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Science, Technology & Geography Interactive Experience

Within this booklet you will find some challenges and questions which we hope will make your visit to Enginuity a fun and interesting experience.

Take a look around you and be amazed by the inspiring worlds of Science, Engineering, Design and Technology

Find out how you can pull a real steam engine; control water; generate electricity; test your speed against a robot and work as a team to make the crazy boiler blow its top.

If you don't understand an exhibit then please ask one of the Enablers (staff) they will be only too happy to help you and show you how the display works.

Name: …….

Start Zone: ……..

Materials & Structures Zone

Key Concepts:
Material Types Materials Uses Combining Materials

X-ray Machine - Everyday Objects

Move the x-ray unit over the objects you want to explore.
Press the buttons to reveal the different materials in each object.

Choose the two objects which most surprised you with the number of hidden parts and different materials. Fill in the chart below to show how many of each type of material is used in each item.

Object	Metals	Plastics	Composites	Natural

Ball Bounce

Can you find out which material bounces the best? Look at the materials - which one do you think will bounce the highest?
……
……..

Now push the buttons and see if you are right.
The highest bouncing ball was made from
……
……..

Were you correct?

Build an Arch

How many people does it take to build an arch with the large blocks?
……
……..

Wobble Proof

See if you can build a two storey tower that will survive a simulated earthquake.
Did it survive? …….
Sketch the design of your structure

Triangulation

Triangles are used in a structure to make it stronger – look up at the roof truss above your head as an example! The name given to this is **'Triangulation'**.

Look around the Materials & Structures Zone. How many things (including the building itself) can you see that use triangulation in their design?

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....

Scan IT: Materials & Structures

Use the Scan It system to find out more about the exhibits in this area

Recycling Metal

Scan the crushed metal cube. Metals can be recycled again and again to make new things. List three reasons why recycling is a good idea:

1. .....

   .....

2. .....

   .....

3. .....

   .....

Teddy Bear

Scan the teddy bear. Name two other products that are made by joining sheet materials:

1. .....
2. .....

Computers can be used to design and make sheet material products. What are the advantages of designing (CAD) and manufacturing (CAM) using computers?.....

.....

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.....

Systems and Control

Key Concept:
Complicated machines are often made to work by joining simple mechanisms together.

The Water Maze

Experiment with the exhibit, but take care you can get wet!!!
This maze is made up of a number of different systems for moving water or using water to make mechanisms work. Choose 3 of the systems to complete the chart below:

Name	Description	How might this be used
Laminar Flow	An electric Pump and a special nozzle that produces a smooth flowing stream of pressurized water	Often used in pond fountains

The Giditron Robot

This robot arm is used to repeat the same movement over and over again. Can you beat the robot to the finish without making the buzzer sound?

Wait until the light says GO!

What makes the robot better at the challenge? .....

.....

.....

.....

.....

The Robot Explorer

Can you diffuse the bomb?

Use the remote control and the T.V screen to control the robot

How does the robot know which way to turn? .....

.....

.....

Besides bomb disposal, list 3 other situations where a robotic explorer could be used.

1. .....
2. .....
3. .....

The Crazy Boiler

This exhibit shows how systems work using building blocks called **Input, Process** and **Output**. So a system takes something in (**Input**), uses it in a **Process** to produce a useful **Output.**

Investigate the Crazy Boiler and complete the statements below…

The Input =.....

The Process =.....

The Output =.....

Scan IT: Systems & Control

Use the Scan It system to find out more about the exhibits in this area

Ejection Seat

Scan the Ejection Seat and find out about the split second timing. List in the correct order how the system works:

.....

.....

.....

.....

.....

.....

Toilet Cistern

Scan the Toilet cistern and find out about all the different systems involved. List them below:

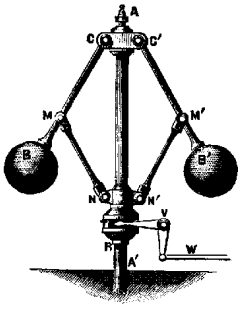
1. .....
2. .....
3. .....

The Governor

Find this object and Scan it.
This is a very early automatic control used on steam engines. But what does it control?

.....

.....



Energy Zone

Key Concepts:

Different sources of energy and how energy is stored, transferred and used

Lightmoor Beam Engine - Fly Wheel Battery

Does the beam keep moving after you have stopped rotating the wheel? Yes / no
Where has this extra energy come from? .....

.....

.....

.....

.....

Can you name something that is still made today that uses a flywheel?

.....

Loco Number 5

This locomotive weighs approximately 15 tons. How are you able to move it?.....

.....

.....

.....

.....

.....

As you move the wheel how much energy have you spent? Watch the indicator and record the joules you have to produce to move the Locomotive one metre.

.....

Piston Fan

Can you move the fan by yourself? Yes / No

Energy is being transferred from you to the fan. What mechanism are you using?

.....

.....

Power Valley - Water system

How is energy being generated by this system? .....

.....

.....

.....

As you change the dam gates what happens to the energy being generated? .....

.....

.....

Is there an environmental effect as you change the settings?.....

.....

.....

Electrical Energy (storing and using energy)

Discover how quickly the energy you have created is used up.

Turn the generator wheels and see how much energy you can create.

What form of energy is this? .....

Push a button and hold it down

Which product needed the most energy? (Used it up the fastest)

.....

Which product needed the least energy? .....

Wind Energy

Test the three different wind turbines. Do they all produce the same power output? Yes / no

Which one generates the most power in high wind speeds?

.....

Which one generates the most power in low wind speeds?

.....

Which design do you think is best overall and why? .....

.....

.....

.....

Energy Sources

List 5 different types of energy sources found within the energy zone

1. .....
2. .....
3. .....
4. .....
5. .....

Name 3 types of energy used in industry and explain how they are used.

1. Type of energy: .....

Use: .....

2. Type of energy: .....

Use: .....

3.Type of energy: .....

Use: .....

Scan IT: Energy

Use the Scan It system to find out more about the exhibits in this area

Mileage Marathon Car

Scan the Mileage Marathon Car and see how it is designed to make the most out of a tiny amount of fuel.

How far can it travel on 1 gallon of fuel?

.....

Rocket

Scan the rocket and see how a massive amount of fuel can be used in a short burst to great effect.

This rocket holds the British and European Amateur record. It got a 10th of the way into space, burning 14kg of fuel. How long did it take?

.....

At what speed does a rocket need to travel to escape Earth's gravity?

.....

How much fuel does the space shuttle use to travel 30cm?

.....

Lightmoor Beam Engine

A flywheel stores energy. List three things that can help a flywheel store more energy.

1. .....
2. .....
3. .....

Design Zone (up stairs)

Key Concepts:
Bigger, Cheaper, Lighter, Faster…

You will have seen and will see many fascinating objects during this visit and each and every one has been designed and made by investors and people just like you.

The best designs are often the simplest and often make us wonder how we didn't think of it ourselves i.e. the paper clip.

Design a machine to do homework for you that could be sold to pupils in school. Label your diagram clearly.

Human Geography

Key Concepts: Different types of industry

As you go around Enginuity, find examples of the following types of industry **Primary, Secondary, Tertiary**

Primary Industry (The growing or extraction of raw materials e.g. farming, mining, fishing).
……
……
……
Draw a sketch of this type of industry.

Secondary Industry (the manufacturing and processing of goods
e.g. making cars)
Draw a sketch of this type of industry

Tertiary Industry (providing a service e.g. tourism)
Draw a sketch of this type of industry

Industry in the Valley:

Describe the main industries that used to be found in Coalbrookdale.

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.....

.....

What industries can be found in the valley now?

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Explain how robots help in factories.

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Look at the pictures shown below of industry in Coalbrookdale. They were taken many years ago. Describe how industry has changed in Coalbrookdale over time.

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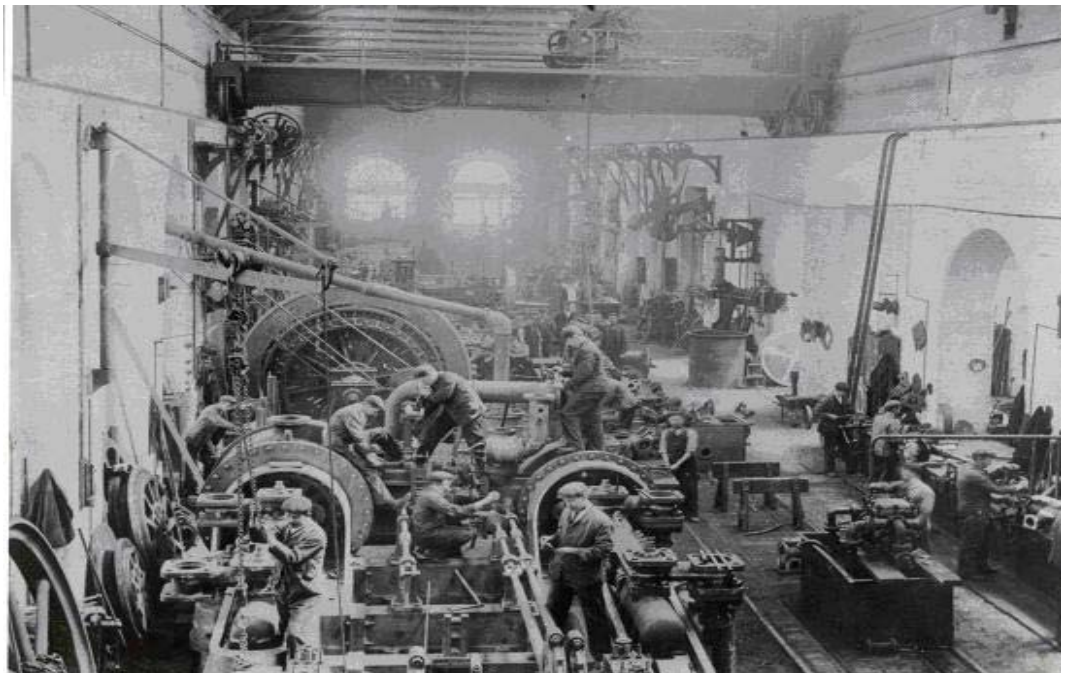
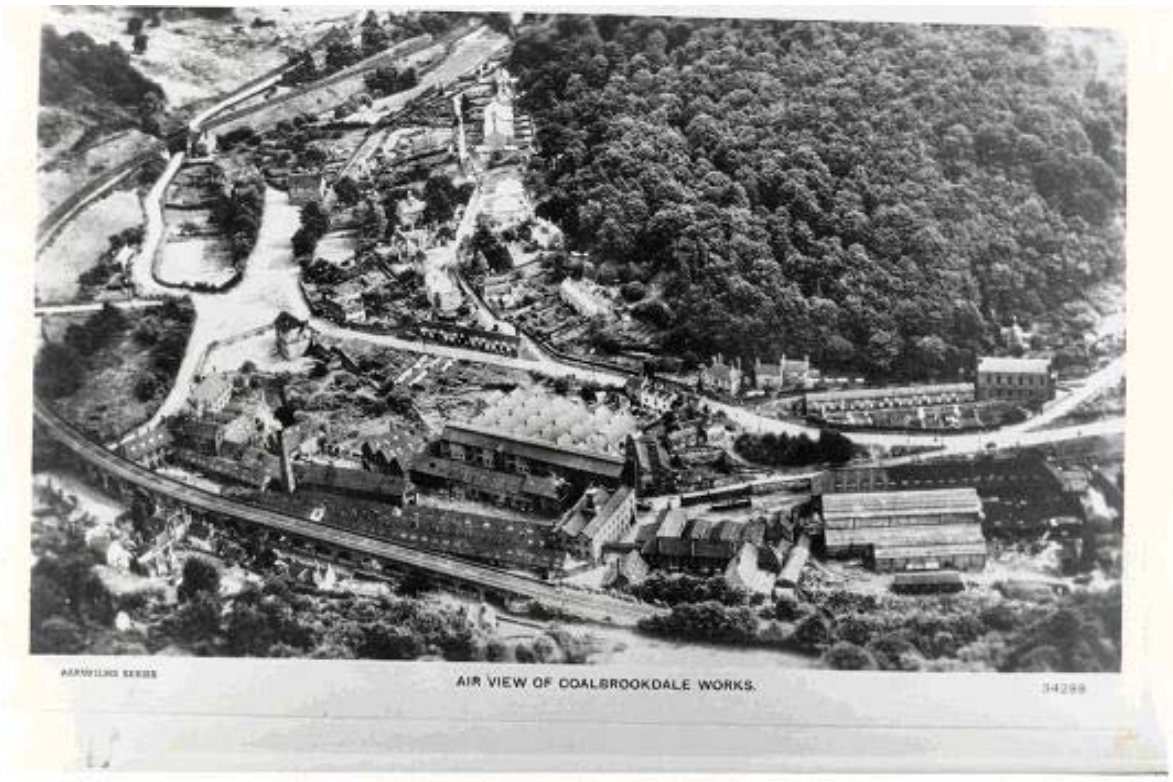


Locate and mark Enginuity on to the Photo below.



We hope you have had fun learning about how Science, Design Technology and Geography all came together at this one place and formed the birthplace for the industrial revolution.

By the way do you know that the iron bridge was only built as an advert.

Abraham Darby III wanted to show all of his potential customers what a brilliant material cast iron was and so he built the bridge!