**Lesson 7**

**02 June 2020**

**Composites**

**Read the information below to gain an understanding of composites.**

Composites are materials used in construction, engineering and technology. Most composites are made of two materials – a material called the reinforcement bound together by a matrix material. Fibreglass consists of fibres of glass (the reinforcement) embedded in a matrix made of plastic polymer. It has a very low density, but is very strong. It is used to make skis, boats and surfboards. Concrete is made from aggregate (a mixture of sand and gravel) embedded in cement. It is strong and rigid. Concrete is used as a building material. Carbon fibres are made from long chains of carbon atoms or carbon nanotubes which are bound together with a polymer matrix. Carbon fibre composites are very strong and light. They are used in aerospace designs and sports car manufacturing.

**Copy the key knowledge table into your exercise books.**

**Key knowledge- Do your look, cover, write check by learning the answers to the questions below.**

|  |  |
| --- | --- |
| Describe what composites are made of. | Two materials: the ‘reinforcement’ and the ‘matrix’. |
| Describe the materials in fibreglass. | Fibres of glass (the reinforcement) embedded in a matrix made of plastic polymer. |
| State the properties of fibreglass. | Very low density but is very strong and so, is used for skis and boats. |
| Describe the materials in concrete. | Aggregate (a mixture of sand and gravel), embedded in cement. |
| State the properties of concrete. | Strong and rigid and is used as a building material |
| Describe the materials in carbon fibre. | Long chains of carbon atoms (or carbon nanotubes), bound together with a polymer matrix. |
| State the properties of carbon fibre. | Very strong and light and are used in aerospace designs and sports car manufacturing. |

**Complete each of the following sentences in your exercise books**

**Recall Quiz:**

1. *The two materials which make up a composite are called the \_\_\_ and the \_\_\_.*
2. *Fibreglass is made from… and…*
3. *\_\_\_\_ is produced by embedding aggregate in cement.*
4. *The properties of fibreglass are… As a result, it is often used to make…*
5. *Carbon fibre composites are used in…*

**Application Task - I do**

Suggest a material you would use to build a sports car with. Justify your answer.

I would use carbon fibre to build a sports car because it is a strong and light material, allowing the car to reach higher top speeds.

**Application Task - We do**

**Copy and complete the question in your exercise book.**

Suggest a material you would use to build the foundations of a large building. Justify your answer.  I would use \_\_\_\_\_\_\_\_\_ to build the foundations of a large building because…

**Application Task - You do**

**Copy and complete the question in your exercise book.**

Suggest a material you would use to build the hull of a boat. Justify your answer.

 I would use \_\_\_\_\_\_\_\_\_\_ to build the hull of a boat because…

**Independent Task**

**Write your answers in complete sentences in your exercise book.**

Below is a table of materials describing various properties of each material. Suggest which material would be best suited for the following:

1. Fruit bowl
2. Skis
3. A protective barrier for spectators at an ice hockey game.

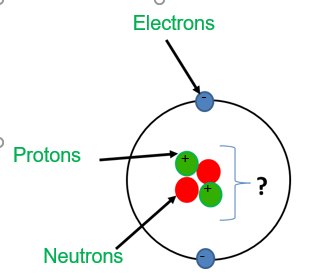
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Material** | **Brittleness** | **Water resistance** | **Transparency** | **Rigidity** | **Weight** |
| Clay ceramic | Brittle | No | Opaque | Hard | Heavy |
| fibreglass | Shatter resistant | Yes | Opaque | Hard | Light |
| Poly(methyl methacrylate) | Shatter resistant | Yes | Transparent | Hard | Light |
| Concrete | Tough | Yes | Opaque | Hard | Very heavy |

**Lesson 8**

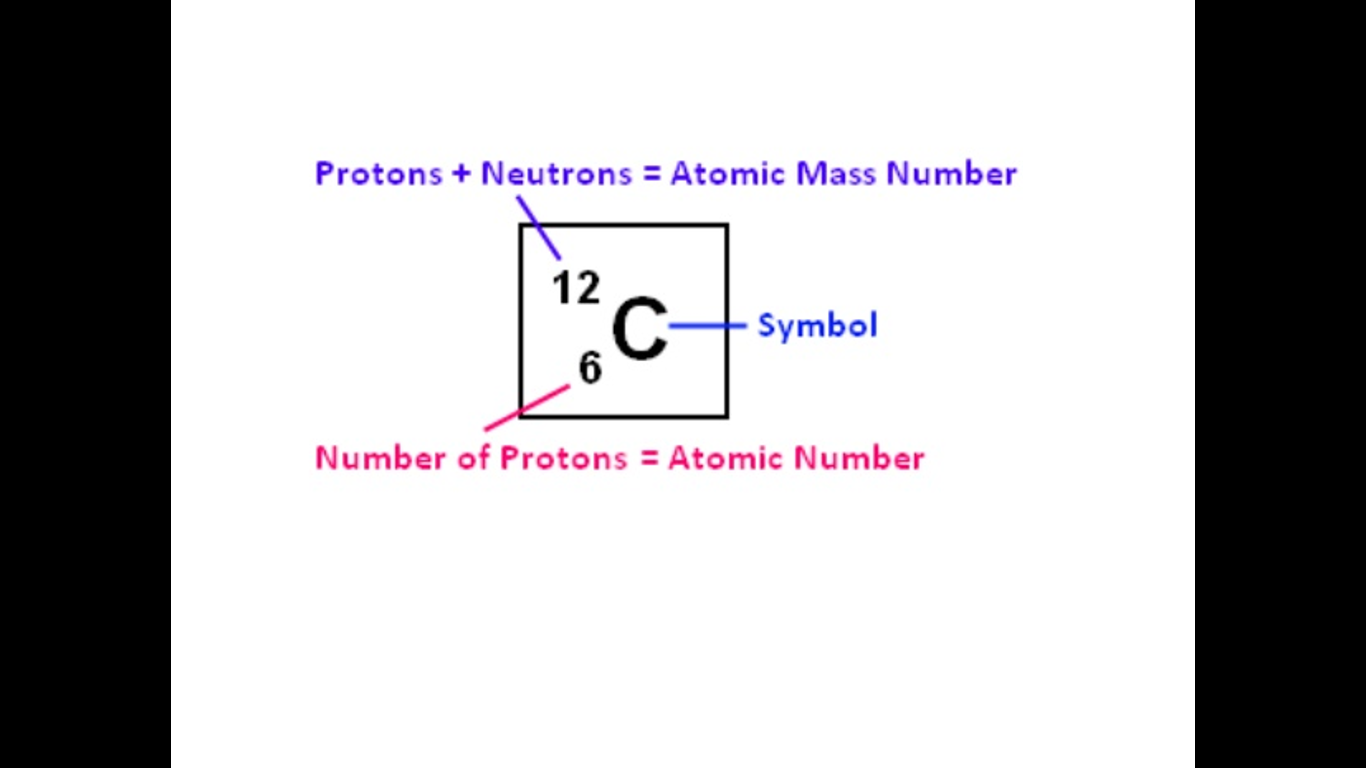
**02 June 2020**

**Atomic Structure**

**Read the information below, then answer the questions that follow.**

All substances are made of atoms. An atom is the smallest part of an element that can exist. An atom is made up of three sub-atomic particles. Sub-atomic means smaller than or within an atom. The three subatomic particles are the protons, neutrons and electrons. Protons and neutrons are located at the centre of atoms, which we call the nucleus. The electrons are located around the outside of the atom, orbiting the nucleus. 

The periodic table gives us information about the number of protons, neutrons and electrons in an atom of each element. Firstly, we have the atomic mass number. The atomic mass number shows the number of protons + the number of neutrons found in an atom. Secondly, we have atomic number, which tells us the number of protons in an atom of an element. We can figure out the number of electrons in an atom because a neutral atom will always have the same number of electrons as protons.



**Copy out the questions below and write your answers in full sentences.**

**Checkpoint questions:**

1. What do we call the centre of an atom?
2. What two sub atomic particles are found in the nucleus?
3. What does the atomic mass number of an element tell us?
4. What does the atomic number of an element tell us?
5. How do we calculate the number of neutrons an atom has?
6. How do we find out the number of protons an atom has?

**Copy the key knowledge table into your exercise books.**

**Key knowledge- Do your look, cover, write check by learning the answers to the questions below.**

|  |  |
| --- | --- |
| Define atomic mass number. | The number of protons added to the number of neutrons.  (this is the bigger number for each element) |
| Define atomic number. | The number of protons.  (this is the smaller number for each element) |
| How do you calculate the number of protons for an element? | Use the atomic number |
| How do you calculate the number of electrons for an element? | Use the atomic number |
| How do you calculate the number of neutrons for an element? | Atomic mass number - atomic number |

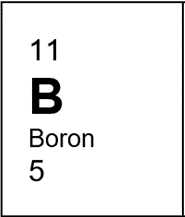
**Complete the sentences below in your exercise book.**

Recall Quiz:

1. *An atom of titanium contains 22 protons. This means that it has \_\_ electrons.*
2. *Adding the number of protons to the number of neutrons give us an atom’s…*
3. *The number of protons, on the other hand, gives us…*
4. *In order to calculate the number of neutrons, we must…*

**Application Task – I do**

Calculate the number of protons, neutrons and electrons in a Boron atom



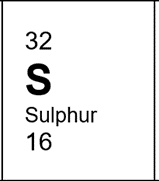
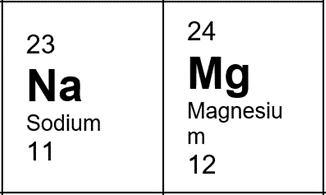
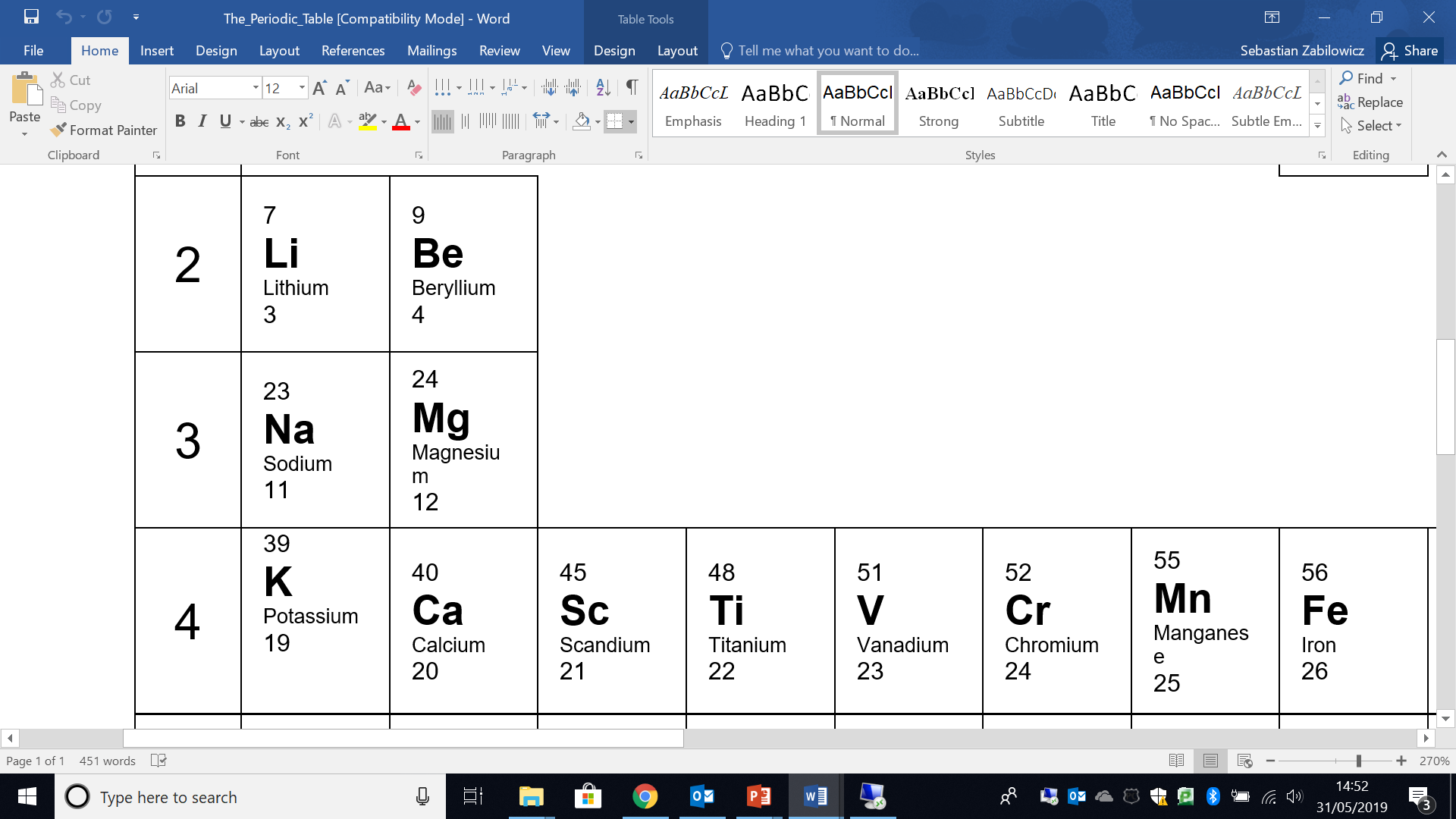
**Protons:** Look at the atomic number (smaller number) – 5 protons

**Electrons:** Look at the atomic number (smaller number) – 5 electrons

**Neutrons**: Atomic mass number – atomic number 11-5 = 6 – 6 neutrons

**Application Task – You do**

In your exercise books calculate the number of protons, neutrons and electrons in a Sulphur, Sodium and Magnesium atom.

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**Sulphur:**  Protons = electrons = Neutrons =

**Sodium:** Protons = electrons = Neutrons =

**Magnesium**: Protons = electrons = Neutrons =

**Independent Task**

Copy the table and calculate the number of protons, electrons and neutrons for the first 5 elements in the periodic table.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Element | Symbol | Atomic number | Atomic mass | Number of protons | Number of neutrons | Number of electrons |
| Hydrogen | H | 1 | 1 |  |  |  |
| Helium | He | 2 | 4 |  |  |  |
| Lithium | Li | 3 | 7 |  |  |  |
| Beryllium | Be | 4 | 9 |  |  |  |
| Boron | B | 5 | 11 |  |  |  |