

# A Level Chemistry – New Student Day Activity

## Incredible Materials

### Introduction

Chemistry really is everywhere. Look around you: Why are your walls standing up? Why is the air a gas? Why do candles melt? Why does sugar dissolve in your tea? Why is water critical for our survival? All of these questions come down to Chemistry and specifically, down to physical properties of the material – which really means that it comes down to the chemical *structure and bonding* of that material

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### Part 1: Great graphene

**Did you know...** that the incredible material graphene was discovered and isolated right here in Manchester? But here's the real surprise, it was isolated using nothing more advanced than a piece of sticky tape!

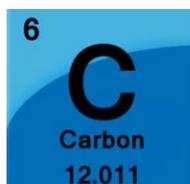


### Activity 1: Properties of the allotropes of carbon

*Keywords: Allotropes, atoms, bonding, structure, physical properties, covalent, isotopes*

*Aim: To find out the properties of diamond, graphite and graphene and how they relate to each structure*

1. Write a glossary of each of the keywords listed above. What does each word mean? Where possible, can you give an example?
2. Here is the entry for carbon from the periodic table:



One of the isotopes of carbon has a mass number of 12. Draw one atom of carbon-12, including the proton, neutrons and electrons.

3. When carbon atoms bond together, a covalent bond is formed. Draw a dot and cross diagram to show one atoms of carbon bonding to another. How many covalent bonds can a carbon atom normally make?
4. All of the allotropes of carbon have the same type of structure. Which type of structure is this?
5. Describe (you can use diagram if you prefer) the structure of each of the two allotropes: graphite and diamond.
6. Describe the difference in physical properties i.e. melting point and electrical conductivity of diamond and graphite?

## Part 2: Tremendous transition metals

If you look around and find an item made of metal, it will almost always be made from a transition metal. Think about it, you wouldn't make a knife from liquid mercury or a spoon from exploding caesium! So, what are transition metals and why are they so useful?

Locate the transition metals

about transition metals



**AIM:** to understand what properties transition metals have and why they are so useful

1. Watch the following YouTube clip about metallic bonding and structure

<https://www.youtube.com/watch?v=S08qdOTd0w0>

Use what you learnt to describe (you will need both diagrams and pictures) both the bonding and structure of metals.

2. Comment on the electric conductivity of transition metals?
3. Describe the difference between group 1 metal elements and transition metals.

## Extension

What about the chemical properties of transition metals? react at all. Find out some of the chemical reactions that transition metals are able to do. Can you write chemical reactions for some of these?

## Part 3: Preposterous plastic

Polymers are extremely useful because their physical and chemical properties make them highly durable and long-lasting, but some polymers also quite controversial. The example of this that you will have heard about is plastic, which is causing problems to sea-life.



Unfortunately, the same properties that make plastic a very useful material for food packaging makes it bad for the environment

### Activity 3: Research task how are polymers formed?

**Aim:** To find out about the structure and bonding of polymers and use them to explain the physical properties of plastic

1. Describe how addition polymers are formed?

2. List some uses of condensation polymers
3. Why are plastic bags now taxed?

## Extension

Try to find out what the 3 main types of intermolecular forces holding polymer chains together. Which is the strongest/weakest? In which circumstances do these forces occur?