

# MODULE: *Matter 1*

## Pre Test Marking Scheme

1. (5 minutes)

### Inside atoms

We can only change, or 'split', atoms by using huge amounts of energy. So for practical purposes, and under normal circumstances, we think of atoms as being indestructible.

But atoms are actually made up of tiny sub-atomic particles. These particles cannot exist on their own.

They are called protons, neutrons and electrons.

They have different masses and different electrical charges.

They do different jobs in the atom.

The nucleus has the protons and neutrons. They are almost the same as each other, except each proton has a positive electrical charge and each neutron has no charge.

The protons give the atom its 'atomic weight', hence its properties.

The neutrons help stop the protons flying apart.

Describe the central nucleus of an atom and explain what particles are found there.

Explain what types of sub-atomic particle are found there.

Describe what each particle is like.

Describe the similarities and differences between the particles in the nucleus.

Describe what each of those particles does in the atom.

### **Answer**

*The nucleus is very, very small compared to the size of an atom.*

*The nucleus contains nearly all the mass of the atom.*

*The nucleus consists of protons and neutrons.*

*A proton has a mass equal to that of a neutron.*

*Protons have a positive electrical charge.*

*Neutrons have no overall charge.*

*Protons determine the type of the atom.*

*Neutrons are the particles that hold the nucleus together.*

2. (5 minutes)

### Elements and compounds

- When atoms of the same type join up, they make elements.
- When different types of atoms join up in lots of identical combinations, and those combinations then join up, they make compounds.
- Elements and compounds are examples of pure substances, because all their molecules are the same as each other.

Sort the materials in the list into the three boxes below

Helium

Chalk

Gold

Ethanoic acid (vinegar)

Cake

Magnesium oxide

Nitrogen

Brine

Zinc metal

Polythene

Hard rubber for tyres

Diamond

### Answers

#### **Elements**

*Helium*

*Gold*

*Nitrogen*

*Zinc metal*

*Diamond*

#### **Compounds**

*Chalk*

*Ethanoic acid (vinegar)*

*Magnesium oxide*

*Polythene*

#### **Mixtures**

*Cake*

*Brine*

*Hard rubber for tyres*

3. (10 minutes)

### Structure and bonding

Diamond is a giant structure of carbon atoms. Each carbon atom shares electrons with four other carbon atoms around it. This sharing of electrons with four neighbouring carbon atoms extends for millions of atoms in three dimensions.

Because of this giant structure, diamond is one of the hardest materials known to us.

Polystyrene is a common plastic. It is made of long, straight molecules that stick to each other with some force of attraction. Because that force of attraction is weak, polystyrene is fairly flexible, and is used in many places where a rigid material would break.



Diamond



Polystyrene

a. What is it about a diamond that makes it very hard?

*Its structure, with all its atoms strongly bonded to each other.*

b. Would you expect diamond to melt easily? Explain your answer.

*No it would not melt easily.*

*The strong forces holding the atoms in a fixed arrangement will need a high temperature and lots of particle vibrations before the forces are broken.*

c. What hardness would you expect from polystyrene compared to diamond?

*Polystyrene would be softer.*

*The force of attraction between its molecules are weaker than the forces in diamond.*

d. Would you expect polystyrene to melt easily? Explain your answer.

*Yes, it would melt easily.*

*The weak forces holding the atoms in a fixed arrangement will need only a moderate temperature and small particle vibrations before the forces are broken.*

- e. Suggest a use for diamond (other than jewellery). Explain your answer.

*A cutting tool*

*It is one of the hardest substances known so it will scratch away almost any other material.*

*(Or another appropriate answer, correctly explained – but not jewellery or decorative use).*

- f. Suggest a use for polystyrene. Explain your answer.

*A flexible application such as a box with a sealable lid for food.*

*The structure of polystyrene and the weak forces between its molecules means it will flex and not break when bent slightly.*

*(Or another appropriate answer, correctly explained)*