# SS John Fisher & Thomas More Catholic Primary School

**A Voluntary Academy**

"Journeying together with Jesus Christ, we learn to love and love to learn."

Science Planning

| **Year Group:** Year 3 & Year 4 | **Topic:** Forces and Magnets | **Term:** Spring 1 (Cycle A) |
| --- | --- | --- |

**National Curriculum Links** (Ref: NC 2014)

Pupils in Key Stage Two should be taught to:

- compare how things move on different surfaces
- notice that some forces need contact between two objects, but magnetic forces can act at a distance
- observe how magnets attract or repel each other and attract some materials and not others
- compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials
- describe magnets as having two poles
- predict whether two magnets will attract or repel each other, depending on which poles are facing.

**Working scientifically** (LKS2 objectives)

5 types of scientific enquiry: Pattern seeking, research, observations over time, identifying & classifying, comparative and fair testing.

- 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 and a range of equipment
- 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
- use straightforward scientific evidence to answer questions or to support their findings.

<u>Global Goal</u>

These global goals would be perfect to fit with this unit of learning.

7 AFFORDABLE AND CLEAN ENERGY — THE GLOBAL GOALS

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE — THE GLOBAL GOALS

12 RESPONSIBLE CONSUMPTION AND PRODUCTION — THE GLOBAL GOALS

| Knowledge and Skills Objectives | Activity | Differentiation |
| --- | --- | --- |

# SS John Fisher & Thomas More Catholic Primary School

A Voluntary Academy

"Journeying together with Jesus Christ, we learn to love and love to learn."

Science Planning

| | | |
|---|---|---|
| Lesson One<br>I know that some forces need contact between two objects.<br><br>Working Scientifically<br>I can use scientific language to explain how I am able perform tasks using a contact force. | Create a mind-map of what they already know about magnets and forces.<br><br>Hook: Discuss what children already know about forces & magnets from their experiences in KS1, Create a mind map on the whiteboard with their ideas.<br><br>Starter Question:<br>Ask the children what a force is? Children talk to their shoulder partner to discus and attempt to explain it in as much detail as possible. Gather ideas from the group.<br><br>**Teacher input:** Explain that a force is an action on an object which allows it to move or change. Demonstrate using a force to move a pen to the end of a table. Explain the steps involved when using that force.<br><br>Children are then shown images of push and pull forces, can they identify the differences? Guide to children to understand that a **push** force is an object mover further away and a **pull** force is an object moving closer.<br><br>Show a video explaining push and pull and how applying more or less force causes and object to speed up or slow down. https://www.bbc.co.uk/bitesize/clips/zch4wxs<br><br>Introduction:<br>Explain that today we are going to focus on **contact** forces. Ask children what we mean by the word 'contact'? Can they think of examples of when we use contact and how this word applies to force? Can children think of examples of when we might use a push or pull contact force?<br><br>**Teacher input:** Ensure children understand that contact forces work between two objects that are physically touching. Ask children if they can understand what a non-contact force could be?<br><br>Task 1:<br>With their shoulder partner, children carefully look around the classroom and find examples of pushing and pulling using a contact force. How many examples can they | Initial Assessment:<br>Create a mind map<br>SEN- Create a mind map with support.<br>Year 3- Create a mind map with images and words.<br>Year 4- Create a mind map with images and more detailed explanations.<br><br>Task 1:<br>**LA –** Are able to explain if their action is a pull or push force<br>**MA/HA –** Explain in more detail about the force being used. What are the two objects involved? (e.g hand and door handle). How did we apply the force?<br><br>Task 2:<br>**LA –** Are able to place push and pull forces into two categories with limited support.<br>**MA/HA –** Once organised into push and pull, can children explain how each force is being applied in detail, using correct scientific terminology?<br><br>Challenge:<br>Think about the pulling and pushing examples we found around the classroom.<br><br>Can you write a sentence about the contact force you would need to use used and how this is being applied? |

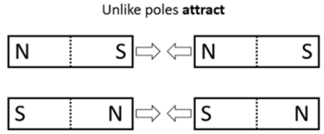
Science Planning

| | | |
|---|---|---|
| **Resources**<br><br>• Images of push and pull examples<br>• Venn diagram | find? Provide them with a whiteboard between them to record ideas. (Light switches, doors, hand sanitiser bottle etc). Children then share their ideas and explain in detail what they did. What were the two objects that physically touched? What force was used?<br>**Teacher input:** Get a child to demonstrate using a force e.g opening a door. Ask children to explain what objects are making contact and the force being used.<br><br><u>Task 2:</u><br>Children are to place images into categories of Push and Pull. Think carefully about the actions involved in these images.<br>Are there any you could include in both categories?<br>Children use a Venn diagram to sort their push and pull forces into categories. | **Plenary**<br><br>Reinforce todays lesson. Ensure children can define what a force is and the key difference between a contact force and a non-contact force. |
| <u>Lesson Two</u><br>I can compare how things move on different surfaces.<br><br><u>Working Scientifically:</u><br>• Carrying out a fair investigation.<br>• Recording results and using simple scientific language. | <u>Hook:</u> A range of materials to compare the effects of friction.<br><br>Recap:<br>Ask children is a contact force? Can they think of examples from last week?<br>**Teacher input –** Ensure children remember a contact force requires tow objects to be physically touching.<br><u>Starter Question:</u><br>Ask children what is friction? Children talk to their shoulder partner and share ideas with the group.<br>**Teacher input –** Explain that friction is a force between two objects that are sliding, or trying to slide, across each other. For example, if you try to push your shoe along the floor, friction makes this difficult. Ensure children understand how this links to our lesson on contact forces.<br><br><u>Introduction:</u><br><br>Show children a video on the effects of friction on a ski slope:<br>https://www.bbc.co.uk/bitesize/topics/zsxxsbk/articles/zxqrdxs<br><br>**Teacher input**: Explain how friction produces heat. Ask children to rub their hands | <u>Task 1</u><br><br>**<u>LA:</u>** Children are supported more in their predictions for the experiment.<br>**<u>MA/HA</u>**<br>Make a prediction explaining in detail why they have made this prediction using key scientific vocabulary.<br>Make a conclusion based on their findings. Were they correct? What have they learnt from their investigation?<br><br><u>Challenge:</u><br><br>Find more examples of friction and explain how this force in the opposite direction of motion. |

| | | |
|---|---|---|
| **Resources**<br><ul><li>Table chart to record results</li><li>Sandpaper, bubble wrap, corrugated cardboard, cardboard, tin foil, towel</li><li>Hairdryer</li><li>Toy car</li></ul>Measuring tape | together quickly, demonstrate how when 2 objects work against each other, the friction produces heat, this is why our hands warm up when we rub them! Ask children to think about how friction is being applied here.<br><br>Ask children to talk to their partner to explain why friction is so important and how we need it in everyday life. Get them to think of examples (eg, grip on shoes against the floor, bike tyres slipping off the road)<br>**Teacher input:** Explain how friction is a force that works in the opposite direction of motion. Friction either stops or slows motion.<br><br>Task 1:<br><br>Toy car investigation<br>Explain that as scientists investigating friction, we need to compare how objects move on different surfaces. Explain that we will use a toy car and hairdryer to see how it travels over various materials and the effect friction has on these materials. Create a method with the children to see how we could investigate this. Consider how we could make this a fair test?<br>Test the car on sandpaper, towel, tin foil, corrugated cardboard, cardboard and bubble wrap and measure the distance covered on each.<br>Explain to children that we will be investigating to see which surface creates the most friction against a toy car. Allow children to see each material and have a quick feel before they make their predications.<br>Children make predictions in their journals on which surface will cause the most amount of friction and the least amount of friction?<br>Give each table a material which they will be in charge of setting up. Each table gets a chance to set up part of the experiment.<br>**Teacher Input:** Make sure to encourage the use of scientific vocabulary in predictions and conclusions. (Friction, force, coarse, motion) | |
| Lesson Three<br>I can **compare, group and identify** everyday materials on the basis of whether they are attracted to a | Hook:<br><br>Starter Question:<br>Ask the children; | Task 1<br>SEN:<br>Year 3:<br>Year 4: |

| | | |
|---|---|---|
| magnet.<br><br>Working Scientifically:<br><br>**Resources** | Introduction:<br><br>Task 1 | Challenge:<br><br>**Plenary** |
| Lesson Four<br>I can **explain** how magnets work.<br><br>Working Scientifically<br>I can make systematic and careful observations.<br><br>I can record findings using simple | Hook: a range of magnets<br><br>Starter Question:<br>Show the children both ends of a magnet.<br>Ask the questions;<br>*What will happen when I put these two magnets together?*<br>*Do both ends of a magnet act in the same way? If not, why not?*<br>Children to discuss with their Talking Partner before discussing as a whole class. | Task 1<br>Make a compass.<br>Everyone<br>Take photographs of the children observing the compass modelled. Stick photographs in the book following the activity. Children to write a sentence about what a compass is and how it works. |

Science Planning

| | | |
|---|---|---|
| scientific language, drawings and labelled diagrams | <u>Introduction:</u><br>Explain what a magnet is:<br>'Magnets are pieces of metal or rock with an invisible power to attract special kinds of metal. That power is called a force. In nature, a force is something that causes a push or a pull. Magnetism is the force that makes a magnet stick to your refrigerator.<br>Magnetism is at work all around you'.<br><br><u>Task 1:</u><br>Give children two bar magnets or so that they can explore what happens when magnets are placed near one another. What do they notice?<br><br>Discuss with the children;<br>'One end of a magnet is called '**North Pole**' and the other end is called '**South Pole**'. These names are used because if you hang a magnet from a thread, the magnet's North Pole points (almost) towards the north direction. This is because the **Earth's core** (its centre) is a large magnet. It is made up of the metals **nickel** and **iron**. Your little magnet lines up with **Earth's magnetic core**, and so points north'.<br><br>Give the children a compass to look at and explore if they can find north. Model how magnetic Earth works by either tying some string around a magnet or make a compass following the instructions attached.<br><br><u>Task 2:</u> | **WAGOLL**<br>A compass is a tool used for finding direction. A magnetic needle on a pivot spins freely until it finds north. It points north because it lines up with Earth's lines of magnetic force.<br><br><u>Task 2:</u><br>Record understanding of attracting and repelling<br><u>SEN:</u><br>Children to complete sentences and to identify which magnets show attracting and repelling.<br><u>Main Task:</u><br>Children to draw two magnets repelling and two magnets attracting. Children to explain what is happening.<br><br>**WAGOLL:**<br>Magnets have two poles. One called the North Pole and one called the South Pole.<br>When opposite poles are near one another, they pull together. This means the two poles attract.<br>Unlike poles **attract**<br><br><br>When two poles the same are near one another, they push away from one another. This means |

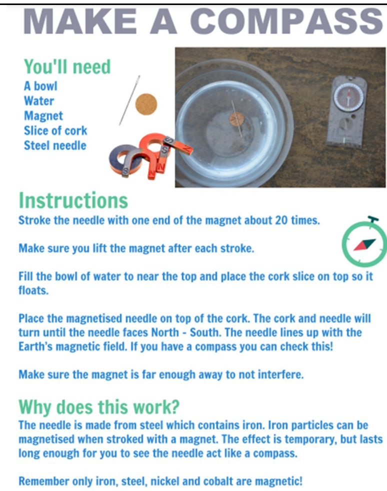
SS John Fisher & Thomas More Catholic Primary School

A Voluntary Academy

"Journeying together with Jesus Christ, we learn to love and love to learn."

Science Planning

Next, introduce the terms; **repel** or **repulsion** and **attract**.
Explain;
'If you hold two magnets the *wrong way* around, they push apart - they **repel**! In other words, if you hold two magnets together so that like-poles are close together (two norths OR two souths), they repel. It feels like the magnets are surrounded by an invisible rubber layer pushing them apart. That **invisible** layer is called a **magnetic field**.
It's only when you hold unlike-poles together (a north pointing to a south) that magnets stick together. This is called **attract**. Now, the magnetic field acts like a stretched rubber band pulling the magnets together'.

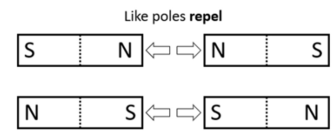



Give the children a variety of magnets (bar/wand/marbles/horseshoe) and continue to explore further. Can they feel the magnets attracting or repelling? Encourage the children to talk to one another to discuss what is happening and why.

Then watch this video to support understanding.
[https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zpvcrdm](https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zpvcrdm)

Task3:
Give children 3 different types of magnets; a bar, a horseshoe and a round magnet. Get the children to explore them and ask them which one is the odd one out?

the two poles repel.

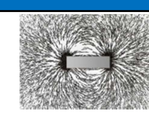



Task 3:
Which magnet is the odd one out?
SEN: Record the children's thinking onto Post-It notes and stick into book.
Main Task:
Children to draw the three magnets into their books, and explain which one they think is the odd one out and why.

Challenge:
Research about magnetic Earth; Draw a diagram of magnetic field lines around the Earth.

## Plenary

Show the children iron filings. Model what happens when you scatter the iron filings around the magnet. Explore with different shaped magnets.



## Resources

A variety of magnets
String

SS John Fisher & Thomas More Catholic Primary School

A Voluntary Academy

"Journeying together with Jesus Christ, we learn to love and love to learn."

WYTHENSHAWE CATHOLIC ACADEMY TRUST

DEUS PRIMUS

Science Planning

| | | |
|---|---|---|
| Slice of cork<br>Needle<br>Bowl of water | When children are exploring the magnets, encourage them to use scientific vocabulary; north pole, south pole, attract and repel. | Then go to Word Wall website and play the following activity. [https://wordwall.net/en-gb/community/quiz-magnets-and-magnetism](https://wordwall.net/en-gb/community/quiz-magnets-and-magnetism)  |
| **<u>Lesson Five</u>**<br>I know that some forces need contact between two objects but magnetic forces can act at a distance.<br><br><u>Working Scientifically</u><br>I can set up a simple enquiry.<br><br>I can make systematic and careful observations.<br><br>I can gather, record, classify and present data in a variety of ways to help in answering questions.<br><br>I can record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. | <u>Hook</u>: a variety of magnets<br><br><u>Starter Question</u><br>Ask the children ;<br>*How can you make something move without touching it?*<br>Get the children to discuss with their Talking Partner before discussing as a whole class.<br><br><u>Introduction:</u><br>Give the children some paper clips and asked to think about how they can make it move without touching it.<br>Have some magnets close by. Observe the children as they investigate this. The children will probably place the magnet close to paper clips and see them quiver and possibly pull towards the magnet. Once they have done this, ask them if they can move the paperclips over a greater distance, still without touching the paperclips. The aim is for the children to place a magnet under a piece of paper or the table to move the paper clips from one place to another. Allow the children to problem solve – if they are not realising that they could place an object between the magnet and the paper clips, offer the suggestion.<br>*take photographs of children doing this, and listen into the discussions. Record some of the children's ideas onto flip chart paper or post-it notes to reflect on as a whole class later. | <u>Task 1</u><br>Magnetism is an invisible force<br><u>Everyone:</u> Stick in an image of children exploring magnetism and then children write a sentence or paragraph about magnetism is an invisible force.<br><br>**WAGOLL**<br>*A magnet has an invisible power or force that attracts special kinds of metal. All magnets have an invisible magnetic field around it, and if a magnetic object enters this magnetic field, it is pulled towards the magnet.*<br><br><u>Task 2</u><br><u>SEN:</u><br>Children to write a simple prediction and conclusion with support.<br><u>Main Task</u><br>Children to write a prediction, complete a table of results and write a conclusion. |

**SS John Fisher & Thomas More Catholic Primary School**

**A Voluntary Academy**

"Journeying together with Jesus Christ, we learn to love and love to learn."

Science Planning

I can report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.

I can use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.

Task 1:

Discuss:

'Magnetism is an invisible force.

In order for the magnet to move, they had to place the magnet under a material to make it move. The paperclip wasn't touched by them. The invisible force moved it.'

Explain to the children that they are going to make a magnetic track or maze to explore the invisible force of magnets. You could provide the children with magnetic tracks or invite the children to make their own.

Remind the children that a magnetic force can work through solid materials, so with a strong magnet under the table you will be able to move your magnet items along the track as if by magic!

Get the children to challenge one another by;

- Moving their magnetic item all the way along the track without touching the sides
- Getting to the end in the fastest time
- Racing with someone else
- Chasing someone else, e.g. cat and mouse

*take further photographs of the children exploring magnets.

Children to write about magnets being an invisible force in their book.

Task 2:

Ask the children if they think all materials will allow the invisible force of a

**WAGOLL**

Prediction:

I think the invisible force will attract only through some of the materials. I don't think the force will travel through the mug because the centre of the mug is hallow and wide. I do think the force will travel through the tinfoil because tinfoil is made of metal.

Method and results:

| Name of object | Main material (if known) | Is the paperclip still attracted to the magnet? | |
|---|---|---|---|
| | | Predict | Measure |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Conclusion:

I found out that not all materials allowed the magnet's invisible force to travel through it. I think this happened because some materials are thicker than others, such as, the wall is thicker than paper. If the paper was a thick as the wall, I don't think the invisible force would be able to travel through it.

If I was going to do this investigation again, I would have to make it fair. I would do this by having the same thickness of materials.

Challenge:

Children to think about if the size of the

| | | |
|---|---|---|
| | magnet to work through it. Generate children's hypothesis & record on w/b paper.<br><br>Explain to the children that we are going to investigate this. Show the children 10 materials e.g. tinfoil, school jumper/cloth, a ruler/plastic lid, a workbook/thick card, wipe-board, table, plastic chair, the classroom wall, a classroom window, a teachers mug, water etc.<br>Invite the children to predict whether a magnet could hold the paperclip in place from the other side.<br><br>Children to complete the table and write about their thinking.<br><br>Next, discuss the method.<br>1) Place the magnet on one side on an object.<br>2) Place the paper clip on the other side of the object.<br>3) Lift up the object with the magnet on the top - does the paperclip fall away from the object?<br><br>Following the task, discuss with the children what they have found out and why. Children to write a conclusion in their books. | magnet is important?<br>Explain.<br><br>**Plenary**<br><br>Ask the children how many pieces of paper they think a magnet's force will work through? Children to offer predictions.<br><br>Go through this together to find out. |
| **Resources**<br><br>Loads of metal paper clips<br>Mazes or tracks<br>Split pins<br>Paper<br>Variety of magnets<br>Objects for the investigation<br>Iron filings | | |
| Lesson Six<br>I know that some forces need contact between two objects but magnetic forces can act at a | Hook: loads of paper clips in a chain, a box of paper clips, magnets<br><br>Starter Question:<br>Give the children Yes and No questions about magnets. In small groups, children to | Task 1<br>Making paper clip fly.<br>All children:<br>Take a photograph of the children doing this. |

| Name of object | Main material (if known) | Is the paperclip still attracted to the magnet? | |
|---|---|---|---|
| | | Predict | Measure |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

distance.

Working Scientifically:
I can set up a simple enquiry.

I can make systematic and careful observations.

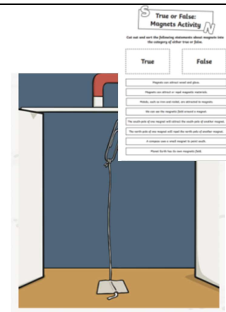
I can gather, record, classify and present data in a variety of ways to help in answering questions.

I can record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.

I can report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.

I can use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.

sort them. Discuss them as a whole class.




Introduction:
Ask the children.
*Can you make a paper clip float in the air?*
Discuss with Talking Partners before discussing as a whole class.

Task 1:
Give them all a paper clip, and invite them to try and make it float in the air. Invite the children to suggest how they could do this, and test out some of their hypothesis. If the children are not forthcoming with ideas on how to do this, present them with other materials e.g. tape, string etc.

In order to make the paperclip float, the children will need to:
1. Tie a length of cotton thread to a paper clip.
2. Tape the end of the thread to the table.
3. Hold a magnet above the paper clip.
4. Can you make the paper clip hover above the table? (see diagram)

Task 2:
Explain to the children that they are going to investigate which magnet is the strongest – Which magnet can pull the longest paper clip chain?

Method:
1. To measure the strength of each magnet, you will hold a paper clip to a magnet so that it is attracted to it.

Task 2
Strongest magnet investigation
SEN:
Support children with the writing of their prediction and their conclusion. Children to use pre-labelled tables and graphs to support them in completing the tasks.
Main Task:
Children to write a prediction, complete a table and graph, and write a conclusion.

**WAGOLL**
Prediction:
I think the horseshoe magnet will be the strongest magnet because its poles are close together. I think the closer the poles are, the stronger the magnetic field is.
I think the magnet with the hole in it will be the weakest magnet because it has a gap in the magnetic field.

Method and results:

| Type of magnet | Number of Paper Clips Attracted in a Chain |
|---|---|
| | |
| | |
| | |
| | |
| | |

SS John Fisher & Thomas More Catholic Primary School

A Voluntary Academy

"Journeying together with Jesus Christ, we learn to love and love to learn."

DEUS PRIMUS

WYTHENSHAWE CATHOLIC ACADEMY TRUST

Science Planning

2. You will then hold another paper clip to the first one to see if it is also attracted to the magnet, through the first paper clip.
3. Keep adding paper clips in a chain, until no other paper clips are attracted in the chain.
4. Keep a record of how many paper clips were in the chains for each magnet.
5. The magnet with the longest chain of paper clips is the strongest, as its magnetic force can pull the paper clips over the longest distance.

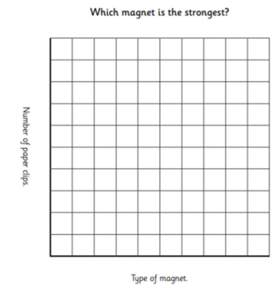
Show the children the magnets for investigating. Invite the children to predict which magnet they think will be the strongest/weakest and why. Model how to write a predictions before the children write one in their journals.

Next, the children complete the investigation completing a table to show their results. The children can go onto completing a graph to show the results. This can be done as a bar graph.

*take photographs of the children conducting this investigation.

Then, discuss what the children have found out. Model how to write a conclusion before the children write a conclusion in their book.

Stick in image of the children investigating this to be stuck into books too.




Conclusion:

I found out that the __________ was the strongest and the __________ was the weakest.

I was surprised that the ______ magnet held _____ paper clips.

I think this happened because ____________.

Challenge;

The children know some coins are magnetic and some are not. Challenge the children to make a penny pyramid. Can they get the highest total amount of money attracted between 2 magnets?

Plenary

SS John Fisher & Thomas More Catholic Primary School

A Voluntary Academy

"Journeying together with Jesus Christ, we learn to love and love to learn."

Science Planning

| | | |
|---|---|---|
| **Resources**<br><br>Paper clips<br>Tape<br>String<br>A variety of magnets<br>Tables and graphs templates | | Consolidate all learning in forces and magnets.<br><br>Here are some video's you can watch.<br>https://youtu.be/yXCeuSiTOug<br><br>https://www.bbc.co.uk/iplayer/episode/b081m9q1/maddies-do-you-know-series-1-21-magnets-and-teddy-bears |

**Applied Write Opportunities:**
Write a non-chronological text about the jobs of magnets and how they help us.

**Enrichment Opportunities:**
Visit the tip and watch the large magnets sort the rubbish.

**Key Vocabulary**

**Tier Two:** magnet, magnetism, North, South, metal, rock, invisible, force, magnetic field, weak, strong, power, material,

**Tier Three:** attract, repel, repulsion, poles, copper, iron, nickel, steel, prediction, method, conclusion, hypothesis, results,

SS John Fisher & Thomas More Catholic Primary School

A Voluntary Academy

"Journeying together with Jesus Christ, we learn to love and love to learn."

Science Planning