [false] 'You can't get pregnant when you are breast feeding.' [false] 'You can't catch STDs/STIs if you are on the pill.' [false] 'You can get contraceptive pills for men.' [true] (5–10 mins) Main Ask the pupils if anyone knows what STDs are and draw out the existing knowledge from the group. Using discussion and exposition to build on this to establish the importance of the alternative use of condoms as a prophylactic device. Sound out the classes opinions and hold a snap ballot to poll whether they think these should be freely available without prescription or not, and what the role of parents might be. Ask the pupils to complete a summary of the different types of contraceptive, either on a worksheet or copied into their books. Plenary - Contraception blockbusters Divide the class into two large groups. Using a 'Blockbusters' style game format, get the pupils to play a game using questions drawn from this lesson and the previous ones. Provide a small prize for the winning group. (10 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Pupils to use a hangman style exercise to identify the key words. Some of the letters could be placed in advance and a list of the key words provided to choose from. • Extension. With a higher attaining group, a point of controversy could be whether the use of the morning after pill and IUDs are ethically sound and tie this in with and the debate on when a life starts. • Learning styles <i>Auditory:</i> Taking part in class debate. <i>Intrapersonal:</i> Reflecting on the effectiveness of different methods of contraception. • Homework. Pupils imagine they are a doctor. They are to write a letter giving advice to a young couple who want to start a family in a few years, but not just yet.
Learning Outcomes <i>All pupils should be able to</i> describe at least two methods of birth control and know what IVF means in simple terms. <i>Most pupils should be able to</i> describe fully male and female condoms and their use; contraceptive pills, injections and implants; IUDs and know some reasons why conception may be difficult and the meaning of IVF. Most should also understand which methods give protection from STDs/STIs and which don't. <i>Some pupils should also be able to</i> do the above in detail and be aware of the ethical controversies involved and be able to take a reasoned and balanced view. How Science Works Identify a range of scientific data and evidence to back an argument and the counterclaim in less complex and/or familiar contexts, e.g. IVF or contraception. (1.1a3)	Additional teachers notes Although not in the pupil book it would be useful to discuss long term surgical methods of contraception, such as vasectomy and tubal ligation (tying the oviducts to stop eggs from descending to the uterus) and to answer some of the pupils' queries regarding these topics. A short discussion on the morning after pill could be held. Show the pupils a video or an animation of a couple who want to have a child but are unable to. Discuss the possible problems which may have occurred and some ways of overcoming them. Emphasise that fertility problems are quite common and nothing to be ashamed of, and that about 1 in every 6 couples will experience difficulty in starting a family.	



Fusion 1: B2.9 – Reproduction in Plants		
National Curriculum Link up •3.3a		
Electronic resources: Learning objectives, Practical worksheets, Homework activities A and B, SEN activity – How to make mint cuttings		
Learning Objectives Pupils should learn: The meaning of the phrase 'asexual reproduction'. The advantages and disadvantages of asexual reproduction.	Teaching / Learning activities Lesson structure Starter - New plants – how does it happen? Pupils are to describe to each other how plants make copies of themselves. They then share this with the class through discussion. (5–10 mins) Main Show the pupils a range of plants which reproduce by asexual means, such as strawberries, daffodils, potatoes, ginger, duck weed and couch grass. Arrange these in a circus around the room. Get the pupils to observe each one in turn and write down a comment on how they think it reproduces. Taking cuttings: use mature well-grown geranium or zonal pelargonium plants. Other suitable species include Wandering Sailors of the family <i>Tradescantia</i> and the vigorously asexually <i>Bryophyllum diagremontiana</i> or <i>Bryophyllum tubifolium</i> . Demonstrate the method first. The class should try to take at least one cutting each and able members should be capable of taking several. As a motivator, ensure that the pupils can take these cuttings home once rooted. Plenary - Which method? Give pupils a sheet which has the pictures of the plants studied during this session. Fill in the description sections for each explaining how it reproduces. (5–10 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Make a mint! Pupils to take cuttings from mint plants and sell them to staff once rooted. Arrange with the school canteen to allow mint from the practical to be used as a garnish or to make sauce. • Extension. Pupils to look up the process of mitosis on the Internet or in textbooks. Summarise the process using diagrams or audio recording. • Learning styles <i>Auditory:</i> Taking part in discussions. <i>Kinaesthetic:</i> Practical on cuttings. <i>Interpersonal:</i> Group work. <i>Intrapersonal:</i> Consideration for other organisms. • Homework. Pupils to write out crossword clues for the key words used in this lesson for use during the starter of the next one. • Functional skills link-up – English Present information in a logical sequence. (Level 1)
Learning Outcomes <i>All pupils should be able to</i> define asexual reproduction and give an example from plants. <i>Most pupils should be able to</i> define asexual reproduction and state its advantages and disadvantages. <i>Some pupils should also be able to</i> do the above and demonstrate some knowledge of mitosis.	Additional teachers notes Equipment and materials required Suitable stock plants: geraniums or zonal pelargoniums, <i>Tradescantia</i> , <i>Bryophyllum</i> and any other plants which are available and suitable for asexual reproduction. Per group: scalpel, white ceramic tile, rooting powder, dibber or similar implement, label, cutting compost (50% peat or peat substitute, 50% Perlite or Vermiculite), pot approx 10 cm diameter, plastic bag, elastic band, newspaper for covering the benches. Safety Take care with scalpels. Do not allow rooting powder to be inhaled or to touch the skin for fear of allergic reactions. Also contains fungicide.	



Fusion 1: B2.10 – Flowers and Pollination		
National Curriculum Link up •3.3a.		
Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop – Learn the structure of the flower, Interactive Drag and drop – How does the pollen get to the egg?		
Learning Objectives Pupils should learn: The advantages and disadvantages of sexual reproduction in plants. How plants reproduce sexually. How pollen gets from one plant to another.	Teaching / Learning activities Lesson structure Starter - What are flowers for? Show the pupils some beautiful slides of flowers and pass around, or have on display, some examples in the classroom. Ask the pupils to write down, in a single sentence, what flowers are for. Get volunteers to read out some of their responses. Conclude by summarising the job of flower as being ‘seed factories’. (5 –10 mins) Main Carry out the ‘Looking at flowers’ dissection. Use daffodils and demonstrate it first using a Flexicam to display, if available. Break open a ripe ovary of a daffodil flower and show the ovules inside using a Flexicam if available. If not, use a PowerPoint slide. Explain that these are the female sex cells called ‘ovules’ and that the function of the flower is to bring the male and female sex cells together so that a seed can be formed. Using PowerPoint, explain the structure of a typical flower. Ask the pupils to say the names of the parts out loud as they encounter them, reinforcing the words by Blu-tacking up laminated flash cards with the words on. Plenary - Wind or insect? Show the pupils a series of slides of flowers. Using ‘show me’ boards ask the pupils to write either W or I to show if they think the flowers are wind- or insect-pollinated. (5 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Pupils to make a giant paper flower for a wall display. • Extension. Using the Internet, texts or library resources, pupils can look up meiosis and find out how variation is introduced by sexual reproduction. This is preparatory work for eventual full coverage at GCSE level. • Learning styles <i>Auditory:</i> Discussing pollination. <i>Kinaesthetic:</i> Flower dissection. <i>Interpersonal:</i> Group work. <i>Intrapersonal:</i> Use of imagination. • Functional skills link-up – English Read and understand texts and take appropriate action. (Level 1) • Homework. Revise flower parts for a short slip test. Complete in-text and Summary Questions from pupil Book.
Learning Outcomes <i>All pupils should be able to</i> state that flowers are for sexual reproduction in plants and that pollen is often transferred between flowers. <i>Most pupils should be able to</i> list advantages and disadvantages of sexual reproduction, to describe the function of flowers and to define and describe pollination. <i>Some pupils should also be able to</i> do the above and link structure to function for each of the parts.	Additional teachers notes Equipment and materials required For each pupil: One daffodil flower (have a few spares), white ceramic tile, scalpel, scissors, seeker or mounted needle, lots of strips of clear adhesive tape (these are best stuck to the edge of the bench), hand lens. Details Remove each part and arrange them in sets on a plain piece of A4 then stick them down and label them. Safety Beware of severe pollen allergies. Care with scalpels/ scissors/mounted needles.	



Fusion 1: B2.11 – Fertilisation in Plants		
National Curriculum Link up •3.3a.		
Electronic resources: Learning objectives, Practical worksheets, Interactive Drag and drop – Pollination and fertilisation, Homework activities A and B, Plenary activity – Seed dispersal, PowerPoint – plant reproduction, Level Assessed Task – Plants do it too!		
Learning Objectives Pupils should learn: How fertilisation takes place in flowers. Which factors affect the growth of pollen tubes.	Teaching / Learning activities Lesson structure Starter - Slip test – flower parts Give pupils a short slip test using single word answers to assess their recall and understanding. (5–10 mins) Main Discuss with the class what might be in the sticky stuff at the top of the stigma. Remind the pupils that making the pollen tube will need energy. After establishing that there is sugar in the liquid at the top of the stigma and that this helps the pollen to start growing, ask the pupils to devise a plan to find out which concentration of sugar would work best. Divide the class into six groups. Allocate each of the first five groups a concentration of sugar to work with. Choose from the following: 0%, 5%, 10%, 15%, and 20%. Ask the sixth group to carry out the experiment using onion epidermis following the practical directions. Observe the slides during the rest of the lesson, and arrange a rota to allow one from each group to come and examine them over the next two days. Pupils are to record growth of pollen tubes and collectively report back next lesson. Plenary - What's next? Give the pupils a set of cards to put into the correct order describing the sequence of events once fertilisation has taken place. (5–10 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Pupils to sequence a series of pictures showing the stages in the growth of a pollen tube. Pupils to make models using modelling balloons and peas. • Extension. Pupils to calculate rates of growth using scale factors. Ask the pupils to imagine a scale model of a pollen tube large enough to get a golf ball down to represent the pollen nucleus. Assume a golf ball to be 4 cm across and a real pollen tube to be 16 µm in diameter. What would the scale be? If the real distance from the stigma to the ovule is 1.5 cm, how long would the golf ball model one have to be? If it was big enough for a person to crawl down, how long would it be? • Learning styles <i>Visual:</i> Observing pollen growth. <i>Auditory:</i> Discussing how the pollen nucleus can descend to the ovule. <i>Kinaesthetic:</i> Carrying out the practical. • Functional skills link-up – Mathematics Use simple formulae expressed in words for one- to two-step operations. (Magnification.) (Level 1) • Homework. Make a scale model of a stigma, style and ovary with a tube down which a model nucleus can pass.
Learning Outcomes <i>All pupils should be able to</i> describe in simple terms what a pollen tube is. <i>Most pupils should be able to</i> describe the process of fertilisation in plants and name several factors which affect pollen tube growth. <i>Some pupils should also be able to</i> describe the process of fertilisation in plants in detail and explain the science underlying the factors that affect pollen tube growth. How Science Works Recognise that the presentation of experimental results through the routine use of tables ... and simple graphs makes it easier to see patterns and trends. (1.2d).	Additional teachers notes Growing pollen tubes; What conditions are best for growing pollen tubes? Equipment and materials required 100 cm ³ sugar solutions, 0.01 g yeast extract, one small crystal of boric acid, 1 g agar, and distilled water. Ripe anthers, Petri dish and lid, microscope and slides. Safety: Wear eye protection. Onion epidermis practical Equipment and materials required Onion, scalpel, white tile, Petri dish and lid, forceps, ripe anthers, damp paper towels, microscope and slides. Safety: Take care with scalpels.	
Fusion 1: B2.12 – Spreading the Seeds		



National Curriculum Link up •3.3a.		
Electronic resources: Learning objectives, Practical worksheets, Animation – Seed dispersal, Simulation – Seed germination		
Learning Objectives Pupils should learn: How seeds are dispersed from the parent plant. The conditions necessary for seed germination.	Teaching / Learning activities Lesson structure Starter - School's out for ever Ask the pupils to think about what would happen to the school field if the school was closed forever. Working in pairs, get the pupils to think about and write down ways in which seeds might get transported to the school field. Share the results with the rest of the class. (10–15 mins) Main Show the pupils a family tree. Ask the pupils to think about what it would be like if all their family came to stay. Where would they all sleep? What problems would there be? On the board, summarise the problems which would occur due to overcrowding. Ask what would really happen and draw out that they would move elsewhere. Emphasise that plants can't move, so don't have this option. Relate this to plants, asking what would happen if all the seeds from a plant just fell to the ground directly below the parent plant? Allow students to complete the 'Helicopter fruits' practical. Show a germinating seed. Discuss the question of what seeds need in order to germinate. Carry out the practical and leave it set up for the next lesson. Plenary - Dispersal concept map Give the pupils a concept map with the links between the boxes which will contain the key words labelled. Have a list of the key words in a box at the bottom of the page. (10–15 mins)	Teaching suggestions <ul style="list-style-type: none"> • Special needs. Hold a competition to see whose seed goes furthest. • Extension. Pupils to research the requirements for pre-chill germination and present a report. • Learning styles <i>Visual:</i> Observing the video clips and specimens. <i>Auditory:</i> Jointly planning the investigation with their peers. <i>Kinaesthetic:</i> Carrying out the practical investigation. <i>Interpersonal:</i> Group work on the practical. <i>Intrapersonal:</i> Considering the necessity for dispersal. • Functional skills link-up - ICT Create and develop charts and graphs to suit requirements, using suitable labels. (Level 1) • Homework. Pupils to write up the germination practical. Provide lower attaining pupils with a structured worksheet to fill in the required information. Include a pre-formed results table and a conclusion in the form of a cloze passage.
Learning Outcomes <i>All pupils should know</i> what the words 'dispersal' and 'germination' mean. <i>Most pupils should be able to</i> describe several mechanisms which aid seed dispersal and name the three conditions required for germination. <i>Some pupils should also be able to</i> describe in detail and link the structural details of the mechanisms to their function and show awareness of the diversity of germination conditions which different species of plants exhibit. How Science Works Describe and suggest how planning and implementation could be improved. (1.2e)	Additional teachers notes Helicopter fruits Equipment and materials required Several hundred dry sycamore or field maple seeds. Dustpans and brushes. Metre rules, tape measures, litter pickers. Optional – several sheets, one for each group, with concentric rings drawn on them like a target at 20 cm intervals. Safety Do not allow the pupils to stand on benches. Use litter pickers to hold the cups at the higher heights. Investigating germination Equipment and materials required For each group: four test tubes, labels, test-tube rack, bungs, 20 small seeds (e.g., cress), boiled water, cotton wool or Vermiculite (care regarding dust) oil, pipette.	