The National Tramway Museum

Teachers' Resource Pack

Key Stage Two

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Key Stage Two

Introduction

The National Tramway Museum exists to illustrate the social, cultural and economic history of tramways and tramcar travel in the United Kingdom. The Museum has three indoor exhibition spaces and a period street with street furniture and historic buildings that have been rebuilt on site providing context for the collection.

The National Tramway Museum's website <u>www.tramway.co.uk</u> is a valuable resource with a large image database which presenting a fascinating visual document of everyday life in towns and cities from the late nineteenth century to the present day.

The Museum encompasses far more than trams. The Woodland Walk and Sculpture Trail offer visitors opportunities to discover plants, minibeasts and a wide variety of habitats; explore and investigate our Sculptures whilst enjoying excellent views across the Derwent Valley and the Derwent Valley Mills World Heritage Site.

The Pack

This pack aims to enable Key Stage 2 teachers make the most of a visit to the Museum. It is designed to provide everything you need for a self-guided visit. There are suggestions for pre and post visit work and photocopiable worksheets to use both at the Museum and in the classroom.

The photo cards can provide prompts to stimulate discussion about many subjects, such as clothes, occupations, toys, then and now, change, etc.

The pack covers activities across the Museum site and therefore links to a wide range of subjects across the curriculum.

The pack aims to:

- Support activity-based learning
- Provide differentiated learning opportunities through a range of worksheets
- Support class topics on travel and transport
- Provide opportunities to develop literacy and numeracy skills in a stimulating environment
- Introduce pupils to the impact of new technologies and inventions in the twentieth century

Pupils will benefit through:

- Working together and sharing ideas
- Making links across different subject areas

Curriculum Links

The Museum provides many opportunities to support programmes of study across a number of subjects at Key Stage 2. In addition to the materials in this pack, school groups can take advantage of our facilitated education sessions which provide interactive learning linked to specific topics. Further details can be found in the School Teachers' Guide and on our website; www.tramway.co.uk/learning.

Below is a general overview of links to the curriculum and programmes of study across the Key Stage.

<u>English</u>: Children can utilise interpretation boards, exhibits, artefacts and collections to engage in meaningful discussions across the curriculum and listen to and learn a wide range of subject specific vocabulary. They will be inspired to debate issues and formulate well considered and constructed points.

<u>History</u>: There are opportunities to study key figures in the Industrial Revolution and explore social history. Study can be enhanced by facilitated education sessions which relate to key themes.

<u>Maths:</u> There are many opportunities for visiting schools to explore a variety of maths based activities on the trams, in the shops, on the Woodland Walk. The Maths Trail for Key Stage 2 uses our exhibitions to explore numeracy.

<u>Geography:</u> There are opportunities for developing mapping skills, particularly with the use of the Jubilee Trail; and also human geography and the development of settlements. <u>Science</u>: Pupils can discover electrical circuits in action and find out about forces and friction. On the Woodland Walk they can explore living things and their habitats.

<u>Art and Design:</u> The Museum provides a variety of opportunities to stimulate creativity and imagination for all age groups. From the collections, to the Sculpture Trail and the Woodland Walk, pupils can explore colour, shape, pattern, space and texture.

Teachers' notes

For the purpose of the pack, the Museum has been divided into two areas, the Village and the Woodland Walk. This has been done to help make planning easier, and to help focus different curriculum areas.

The children should begin to develop their own thoughts about social history, the development of transport and the effects of different historical events on the people of the time. Thinking about their own situations will enable them to compare and contrast their lives with the lives of others in the past. They will also be able to compare the differences between town and country, explore environmental issues and investigate art and design.

The Trams, Street and Exhibitions

Many children will never have seen a tram, whilst some will be familiar with modern tram systems or have ridden on a tram on holiday.

We do not keep our collections in glass cases, our visitors are encouraged to interact with them through riding a tram or touching a lamppost. This doesn't mean they are any less precious than an Egyptian mummy or Rembrandt painting, each tram is special and may be the last of its kind in the world; our buildings and street furniture all have stories to tell.

The Woodland Walk and Sculpture Trail

The woodland walk offers opportunities to explore a variety of curriculum linked

activities, science, environmental issues, literacy and more.

The woodland here is upland mixed ash wood and is part of the limestone landscape of the Peak District, as is our calcareous grassland.

The tall ash trees dominate the canopy but hawthorn, silver birch, wych elm, sycamore and alder can all be found. The woodland supports an abundance of flora and fauna, with some species particular to our landscape.

The sculptures along our trail are created by our in-house sculptor, Andrew Frost. He has an outdoor studio at the start of the woodland walk and can often be seen at work.

The very nature of the sculptures means that they decay and rot. As they decay, fungus grows in the cracks and can look quite spectacular. As one sculpture disappears another one appears, so the trail is always changing in some way. There are constants, the wood ant, the green man and the troll (now reborn from the original), are always here.

Preparing for a visit

Show children photographs of tramways and tramcars. Some images are included in the pack and more can be downloaded from the Museum website.

Involve children in planning the journey to the Museum: what different kinds of transport could they use? Which will be the best for the class? How long will the journey take? Look at a map to see where the Museum is in relation to the school.

Background information

Horse powered trams

Horse tramway systems were first introduced in the 1860s, helping to meet the transport needs of the growing industrial working classes. Before this most people wanting to travel walked. Railways provided efficient, long distance and suburban transport from the middle of the nineteenth century, but could only be afforded by the better off. The introduction of horse buses in 1829 provided cheaper transport for the middle classes in towns, but was limited by the number of people they could carry and the speed at which they could operate.

Horse trams spread throughout the UK from the late 1860s, becoming very popular method of transport, especially for travelling to work. They were more efficient than horse buses as the rails gave a smooth ride over uneven roads. The rails also reduced friction, enabling horses to pull larger vehicles and carry more passengers so allowing lower fares.

In 1880 there were over 12,000 horses and 1,610 trams and by 1885 these numbers had increased to over 25,000 horses and nearly 3,000 trams.

Almost as soon as horse tramways started to develop the search for alternative forms of traction began.

Cable tramways were introduced in the United States in 1873 but were never widely established in Great Britain. One of the few cable tramway systems in this country operated in Matlock between 1893 and 1927.

Steam powered trams

Steam powered road vehicles began to appear from the 1830s, but in the 1860s their operation was hampered by legislation requiring a man carrying a red flag to walk ahead of each vehicle. From 1875 the steam tram was the main rival of horse drawn trams and helped to establish the principle of mechanical traction on the roads; changes to the law meant they no longer needed someone to walk ahead of the vehicle with a red flag.

Electric powered trams

By 1885, horse trams had reached the limit of their development. It was expensive to feed, stable and maintain the horses to pull the trams. While the horse tram had brought mobility to many, it was still not cheap enough for the vast majority of the urban working population. Steam trams also had their limitations, having to stop frequently to take on water and clean out the fires.

Between 1898 and 1906, electric tramways were introduced into nearly all urban areas of the British Isles, replacing both horse and steam drawn tramcars and providing cheap, efficient transport for everyday needs.

The electric tram was the main method of public transport in British towns and cities from 1900 to the 1930s. As their use widened, comfort and safety became more important. Tramcars were fitted with cushioned seats, hanging straps, boxes for used tickets and safety gates. Signs and notices set the standards of behaviour for tramcar passengers.

Most tramway systems used overhead wires to carry electricity to the tramcars. A small number of tramways used alternative methods, although the expense and problems associated with these meant they were never widely adopted.

In central London, a 'conduit' system was used until 1952. This carried electricity along a concrete trough (the conduit) underneath the road and a current collector on the tramcar picked up the current through a slot between the rails. The conduit often became blocked with rubbish or sand; causing the collector to jam and separate from the tramcar.

Another system was the stud contact system. In this large metal studs were set between the tramway rails. As the tramcar passed over the studs, switches would turn on the electric current, which passed to a collector underneath the tramcar. Sometimes the switches failed stranding the tramcar, or would not turn the current off leaving the studs live and dangerous to passers-by or to horses with iron shoes.

The widespread introduction of tramway systems had a huge impact on the way of life in towns and cities. Instead of having to live close to their work, in the congested, unhealthy inner cities, people were able to move out to newly developed housing estates in the suburbs and travel into work by tram.

Trams were used for leisure as well as work. In the 1900s trams capable of carrying more than 50 passengers could be hired for as little as 3 shillings (15 pence) and schools, clubs and societies took advantage of this cheap form of transport for outings and visits.

In Belfast, the tram route serving one of the largest shipyards in the world was probably one of the most heavily used in the British Isles with trams in a non-stop procession throughout rush hour. Trams were hired for sporting events and services operated to venues such as Aintree for racing, Wimbledon for tennis, Murrayfield and Cardiff Arms Park for rugby and many football venues around the country.

During the First and Second World Wars women were recruited as conductors and drivers to replace the men who had enlisted. There was considerable resistance to this, especially during the First World War, and many arguments against female employees were put forward. Some believed women did not have the stamina required for the job and that the working environment was unsuitable. Unsocial hours and the lack of suitable facilities at tramway depots were also given as reasons against employing women. However, a female workforce proved a great success as well as a necessity when companies were losing male employees to the war effort. By December 1918, there were 11,671 women conductors as opposed to 2,906 men, a statistic reflecting the change in thinking about women's roles during the war years.

Decline and Revival

The decline of trams and tramways in the UK began in the late 1920s and 30s as motor buses began to offer efficient competition. Trams were abandoned because they were thought to be old fashioned and uneconomic. Tramways began closing down as early as the mid-1920s and their decline increased through the 1940s and 50s. By 1962, only Blackpool and the Isle of Man remained in the UK. Overseas, France took a similar view and their tram systems disappeared too. Elsewhere, including the United States and what was the Soviet Union, the tram was highly regarded and continued to be modernised.

Since the late 1980s however, the perception of trams and tramways has changed. They are increasingly seen as a way of regenerating inner city areas and helping to alleviate traffic congestion. Electric tramways are also considered to be more environmentally friendly than buses or private cars.

In 1980, 'super-trams' were introduced as part of a new underground metro system in Tyne and Wear and in 1987, the Docklands Light Railway was opened as part of a scheme to develop London's Docklands. Other cities have followed, including Manchester, Sheffield, Nottingham and Edinburgh. The new trams are quick, clean and designed to allow good disabled access.

While it is unlikely that new tramway systems will ever be established on the scale of the early 20th century, trams now have a future as a clean, safe and quiet alternative to oil powered transport.

The Street

The street at the Museum provides the context in which our trams run. Some of the buildings are original quarry buildings, some have been brought from elsewhere and rebuilt here and some have been built to fulfil a specific purpose at the Museum.

Original buildings include the Forge Shop, Stephenson's Discovery Centre and the Learning Centre. This was the smithy for the quarry. Our Eagle Printing Press is also housed in one of the quarry buildings.

The Red Lion public house was originally situated opposite the Tramway Offices in Stoke-on-Trent. Tramway workers were paid in the bar.

The façades of the Burnley Tramway Office and Yorkshire Bank were acquired for the Museum by a volunteer who saved them from demolition. The Museum's library, archive and offices are housed behind them.

The Derby Assembly Rooms were completed in 1774 to house a ballroom, supper and card rooms. The interior was destroyed by fire in 1963, and the façade brought to the Museum in 1972. The smoke blackened stonework can still be seen. At the top of the building are carvings of musical instruments.

The cast iron bridge was made in 1844 to cross an ornamental lake on the Bowes Lyon Estate in Hertfordshire, the childhood home of Queen Elizabeth the Queen Mother. The bridge was given to the Museum in 1971 and rebuilt on top of stone pillars.

As with the buildings, our street furniture comes from all over the country and makes up one of our Designated (of national importance) Collections.

The Police Box was donated by the Metropolitan Police. The boxes were used by beat 'bobbies' to write reports, contact their station and take refreshment breaks. The Bundy clock was used by tramway managers to check on the service. Drivers inserted a key which recorded their departure time on a roll of paper.

The red and white telephone box is one of the earliest designs of public telephone boxes, as is the pillar box. Pillar boxes were originally green, but the public complained they were difficult to see.

The tall stench pipe outside the sweetshop was a common feature of Victorian and Edwardian streets, and can still be found today if you look carefully. They released the foul smelling gas from the sewers, discharging it high into the air so avoiding the stench invading the streets. This one was above a public toilet in Birmingham.

Exhibitions

There are three exhibition areas at the Museum:

Stephenson's Discovery Centre – This exhibition describes the beginnings of the Museum, our links to George Stephenson and the development of the first tramways. Over the glass bridge is the Workshop Viewing Gallery where our dedicated team of staff and volunteers can be seen servicing and restoring our running fleet.

The Great Exhibition Hall – A Century of Trams from 1860 to 1960, from early horse trams to steam and electric, through to the last of the first generation of trams. Follow their development and decline and what was happening in the world during each decade.

The Assembly Rooms – The Survive and Thrive exhibition charts the resurgence of tramways to our cities, with a light wall showing first and second generation tramways. Our temporary exhibition space is also housed here.

You can also see much of the Museum's tram collection in the Depots.

The Woodland Walk

The Museum is in the heart of the Peak District, on the edge of the Derwent Valley.

The geology of the Peak district has influenced the industry of the area from Roman times. Rich mineral veins are contained within the exposed carboniferous limestone, making them relatively easy to extract, resulting in extensive mining and quarrying.

Lead Mining

The Derbyshire lead field was the largest and most productive in Britain. Lead was exported throughout the Roman Empire to be used for pipes, baths, roofing and coffins. Lead pigment was used in paint and face powder.

By the 14th century lead was England's leading export. Production slowly declined but continued to supplement the incomes of agricultural workers in the area.

Relics of lead mining can be seen all over the Peak District; the Museum is home to the remains of a lead smelter and houses a small display by the Peak District Mining Historical Society which runs a Museum in Matlock Bath.

Quarrying

The limestone quarries of Derbyshire have provided employment in the area for over a thousand years and Derbyshire is still the UK's largest limestone and lime producer.

The Museum is built on part of what was once Cliff Quarry, one of four quarries in Crich. The other part of the quarry was still working until 2012 and the abandoned machinery can be seen when taking a tram ride.

The purity of Crich lime was renowned and brought George Stephenson here in the 1830s,

when he was looking for lime to use as flux to smelt the iron to build his Midland Railway.

Many household products contain limestone in one form or another, from toothpaste and pills to the adhesive holding the tiles to our kitchen and bathroom walls. Roads, roof tiles, carpets, window glass and glass food jars and bottles are all dependant on limestone. It is added to the soil to help increase crop yields and to animal feeds, so finding its way through the food chain to the bones in our bodies.

Woodland

The woods at the Museum are mixed ash woodland, common to limestone areas. Ash colonises open ground vigorously and many ash woodlands in Derbyshire are a rich mixture of ancient and new trees.

Besides ash; sycamore, alder and birch can be found. The shrub layer consists of a wide range of species including hazel, wych elm, wild rose, elder and hawthorn. The light shade provided by the ash canopy provides a very diverse ground flora with primrose, wild garlic, early purple orchid, cowslip, wild strawberries, ladies bedstraw, wild marjoram and more. Many different lichen species can be seen adorning the bark of old ash trees which in turn provide plentiful habitats for minibeasts.

Our woods are home to an abundance of small creatures including spiders, bees, grasshoppers, moths, butterflies, wood ants and common lizards. The wood ants can be seen marching along the side of the path carrying leaves and sticks back to the nest.

Wrens bob in and out of the dead hedges, woodpeckers tap at the tree trunks, peregines screech near the cliffside, sparrows, greenfinches and blue tits feed and nest all along the woodland walk. Take a look at the back of the Green Man's head – there is a perfectly round hole that was pecked away by woodpeckers making a cosy home to bring up their young.

Ideas for activities

Past and Present

Was there a tramway system near your school? Pupils could use the Museum's website to research the tramway history of the local area.

Use examples of new tramway systems in the UK to open up class discussion on the future of public transport. List advantages and disadvantages of public transport.

Investigate local public transport services. What different types of public transport are available? What is happening to local public transport services? Are they in decline? Are they improving?

How could a tramway system help the local area? What problems do pupils envisage would have to be dealt with if a tramway system was to be established? What would happen to other forms of transport once the tramway was up and running?

Use local maps and street plans to identify where a tramway system could run today.

Number and Language

Explore how numbers and numbering are used on trams and tramcars e.g. ticket numbers, numbers of seats and standing passengers, vehicle numbers, destination numbers.

Write and perform poems and descriptive pieces. They could explore how language can be used to recreate the sounds, sights and feel of a tramcar using the poems on Classroom Activity Sheet 1 as stimulus for their own work.

Carry out a survey of numbers of private cars within the class and how these are used or a survey of how pupils travel to school. The results could be expressed in tables and graphs. The disappearance of tramways from towns and cities in the UK could be used as a starting point for language work. Why did people regret the passing of the trams, what sounds and sights did they miss? How did they express these feelings in poems and writing? What other forms of transport have been used as the subject of descriptive writing and poetry? Pupils could write about forms of transport that they would be pleased to see disappear forever.

Organise a debate considering the arguments for and against tramway systems. Pupils could assume different roles such as a taxi driver, a mother of small children, a pensioner, a business-woman with a company car, a shop owner.

Art and Design

Devise an advertisement to encourage people to travel by tram. Use existing tramway publicity as stimulus material and focus on the environmental benefits of tramway travel.

Tramway companies used design to create an image for their tramcar services. Colour, logos, badges and lettering were all important elements of a tramway company. Use a large line drawing of a tramcar and let the pupils choose their own colours and logo. This activity could also involve pupils designing uniforms and tickets.

Science

Make a simple circuit using batteries and bulbs to explore how electricity travels in a circuit and that a circuit can be broken. Ask pupils to explain how the tramway system circuit works (see Classroom Activity Sheet 4) and to suggest ways in which the circuit could have been broken.

Investigate materials used to make tramcars, their properties and uses, and the difference

THE NATIONALTRAMWAY MUSEUM

between natural and manufactured materials. Pupils could compare materials used in older tramcars with those used in modern tramcars, buses and trains today.

Experiment with different types of materials that reflect light and look at the types of materials used on tramcar headlamps and lights.

Investigate various toys to learn that an energy source is needed to make something move.

Experiment with pulling things with and without wheels, movement on and off rails. Investigate different surfaces and how they can assist or hinder movement (see Classroom Activity Sheet 5).

Examine adverts for tyres to see that wheels still need friction to grip the surface to help them to roll. Wheels can skid instead of rolling if a road is icy or wet. The tread on tyres increases their friction with the road and this is why sand was dropped on the tram rails the help braking in bad weather.

Design and technology

Compare the different trancars on display to investigate how design has been used to improve comfort and safety when travelling by trancar.

Tramway companies used design to create an image for their tramcar services. Colour, logos, badges and lettering were all important elements of a tramway company 'livery'. Pupils could design their own livery, uniforms and tickets.

Pupils could investigate the range and types of materials that were used to make tramcars – glass, metals, fabrics, wood, and consider why specific types were used e.g. for safety, for comfort, to make tramcars look attractive. They could also compare older tramcars with modern tramcars to identify what different materials are used today.

Poem Page

The Tramway

Along the highways And over the hills, Down the valleys Past tall darkened mills, Through squares full of people On market day, Past theatre and steeple, You would find the tramway. Where steel rails were laid And wires above hung, Where cheap fares were paid And two bells rung, Where car after car would glide From dawn till night each day, Packed tight with people inside, You would find the tramway.

Dennis Gill



The Last Tram

Farewell, old tram. We shall remember you. You die, but going strong at 91! You were the People's Coach. You did not ply From Piccadilly to Cadogan Place. You took the humble millions to their homes, And lovers rode you down the Old Kent Road. The motors hated you: but we small fry Form your high haven could look down on motors.

The might bus is safe and swift, we know: But it is not so like a moving mountain. You seem so sure, so solid, on your tracks That when you strayed from them it was a portent,

As if a ship had wandered onto land. You could be beautiful, I see you sway Along the Embankment, under the lighted trees; I see you swimming in the Thames below. You could be brave, gay, clanging galleon. There in the dark, I see you, swaying still, With no light showing but the doodlebug's. You held your course, a battleship of glass: Not unafraid but faithful, on you went, For there were humble people far from home. You will not shimmer on the Thames again, Or hang like some huge planet on the Bridge, Or carry lovers down the Old Kent Road. Dear clanging friendly monster, fare you well.

A. P. Herbert



Classroom Activity Sheet 2 The Great Tram Debate 1

The Past





Electric trams were popular in 1900 because they were:

- Clean
- Cheap
- Fast
- Quiet
- Convenient
- Brightly lit
- Smooth
- New

Electric trams were unpopular in 1950 because they were:

- Dirty
- Expensive to repair (many towns were unable to afford repairs to World War 2 bomb damaged tram rails)
- Slow
- Noisy
- Inconvenient
- A cause of traffic jams
- Old fashioned
- Bumpy
- Dangerous (people got on and off trams in the middle of the road)

Classroom Activity Sheet 3 The Great Tram Debate 2

The Future



Trams are becoming more popular because they are:

- Clean electric power means less pollution in town centres
- Attractive to ride in
- Accessible to wheelchair users and pushchairs
- A way of reducing traffic jams
- Quiet
- Flexible can go anywhere that tracks are laid
- Cheaper than buses (they can carry more passengers)
- Cheaper to build than underground or railway trains
- Modern
- Safe to get on and off

Private transport will be more popular because it is:

- Convenient
- Cheap
- Fast
- Comfortable
- Door to door
- Shopping centres have good parking
- Private cars mean a family can travel together
- Available when you want it (no timetables)

How a tramcar works



Tramcars run on rails like railway trains. The rails are often set in the road surface so that the trams run along streets used by other vehicles. A tramcar can be either single or double decked.

Most trams can be driven from either end and do not have to be turned round at the terminus. On many trams the seats can be reversed so that passengers can always face in the direction of travel. The earliest trams had wooden seats but later cushioned seats were introduced to give greater comfort.

A tramway system is like a large electric circuit. Electricity travels from a generating station through overhead wires, and is collected by the tramcar through a current collector. The electricity is then returned from the tramcar along the tramway rails. The electric voltage in the overhead wires is 550 volts; the voltage is very low once it has passed back into the rails. Most trams in the Museum collect electricity from overhead wires through a trolley pole. One end of this has a small wheel that runs along the overhead wire. The other end is attached to the roof of the tram. Sometimes a trolley pole could become detached from the wires, breaking the circuit. As a solution to this problem, in the 1930s, the trolley pole was replaced with a bow collector. The most common type of collector used today is the pantograph, which is a modern version of the bow collector.

The driver usually stands on the front platform of the tram, although a few trams have separate cabs for the driver. The driver operates the tramcar using a controller and brakes. The controller is usually operated with the left hand and governs the amount of electricity passing to the motors and therefore sets the speed of the tram.

The brakes are operated with the right hand. Older trams have mechanical brakes worked with a large brass handle, newer trams use air brakes. If it is raining and the rails are slippery, the driver uses a foot pedal to drop sand onto the rails to give the wheels a better grip when the brakes are applied.



Sticky surfaces: measuring friction – Teachers' notes

This experiment can help children to compare the friction between different surfaces and to understand how tram rails assist the movement of tramcars.

What you will need:

- A flat board about 50cms long, made of wood or hardboard.
- 2 identical wooden bricks, one wrapped smoothly in aluminium foil.
- Pieces of aluminium foil, cloth, course sandpaper, large enough to cover the board.
- Ruler.

What to do:

- Put the board flat with a brick at one end.
- Lift this end until the brick can just slip down the surface.
- Measure the height of the upper end of the board.
- Repeat with the brick wrapped in aluminium foil.
- Now put different materials on the board to change the surface and test both bricks again.
- Record the results in a table.

In doing this activity, the children should appreciate that the higher they have to lift the slope, the more friction there is between the surfaces. Also that to compare the results for a fair test the two bricks should be identical (in mass and shape). Depending on the level of the pupils, they may want to repeat results to get better accuracy. Teachers can ask pupils to talk or write about the experiment using the questions overleaf.

What should emerge is that:

- The metal block on the metal surface has a lower friction than on a rough surface, hence horse drawn trams could carry more passengers on rails than horse drawn buses on cobbled roads.
- Sandpaper has a very high friction. This was why sand was used to put on icy or wet rails and roads.

Extension questions

- Before you do the experiment, what do you think will happen?
- What did you find out by doing this experiment?
- Was your prediction right?
- What did you do to make your experiment a fair test?

Pupils who can appreciate the balanced forces acting on a stationary object and are familiar with force diagrams can be asked to draw arrows on the drawing overleaf to show the forces acting on the brick just before it starts slipping down the slope.

Sticky surfaces: measuring friction

When two surfaces don't move easily against one another we say they have a lot of friction. You can measure friction by making a slope. When a brick starts to slide down a slope the force of gravity pulling it downwards is just bigger than the force of friction making it stick.

This experiment will help you to compare the friction between different surfaces.



Surface	Height of board			
Surface	Wooden brick	Foil wrapped brick		
Smooth Board				
Rough board				
Cloth				
Aluminium Foil				
Sandpaper				

- Which two surfaces had the lowest friction?
- Which two surfaces had the highest friction?
- What do the results tell you about the friction of:
 1. Metal surfaces?
 2. Sandy surfaces?
- Why do you think horses could pull more passengers by trams on rails than by bus along the cobblestone roads?
- Why do you think the tram driver used sand to stop the tram slipping on the rails in wet weather?

Tram Power!



Horse power Steam power Electric power

Draw lines to match each vehicle with the correct type of energy that it uses.

Talk about how you know.

What are the main differences that you can see between the three tramcars. Think about these questions to help.

- Are the tramcars single or double decked?
- Are the tramcars covered or open top?
- How many passengers could each tramcar carry?
- How comfortable would each of the tramcars be for the passengers?
- How fast do you think each of the tramcars could move?

Why do you think horse drawn and steam drawn tramcars were replaced by electric tramcars?

Apart from providing the energy to make the trancar move, can you find three other ways in which electricity was used to make improvements to passenger comfort and safety in electric trancars.

1.

2.

3.

What is it made of?

You can do this activity using one of the trams in the Exhibition Hall or when you take tramcar ride.

Materials and uses

- Choose a tramcar to study. Decide what materials have been used to make it.
- List them in the table. One example has been done for you.

Name of tram:			Year it was built	t:	
Rubber	Wood	Glass	Metal	Cloth	Plastic
		windows			

Materials and their properties

Choose one item from the lists above. Look at it closely and touch it if this is possible, then fill in the table.

Object:			Material:		
hard or soft?	cold or warm?	smooth or	rough?	see-through?	what colour?

Back at school you can find out more about materials.

- Which materials used in this tram are natural?
- Which materials used in this tram have been manufactured?
- Which materials are used in trams, buses and trains today?
- Which of these are the same as in the old tram?
- Which of these are different?

Taking a tram ride

During your tram ride you will see and hear lots of different things. Read through this list while you are waiting for your tram and, during the ride, fill the sheet in.

My tramcar is	dou	ible decked \Box	single decked \Box (tick bo	x)	
The seats are n	The seats are made of				
There is room	for	people seated	l and standing		
Which words w	would you use	to describe your	tramcar ride? (tick the boxes)		
Bumpy 🗆	Fast □	Noisy \Box	Comfortable \Box		
Slow	Rattling \Box	Smooth \Box	Quiet 🗆		
Where might passengers be at risk when travelling by tramcar? Think about:					

- Going up and down
 Getting on and off
 Sitting on the top deck stairs
- Standing
 Changing direction

Why might pedestrians and cyclists be in danger as well as passengers?

Look out for safety rules and instructions inside and outside tramcars. Why do you think these were important?

.....

.....

After your ride, write a sentence about:

- What the driver had to do
- During the tramcar ride I could hear
- What was the tramcar ride like compared to travelling by bus or car?
- What the conductor had to do
- During the tramcar ride I could see

Survive and Thrive

Look around the Survive and Thrive exhibition in the Assembly Rooms.

The light wall shows tramway systems in the United Kingdom from the 1860s to the 1960s (first generation), and those running today (second generation). Can you find your town? Did it have a first generation tramway? Does it have a second generation tramway?

Which is the only electric tramway in the United Kingdom to run both first and second generation trams with no break in service?

After the Second World War, bomb damage and lack of investment were instrumental in the decline of tramways. Can you describe any other major factors?

Why are modern trams more environmentally friendly than petrol or diesel vehicles?

How much longer can a modern tram last than a motor bus?

Tramcar People

Each tramcar needs a driver and a conductor.

The driver operates the trancar using a controller. This is a large handle held in the left hand that controls the amount of electricity passing into the motors and speeds up or slows down the car. The driver's right hand operates the brakes.

The conductor collects the fares and issues tickets, lets the driver know when it's safe to move off, helps passengers on and off the cars and ensures the safety of the passengers.

Can you find some of the rules and instructions on the trams? Why do you think these are important? What problems do you think the conductor might have to deal with?

What words would you use to describe what it was like to work on a tramcar?

	Easy 🗆	Tiring \Box	Interesting \Box	Difficult 🗆	Enjoyable 🗆
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Draw two pieces of equipment or uniform that a conductor would need and write something about each of them.

Worksheet 5 (continued)



Tramcar People

During the First and Second World Wars women worked on the tramcars as conductors and drivers. They filled the jobs left by the men who had joined the armed forces. Some of the Tramway Company managers did not think women should work on tramcars. They said things like:

• Women are not strong enough to drive a tramcar

• Women shouldn't run up and down the stairs all day collecting fares

• Women shouldn't mix with male passengers

What do you think about arguments like this?

Can you think of three other jobs that would have been needed to keep a tramway system working.

1.

2.

3.

Woodland Walk - Make a Map

Draw a map of our woodland walk and sculpture trail. Can you work out north, south, east and west from the position of the sun? Which features do you want to highlight? Make up names for big trees, the shelters, the sculptures. Add a key so that other people can understand your map.

KEY

Woodland Walk – scavenger hunt

Take turns to throw a small pebble or stone (gently!) onto the page then go and find whatever it lands on or nearest to. Write or draw what you found in the shape.



Woodland Walk – Getting to know a tree

Choose a tree and work with a partner to find the answers to these questions. You will need to look carefully at the tree, its leaves and bark and the area around the tree too.



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Worksheet 9

Woodland Walk – The News Woodlines



Pretend you are a reporter on 'Nature News'. Find a thick stick to use as a microphone and you are ready to report the latest news.

Have a look around you and find some interesting things to talk about in your programme.

You could talk about something interesting you have seen or describe the live action of minibeasts, birds or trees as it happens.

Interview a friend and find out what they have seen and discovered. What's the best thing they've seen today?

Tell people about what they can do, see and find in the wood.

What's the weather like? Present a weather report so that your viewers will know what to wear when they visit the woods.

Photocard 1

Horse Drawn Tramcar



Photocard 2

Steam Powered Tramcar



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KEY STAGE 2

Photocard 3

Street Scene



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KEY STAGE 2

Photocard 4

Cardiff in the 1930s



Photocard 5

Alighting into the traffic!



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Photocard 6

Manchester 'Metrolink'

