Science

Year 7: Static Electricity and Magnets

Assessment Opportunities	Literacy/Reading opportunities	CEIAG Links
• Regular low stakes quizzing of AO1- self marked. • In class past paper questions where – self / peer marked • Extended writing is teacher marked with personalised feedback provided. • End of unit assessment self & teacher marked with collective feedback provided.	**Reciprocal reading:** The discovery of magnetism **Key vocab is highlighted in the SOL**	**Spotlight on careers:** Electrical Engineer Other careers: • Physics teachers • Research scientist • Electronics technician • Renewable energy engineer

Curriculum vision:

"Our aim is to deliver a curriculum that is inclusive, relevant and progressive for all learners."

KS3 Static Electricity and Magnets

Big Picture:
This unit on static electricity and magnetism provides students with a foundational understanding of how magnetic and charged objects interact, how objects interact when placed inside electrostatic and magnetic fields and provides a basic introduction to electricity before exploring this idea later in 'Electricity in Circuits'. The knowledge and skills acquired in this unit are not only essential for academic progression but also highly relevant to understanding and addressing real-world issues posed in advancing technology.

Lesson sequence	**Learning outcomes / Key knowledge (including NC KS3)** Interleave / review Scaffold	**Skills development:** Reading / writing / data / numeracy / graph work	**Spec / book reference**

1. **TBAT:** Describe how charged objects interact.	• **Understand the separation of positive or negative charges when objects are rubbed together, including the transfer of electrons, as well as exploring the forces acting between charged objects.**
	• Separation of charges using friction
	• Movement of electrons and the effect on the charge of an object
	• Forces between charged objects (repulsion, attraction)
	  ○ Friction
	  ○ Use visual aids like diagrams and videos.
	  ○ Use hands-on activities to fully engage students.
		• **Describe** the process of charge separation.
		• **Predict** the behaviour of charged objects (attraction and repulsion).
		• **Justify** predictions and observations by commenting on forces between charged objects.
			Spec NC pos here pg12
			Boost book 3 pg 138-153

2. TBAT: Describe electrical fields around charged objects.	• **Understand the idea of electric fields and the presence of forces acting across the space between objects not in contact.**
	• What is an electric field?
	• Non-contact forces
	  ○ Friction
	  ○ Use visual aids like diagrams and videos.
	  ○ Use of interactive simulations for visualisation
	  ○ Use hands-on activities to fully engage students, such as practical demonstrations/experiments to experience the non-contact forces.
		• **Describe** the forces between objects not in contact.
		• **Draw** diagrams to represent electric fields.
		• **Explain** the concept of electric fields using correct scientific terminology.
			Spec NC pos here pg12
			Boost book 3 pg 138-153

3. TBAT: Describe and explain the function of a Van de Graaff generator.	• **Understand the function of a Van de Graaff generator and explain the effect on various objects.** ○ Friction ○ Attraction and repulsion ○ Provide thorough, hands-on demonstration and time to use the piece of equipment. ○ Use of sentence starters ○ List of subject specific terminology ○ Effective planning time before beginning the piece of writing.	• **Writing at ASTN** Function of a Van de Graaff generator	**Spec NC pos here pg12** **Boost book 3 pg 138-153**
4. TBAT: Describe how magnets interact with different materials.	• **Understand magnetic poles, forces of attraction and repulsion. Explore how magnets interact with different materials.** • North and south poles • Attraction and repulsion between magnets • Interaction between magnets and different materials • Identify the three magnetic metals and alloys as mixtures of magnetic metals ○ Non-contact forces ○ Attraction and repulsion ○ Provide real samples of materials for hands on demonstrations ○ Using visual aids to illustrate interactions between magnets and different materials	• **Describe** the interaction between magnets and different materials. • **Compare and contrast** the interactions of magnets with different materials, identifying patterns and trends. • **Evaluate** the effectiveness of various materials in influencing magnetic interactins.	**Spec NC pos here pg12** **Boost book 3 pg 138-153**
5. **TBAT:** Engage with a scientific article	• **Explore the discovery of magnetism and magnetic materials, as well as the creation and use of magnetic fields using electromagnets.** ○ Non-contact forces ○ Circuit based electricity ○ Reading rulers, tracking as teacher reads ○ Larger text chunked as needed. ○ Modelling highlighting & annotation of text	• **Reciprocal reading** The discovery of magnetism	**Spec NC pos here pg12** **Boost book 3 pg 138-153**

6. **TBAT:** Use a compass to visualise the magnetic field around a bar magnet.	• **Explore the concept of magnetic fields by plotting field lines using a compass.**
	
	• Visualisation of magnetic fields using compass and bar magnets
	• Plotting magnetic fields using compass and bar magnets
	• Representation of magnetic fields using field lines
	
	  ○ Field line diagrams
	
	  ○ Large scale visuals and use of visualiser for demonstrations
	  ○ Hands on exploration
		• **Draw** and represent fields around a bar magnet using a compass.
		• **Predict** the behaviour of a compass needle when placed inside a magnetic field.
			Spec NC pos here pg12
			
			Boost book 3 pg 138-153

7. **TBAT:** Describe how the Earth is surrounded by a magnetic field	• **differences between species**
	• **the variation between individuals within a species being continuous or discontinuous**
	• **to include measurement and graphical representation of variation**
	• Methods of data collection (e.g., surveys, observations, measurements).
	• Data presentation techniques (e.g., charts, graphs).
	
	  ○ Composition of the Earth
	  ○ Compass behaviour inside magnetic fields
	  ○ Magnetic poles
	
	  ○ Interactive maps to visualise Earth's magnetic field
	  ○ Use of simplified readings and illustrations for greater understanding
		• **Describe** the characteristics of Earth's magnetic field and its relevance to navigation.
		• **Label** key components of the Earth's magnetic field.
		• **Measure** the direction of the Earth's magnetic field at different positions, and relate this to navigation.
			Spec NC pos here pg12
			
			Boost book 3 pg 138-153

8. **TBAT:** Describe how to make and test an electromagnet.	• **Explore the magnetic effect of a current, understand the principles of an electromagnets and their uses, and learn how to make and test one.**
	• Magnetic effect of a current carrying wire
	• Principles of electromagnets
	• Uses of electromagnets
	• Procedures for making and testing electromagnets
	
	  ○ Circuit building
	  ○ Non-contact forces
	  ○ Field diagrams
		• **Describe** the process of making electromagnets.
		• **Plan** an appropriate method to build and test an electromagnet.
		• **Plot** a diagram to demonstrate the change in shape of magnetic fields from wire to coil.
			Spec NC pos here pg12
			
			Boost book 3 pg 138-153

	○ Large scale visual demonstrations		
9. **TBAT:** Investigate ways to alter the strength of an electromagnet.	• **Explore methods to change the strength of an electromagnet and understand the factors influencing its magnetic properties.** • Factors affecting the strength of an electromagnet • Methods to alter the strength of an electromagnet ○ Magnetic effect of current carrying wire ○ Circuit building ○ Field diagrams ○ Lab safety protocols ○ Use images & dual coding ○ Provide access to key terms & definitions ○ Dual coded methods ○ Large scale demonstrations	• **Evaluate** and analyse the effectiveness of different methods altering the strength of an electromagnet. • **Suggest** methods for altering the strength of an electromagnet. • **Explain** the impact of each method on altering the strength of an electromagnet, using correct terminology.	**Spec NC pos here pg12** **Boost book 3 pg 138-153**

Vocab	**Links to previous learning / interleaving**	**Assessment & homework**

L3 Vocab Electric field Magnetic field Magnetism Field line Force Attraction Repulsion Magnetic pole Electromagnet Solenoid Electron	**L2 Vocab** Change Similar Different Device Property Strength Permanent Temporary Navigation Region Flow Charge	**Command words focus** Label Plot Measure Predict Identify Estimate Observe Justify Evaluate Compare construct	**KS3** ○ Energy ○ Forces (contact and non-contact) **KS2** ○ Properties of materials ○ Simple circuits ○ Earth and Space ○ Simple forces and motion ○ Observation and data collection	• Regular low stakes quizzing of AO1 • In class assessment of AO1, AO2, AO3 using past paper questions where appropriate • Written word is assessed with personalised feedback provided. • End of unit assessment marked with collective feedback provided. Homework is set weekly and is outlined in the half-termly homework booklet. Homework includes • online quizzes on Carousel • Learning of content for in-class quizzes • Completion of written questions.

Independent learning BBC Bitesize KS3 – Static Electricity Static electricity - BBC Bitesize BBC Bitesize KS3 – Magnetism Electromagnetism and magnetism - KS3 Physics - BBC Bitesize YouTube Revision Monkey KS3 Static Electricity: https://youtu.be/Kqm26J0-j0Y?list=PLyf3QQ9ddzgngBzZiwWcEBuRoKUYaXS6N Magnets and Magnetic Fields: https://youtu.be/av7VrSezpHg?list=PLyf3QQ9ddzgngBzZiwWcEBuRoKUYaXS6N Electromagnets: https://youtu.be/BqmYvROFGr0?list=PLyf3QQ9ddzgngBzZiwWcEBuRoKUYaXS6N Using Electromagnets: https://youtu.be/Nb25_foS9Mg?list=PLyf3QQ9ddzgngBzZiwWcEBuRoKUYaXS6N	**Misconceptions / common errors** • Opposite charges attract, but like charges do not repel. • All metals are magnetic. • Magnets only attract iron. • Magnetic fields only exist around magnets. • Electricity and magnetism are unrelated. • Electromagnets work only with alternating current, not direct current. • Earth's magnetic field is static and unchanging. • The strength of an electromagnet depends only on the number of turns in the coil. • Electric fields only exist in the presence of visible electrical devices.

	• All forces between magnets are attractive.