Waste and Recycling topic: materials and their properties and how that helps them be separated for recycling	**Key stage** Key stage 2 Suitable for Key Stage 3 with perhaps omission of the introductory activity but with the additional extension	**Topic** Waste and recycling	**Subject** • STEM (Science, technology, engineering, and mathematics) • PHSE (Personal, Social, Health and Economic) • Geography

Resources for activity
 	
• A range of waste materials on each table:
  ○ paper
  ○ card
  ○ aluminium cans
  ○ steel cans
  ○ glass jars
  ○ transparent plastic bottles
  ○ coloured / opaque plastic bottles
		Vocabulary
		
		• Aluminium
		• Cardboard
		• Contamination
		• Glass
		• Magnetic
		• Opaque
		• Paper
		• Plastic
		• Recycle	

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Plus some additional items to show contamination such as:

clear plastic punnets
black food trays
metal coat hanger

School magnet set
Post it notes and pens for each table
Download and print Sorted by Science activity clue cards or actual props of the same items (magnets, hammer, sieve, torch, balloon / bike pump)
Interactive whiteboard for showing related films

KS3 extension

A selection of products that cannot be recycled because they are made of mixed materials. For example, famous crisp snack tube, drinks or pet food pouches
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Sieve
Steel
Transparent

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Learning objectives

Students will be able to:

describe the properties of different materials
describe how the properties of certain materials enable them to be separated

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- explain and describe the science behind the separating technologies used in the Materials Recovery Facility
- explain why other items will end up contaminating the separated recycling

Introduction	**Guided/group tasks**
The items you put into your mixed recycling bin have to be separated to go to different factories / facilities to be made into new things. When you want to separate a mix of items, you need to think about the materials they are made from. These differences may be used as the way to separate them. Encourage the group to come up with a list of words to describe materials and write these onto the whiteboard. These could include • Light • Heavy • Rough • Smooth • clear (transparent) • opaque • bendy	Ask the students to place the waste items on their tables and write words on post it notes and place them on the items to: • name the type of material, e.g. paper, glass, metal, plastic etc. • describe the properties of those materials. For example, on the glass they may write, cold, transparent, heavy, breakable

• brittle • cold • hot • magnetic	
Main teaching Now let's look at how the items from your mixed recycling are actually sorted out. This happens at a large factory called the Materials Recovery Facility (MRF). The MRF has technology and machines that can sort out and separate the different items. This activity introduces how materials are sorted in the MRF using their properties. Display on one side of a table: • transparent plastic bottle • opaque or coloured plastic bottle • aluminium drinks can • steel food can • foil • glass jar	**Group task / discussion** Guide the group to use the properties of the materials from the introductory activity to discuss and match each waste item, with one or more of the clue items as a way that they could be separated. For example: If little hammers hit everything, the glass would smash and these bits could fall through holes at the bottom of the machine (like a sieve). The group feedback their ideas. The aim at this stage is to keep it simple and allow creative problem solving ideas. It would

Display on the other side of the table, (or use the clue cards): • magnet(s) • hammer • sieve • torch • balloon pump To sum up – The MRF does have a series of machines to carry out each method of separation. Play the video of our education officer explaining the answer using these props. Sorted by Science video Then play the video of the real MRF in action. How is my Recycling sorted? Video Now let's think about what happens when wrong items are put into the mixed recycling bin.	be unlikely that they would know how to separate aluminium.

Remind group that the machines work on the property of the material, not WHAT the item actually is. Demonstrate with the clear plastic punnet that this also is transparent so the Aladdin machine (lasers) will think this is a clear plastic bottle and the air jets will blow this into the bottle pile. The same would happen with any coloured trays – they will be separated in with the opaque bottles. The metal coat hanger is magnetic, so it would be picked up by the magnet and put in with the steel cans. This creates contamination. Contamination reduces the value of the recycled materials and if there is too much contamination – the whole batch may be rejected and not recycled at all. People have the responsibility to make sure they put the correct items into the bins in the first place. **Extension/Independent tasks** Design a superhero that has separation powers	
KS3 extension If only certain items can be recycled – why do manufacturers make their products the way they do? Some items cannot be recycled because they are made from a mix of materials that cannot easily be separated.	Groups look at or research a range of products and consider how easy they are to recycle. Design their own products that fit the circular economy model.

Download our Circular economy information sheet to help promote a discussion about the concept of designing for recycling	
Plenary/Assessment for Learning (AfL) The technologies used for separating the recycling items are based on the type of material or properties of the material. It is still important that these are the actual correct items or it will cause contamination.	**Evaluation** What went well? What would you do differently/include next time?