

Part 1 What is a model?

Activity No	Activity Name	Lesson type	Activity Description
1.1	What is a scientific model?	Engage	Students make a cup-and-string telephone and decide which of three models presented as student ideas explains the phenomena. The digital activity invites students to compare and evaluate the usefulness of models.
		Hands-on & Digital	
		Medium	
1.2	Recapping the particle model	Explore & Explain	Students revisit a number of situations that involve using the particle model to show understanding of phenomena such as elements and states of matter. They use an interactive simulation to explore states of matter and phase changes.
		Classroom & Digital	
		Medium	
1.3	Conduction	Explore & Explain	Students will use the Predict-Observe-Explain strategy to investigate the differences in thermal conductivity of metals. Students use the particle model to explain their general observations about conduction.
		Hands-on	
		Short	
1.4	Convection	Explore & Explain	Students practically explore the phenomena of convection and use the particle model to explain their observations.
		Hands-on	
		Short	
1.5	The wave model	Explore & Explain	Students explore producing pulses and waves on rope and a slinky before using a simulated string to investigate waves. Students are introduced to amplitude, frequency, wavelength, velocity and the wave equation.
		Hands-on & Digital	
		Medium	
1.6	Using models	Evaluate	A formative assessment to look for misconceptions about models. Students convey their understanding of the particle and wave models through a quiz covering states of matter and kinetic theory, diffusion, conduction, convection, and the wave model.
		Classroom	
		Short	

Optional

Part 2 Charged particles

Activity No	Activity Name	Lesson type	Activity Description	
2.1	Static electricity	Engage & Explore	Students will explore a quick discrepant event involving charged balloons and will then consider the phenomena of grounding through a simulation.	Optional
		Digital & Hands-on		
		Short		
2.2	Charging objects	Engage, Explore & Explain	Students explore the way that charged objects interact, and collect evidence for the existence of two types of charge.	
		Hands-on		
		Medium		
2.3	Conductors and insulators	Engage & Explore	Students investigate the production of light by building electric circuits. They will discover the difference between insulators and conductors.	
		Hands-on		
		Short		
2.4	Current	Engage & Explore	Students will learn how to use ammeters whilst exploring the difference between series and parallel circuits. There is a digital component to consolidate their learning.	
		Hands-on & Digital		
		Medium		
2.5	Bright lights	Explore	Students will investigate how the brightness of a globe changes in a circuit with a variable resistor.	
		Hands-on		
		Short		
2.6	Voltage	Engage & Explore	Students will learn how to use voltmeters whilst consolidating their understanding of the difference between series and parallel circuits.	
		Digital & Hands-on		
		Medium		

Activity No	Activity Name	Lesson type	Activity Description	
2.7	Ohm's Law	Explore & Explain	Students explore the $V = I R$ relationships of wires, globes and diodes.	
		Hands-on		
		Medium		
2.8	Test me	Evaluate	Students will use the models presented in Part 1 and Concept Mapping to explore their understanding of electricity. This is followed by an online formative assessment test.	Optional
		Digital & Classroom		
		Medium		

Part 3 How is sound transmitted?

Activity No	Activity Name	Lesson type	Activity Description	
3.1	Bang, bang!	Engage, Explore & Explain	Students explore making sounds with simple equipment in the laboratory and locate sounds while blindfolded. Students are introduced to longitudinal waves and explore sound waves by varying their frequency, amplitude and wavelengths. They watch and listen to a bell ringing in the absence of air.	
		Hands-on & Digital		
		Long		
3.2	Speed of sound	Explore & Explain	Students will time the speed of sound outside using a starter pistol and/or use data-logging equipment to explore the speed of sound. They will convert units, derive solutions to problems and construct a bar graph of speeds of sound in different media	
		Hands-on & Digital		
		Medium		
3.3	Seeing with sound	Explore & Explain	Students explore the uses of reflected sound through a simulation Doppler lab and a video of how vision-impaired people use echolocation.	Optional
		Digital		
		Medium		
3.4	Hearing	Explore & Explain	Students review their understanding of the ear and relate it to hearing. They explore hearing loss and consider whether earphones are damaging.	
		Classroom & Digital		
		Long		
3.5	Music to my ears	Elaborate & Evaluate	A formative assessment where students choose a method to present their understanding of sound, as applied to a musical instrument.	Optional
		Classroom		
		Long		

Part 4 How do we see the world?

Activity No	Activity Name	Lesson type	Activity Description	
4.1	Mirror, mirror	Engage & Explore	Students are introduced to scientific terms, observe and record the reflection of light from plane, concave and convex mirrors and distinguish between virtual and real images.	
		Hands-on & Digital		
		Medium		
4.2	Does light travel in straight lines?	Engage & Explore	Students use standard lab equipment to explore how lenses and water affect the path of light. This is consolidated with a digital activity.	
		Hands-on & Digital		
		Long		
4.3	The world of colour	Engage, Explore & Explain	Students explore the visible light spectrum and use filters and prisms to separate colours. They explore colour addition and learn how humans see colour.	
		Hands-on & Digital		
		Long		
4.4	Eye defects	Explore, Explain & Elaborate	Students explore a variety of eye defects through a simulation and acquire knowledge through videos about cataracts, multifocal lenses and glaucoma.	Optional
		Digital		
		Short		

Part 5 Making use of electromagnetic waves

Activity No	Activity Name	Lesson type	Activity Description				
5.1	What is light?	Engage & Evaluate	Students watch a video introducing the electromagnetic spectrum and then explore how light can be modelled as both particles and waves.	Optional			
		Digital					
		Medium					
5.2	UV light	Explore & Evaluate	Students explore the advantages and disadvantages of ultraviolet radiation, from fish-sensing predators to counterfeiting. They conduct an independent investigation into the effectiveness of sunscreens.		Optional		
		Hands-on					
		Medium					
5.3	Heating up	Explore	Students explore radiation through a hands-on inquiry about remote controls, complemented with an exploration of infra-red images.			Optional	
		Hands-on & Digital					
		Medium					
5.4	Microwave fun	Explore & Explain	Students observe a demonstration of popping corn in a microwave. This is followed by a demonstration using mobile phones and a look at the uses of microwaves.				Optional
		Hands-on & Digital					
		Short					
5.5	Listen to the radio	Explore & Explain	Students investigate radio transmission in the classroom followed by a look at uses of radio waves in medicine, research and the search for extra-terrestrial life.	Optional			
		Hands-on & Digital					
		Short					
5.6	High energy	Explore	Students watch a video and visit websites to explore aspects of high energy radiation including both dangers and uses.		Optional		
		Digital					
		Short					
5.7	Concept mapping	Explain & Evaluate	Students construct a concept map to illustrate the concepts and ideas they have learnt about electromagnetic and high energy radiation.			Optional	
		Classroom					
		Medium					
5.8	Sample test	Evaluate	Students complete the end of unit test.				Optional
		Classroom					
		Medium					

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