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|  | National curriculum | Lesson outline | Key questions | Key vocab | Factual knowledge | Scientific enquiry |
| 1/2 | • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets.• Working scientifically − Use and develop keys and other information records to identify, classify and describe living things and materials (non-statutory). | Lesson 1- Book lesson- grouping objectsIn this small step, children test everyday materials and group them based on their transparency, hardness and magnetism. They also link the properties of materials to their uses. Within younger year groups-, children have looked at these concepts but they will need to be revisited within this step. There are a variety of methods to test the hardness of materials. Testing for hardness can be comparative. Children should understand that a harder material will scratch a softer material.Children should be encouraged to group the materials they have tested in different ways based on a range of categories. It is important that children are encouraged to group the materials into more than just two groups, to challenge their understanding of the properties of materials.Lesson 2- floor book lesson- testing objects• Give children a selection of copper and silver coins.Try to ensure that some of the 5p and 10pcoins were made before 2012 and somewere made after 2012. Coins made after2012 are made from plated steel and so are magnetic.Test the coins with a magnet to see which are magnetic. Ask the children to group the coins based on whether or not they are attracted to a magnet. | • What does “magnetic” mean?• Is a magnetic material?• Are all metals magnetic?• What do the terms “translucent”, ”transparent” and “opaque” mean?• How could two materials be tested to see which one is the hardest?• Which material do you think is the hardest? | Transparent, translucent, opaque, magnetism, hardness | actual knowledge• Materials can be transparent, translucent or opaque.• A harder material will scratch a softer material.• Most metals are non-magnetic. Only a few metals are magnetic, such as iron and steel. |  |
| 3/4 | Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets.• Working scientifically − Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. | Lesson 1- Book lesson complete knowledge and create a sheet to reflect the one from white rose. In this small step, children test some everyday materials and group them based on their electrical conductivity. This step builds on the electricity block studied in Year 4. The materials will be classified as conductors or insulators.By the end of this step, children identify that conductors allow electricity to pass through them easily and can complete an electrical circuit. They should also be aware that non-conductors (insulators) do not let electricity pass through them.Children should build circuits to test whether different materials can conduct electricity. They may need to recap how to build a working circuit before completing this step. Children should only use a battery, bulb and wires in their circuit. They should draw the circuit pictorially. Conventional circuit symbols will be introduced in Year 6Lesson 2 floor book- experimentGive children a selection of materials such as plastic, wood, paper and different types of metal.Ask children to build a series circuit to test whether the different materials can conduct electricity or not. This can be done by leaving a gap in the circuit for the materials to be added in to complete the circuit.Encourage children to predict whether the material will be an insulator or a conductor of electricity before each test. | • What does “electrical conductor” mean?• What does “electrical insulator” mean?• What components are needed in a complete circuit?• Is a conductor of electricity?• How would you know that is a conductor of electricity?• Electrical wires are covered with a plastic casing. Why is plastic used? | Electrical conductor, electrical insulator, circuit, cell, bulb | • An electrical conductor is a material that allows electricity to flow through it.• An electrical insulator is a material that does not allow electricity to flow through it.• Metals are good electrical conductors.• Plastic, wood and paper are electrical insulators |  |
| 5/6 | • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets.• Working scientifically − Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. | Lesson 1- planning – Lesson 2 Experiment In this small step, children plan a comparative test to investigate which material is the best thermal insulator. Over the next three steps, children explore which material is the best at keeping hot water warm. Children learn that a thermal insulator is a material that prevents heat passing through it. They should choose three different materials, such as bubble wrap, aluminium foil and felt, to wrap around the beakers filled with hot water. Alongside this, children should have a beaker that is not wrapped in any material. This beaker provides a control that they can use to measure temperature differences against.Children have learnt how to use a thermometer in Year 4 (States of matter block) to accurately measure the temperature of water over time. However, this skill may need practising prior to the investigation. Within this step, children should create their experiment plan and identify the independent, dependent and controlled variablesEquipment needed• four same-sized beakers• aluminium foil• cloth• bubble wrap• four thermometers• hot water• stopwatch or timerPractical activity• Put children in small groups.Give each group the equipment neededfor the experiment.Children should identify what the equipmentis and why it is used within the experiment.Planning sentence stems• I predict that …I think this will happen because …• We are changing the …• We are measuring the …• We are keeping the the same | • What is a thermal insulator?• When would you need to keep something hot?• When would you need to keep something cold?• What are the independent, dependent and controlled variables in this experiment?• What equipment will you use and why?• How will you record your results? | Independent variable. Dependent variable.  |  |  |
| 7/8 | • Compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets.• Working scientifically − Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. | In this small step, children carry out a comparative test to explore which materials are the best insulators of heat. Before they begin the investigation, Lesson 1 children should be encouraged to recap their experiment plan and identify the independent, dependent and controlled variables.Lesson 2children should set up their own investigations more independently, including the control beaker. They should identify that the control beaker is one without anylayers of material insulation. They should be able to identify that having a control beaker allows them to compare the temperature change of water in an uninsulated beaker with the temperature changes of water in beakers with different types of insulating layers.Equipment needed• four same-sized beakers • aluminium foil• felt• bubble wrap• four thermometers• hot water• stopwatchMethod1. Get four beakers of the same size.2. Wrap three beakers in one layer of material – aluminium foil, felt and bubble wrap.3. Leave one beaker without insulating material to use as a control.4. Add hot water (no hotter than 50°C) to each beaker.5. Record the starting temperature of each beaker. Leave the thermometer in each beaker to avoid delays in recording the data at each interval.6. Record the temperature of each beaker at five-minute intervals.7. Repeat this process for 30 minutes.8. Ask children to identify which material is the best insulator of heat | What is a thermal insulator?• What is your experiment plan?• What is your prediction for the experiment?• Why was one of the beakers not covered in insulation?• What did you notice about the temperature of all four beakers at the end of the experiment? | Thermal insulator, thermometer, control beaker, temperature  | • When setting up the experiment, the temperature of the water should not exceed 50°C to align with health and safety regulations.• Children may think that their results are inaccurate once all four beakers have reached room temperature and the temperature in each beaker is the same |  |
| 9 | • Compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets.• Working scientifically − Using test results to make predictions to set up further comparative and fair tests | Lesson 1- Evaluate In this small step, children work scientifically to analyse data, make conclusions and evaluate the insulation experiment from Step 4. Children can use the evaluation sentence stems to structure their written analysis and evaluation.Within this step, children should use their data to explain which material was the best insulator of heat. Children should be encouraged to refer to the control beaker within their evaluation. This will allow them to make a comparison between the insulated beakers and the non-insulated beaker. Children should be given the opportunity to answer the enquiry question and discuss which material is the best insulator of heat. They should determine that the best insulating materials will slow down the warm air passing through the insulationPractical ideas• Children could extend the experiment to test whether the material that keeps the water hottest for longest is also the material that keeps ice coldest for longest.Children could wrap ice cubes in different materials and record the loss in mass after 10 minutes.The material that leads to the least loss in masswill be the best insulator.One of the ice cubes should be uncovered forcomparison.Evaluation sentence stems• I predicted that …My prediction was correct/incorrect because …• From looking at our results, I can see that …This happened because …• Our results are/are not reliable because …• To make our investigation more accurate, we could …• For future investigation, I would like to find out | • What do the results tell you about which material is the best insulating material?• If you were to repeat this experiment, how could you improve your results?• How could you make your results more reliable?• What questions do you have for further investigation? | Thermal insulator, data, temperature, conclusion, anomalous result | • |  |
| 10/11 | • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.• Working scientifically − Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas (non-statutory). | Lesson 1- Book lessonIn this small step, children look at three common materials, plastic, wood and metal, and link the uses of these materials to their properties. In this block, children have completed a variety of tests to explore electrical and thermal conductivity as well as hardness, transparency and magnetism.When thinking about the uses and suitability of materials for different purposes, children should be encouraged to use evidence from their own testing to explain why a material would be suitable or unsuitable for use.Children should identify that some materials have the same uses and all the different properties must be considered to make a justified decision on which material is best for the particular use. Sometimes, two or more of the materials can be correctLesson 2- Practical lesson- floor book lesson• Give children a selection of metals, plastics and wood.Ask them to test the properties of different materials. Example questions are listed below. Children could record results in a table.• Are they magnetic?• Are they hard or soft?• Are they flexible or rigid?• Are they waterproof?• Can they be recycled?• Are they expensive or cheap?• Can they conduct heat or electricity?Children should use their own testing and findings from previous steps when defining materials. They should be encouraged to think about when these materials would be suitable or unsuitable for a particular purpose | • What is an electrical conductor?• What is an electrical insulator?• What is a thermal insulator?• What object is this?What material is it made from?What other materials could this object be made from?• Why is a suitable material for a ?• Why would be unsuitable for a ? | Properties, wood, metal, plastic, lifespan | • Materials have specific uses.• Metals are good conductors of electricity and heat.• Plastics are good insulators of electricity |  |
| 12 |  | End of unit assessment, complete and send scored to ND for monitoring, |  |  |  |  |
| 13/14 | **NEW topic Animals including humans****• Describe the changes as humans develop to old age.****• Working scientifically – Planning different types of** **scientific enquiries to answer questions, including** **recognising and controlling variables where necessary.** | Lesson 1In this small step, children learn how humans grow and develop.They look at the six stages of the human life cycle − foetus, baby, child, adolescent, adult and elderly adult. Children briefly look at the key features of each stage of the human life cycle, but will explore each stage in more detail throughout this block.Encourage children to explore where they and other familiar people (such as teachers and family members) are within the life cycle. Children should understand that babies, children and adolescents grow rapidly in terms of mass and height. They tend to reach a peak in their growth when they become an adult. Children do not need to look at the stages of foetal development or the process of conception within this step, as this is covered in later curriculum.Lesson 2• Split the class into small groups.Give each group a stage of the human life cycle.baby0–1child2–10adolescent11–17adult18–64elderly adult65+Children could research the main changes that occur within that life stage and present findings back to the class.• Create a whole-class timeline using photos of children, staff and parents/carers, with permission.Children could discuss key features of each life stage by observing photos. | • What are the six stages of the human life cycle?• Around what age is a human described as a baby?• Around what age is a human described as a child?• In which life stages do humans grow the most?• What is the difference between a foetus and a baby?• How might a human look different as an elderly adult compared to an adult?• During which stage of the human life cycle might a human have a baby?• Where does a foetus grow and develop? | Adolescent, baby, foetus, elderly adult, adult, lifecycle | • The human life cycle has six main stages – foetus, baby, child,adolescent, adult and elderly adult.• Every human goes through the same life stages in the same order.• All humans start their life as a foetus inside their mother’s womb.• After puberty, humans can reproduce |  |