Forces and Magnets (Physics)

Year 3

End Points:

- A force is a push or a pull.
- Gravity is a force that makes objects fall to the ground.
- The effect of a force is to make something move, or change speed, direction or shape.
- We can change the amount of force we use when we push and pull things.
- Friction is the force between two surfaces.
- Rough surfaces create greater friction.
- Smooth surfaces create less friction.
- Magnetic force is an invisible push or pull force.
- When a magnet pushes an object away, we say it repels it. If a magnet pulls an object towards it, we say it attracts it.
- A lodestone is a naturally occurring rock that has magnetic properties
- A magnet has two opposite poles: the north and south pole.
- A magnetic field is the space around a magnet where the magnetic force can be felt.
- Larger magnets are often, but not always, the strongest.
- Magnetic strength can be weakened over time.

This unit introduces pupils to simple forces, including magnetism. In Year 2, pupils began learning about magnets in the unit ‘Materials and Magnets’. They began to learn that magnets attract certain metals, but that not all materials are attracted to magnets. This unit will build substantive science knowledge about how forces, such as gravity and magnetism behave.

In this unit, pupils will be introduced to forces and will firstly learn about gravity and friction. They will begin to understand the concept that scientists draw conclusions about things they cannot see, like forces, from looking at the effects they have. For example, we cannot see gravity, but we can see a ball fall to the ground when we drop it. Pupils will learn that Sir Isaac Newton was a scientist who thought about why things fall when dropped and developed lots of ideas about the force of gravity. This will help pupils to develop their disciplinary knowledge, considering how scientists observe and reflect on what they notice before suggesting theories.

In the second lesson, pupils will learn about the force of friction. They will compare how things move on different surfaces by investigating how a toy car moves down a ramp. They will select different materials to place on the ramp to see how it affects the car’s ability to move down the ramp. They will learn that friction is a contact force, where two objects touch, but gravity is a non-contact force as it can act upon an object alone.

Moving through the unit, pupils then build on their prior knowledge of magnets from Year 2. They will observe how magnets attract or repel each other and attract some materials and not others. They will compare and group materials on the basis of whether they are attracted to a magnet and will identify magnetic

materials. Pupils then learn about the poles of a magnet and will think about whether two magnets will attract or repel each other, depending on which poles are facing.

In the final lesson, pupils will work scientifically to test the strength of different magnets. They will learn that generally, larger magnets are stronger than smaller magnets that are made from the same material, however this is not always the case. Pupils will learn that heating a magnet to high temperatures can weaken its magnetic force. They will then test the strength of the magnets they have in the classroom and record their findings.

Finally, there are some short assessment tasks suggested and an optional extended writing task that requires pupils to explain what they know about forces and magnets.

Lesson Sequencing:
In lesson one, pupils will learn what a force is: a push or pull. Lesson two will develop this knowledge as it looks at friction. This knowledge will be developed even further in lesson three when pupils learn about magnetism as an invisible force. Lesson four will build on lesson three by looking at the poles of magnets and what a magnetic field is. In lesson five, pupils will investigate whether the size of a magnet has any correlation with the strength of its magnetic field. In the assessment lesson, pupils will either explain whether statements are true or false, or write a response to the statement 'invisible forces cannot be real'.

Misconceptions:
- Heavier objects fall faster as they have more gravity acting on them
- Forces always act in pairs which are equal and opposite
- A stationary object has no forces acting on it
- A moving object has a force pushing it forwards and it stops when the pushing force runs out
- Smooth surfaces have no friction
- Objects always travel better on smooth surfaces
- The bigger the magnet, the strong it is
- All metals are magnetic

Working Scientifically criteria met in this unit:
- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.