7.3 Atoms have mass

Student worksheet answers (pages 138–139)

Atoms are all about the mass

1 In the following table, summarise the structure of the atom.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Location | Charge | Mass |
| Protons | nucleus | + | 1 |
| Neutrons | nucleus | neutral | 1 |
| Electrons | surround the nucleus | - | 0 |

2 What does the atomic number of an atom represent?

the number of protons and the number of electrons

3 What does the mass number of an atom represent?

the number of protons + neutrons

4 How can you calculate the number of neutrons using the atomic number and mass number?

mass number – atomic number = number of neutrons

5 In the space below, write the conventional representation of the following elements.

|  |  |  |  |
| --- | --- | --- | --- |
| Lithium | Helium | Phosphorous | Aluminium |
| $$$$ | $$$$ | $$$$ | $$$$ |
| Iodine | Carbon | Xenon | Iron |
| $$$$ | $$$$ | $$$$ | $$$$ |

6 Complete the following table using your knowledge of atomic number. Remember: You cannot have a decimal in the neutron column, so you must round off the mass number first.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Atomic Number | Mass Number | Number of Electrons | Number of Protons | Number of Neutrons | Chemical Symbol | Name |
| 3 | 7 | 3 | 3 | 4 | Li | Lithium |
| 17 | 35 | 17 | 17 | 18 | Cl | Chlorine |
| 21 | 45 | 21 | 21 | 24 | Sc | Scandium |
| 50 | 119 | 50 | 50 | 69 | Sn | Tin |
| 24 | 52 | 24 | 24 | 28 | Cr | Chromium |

EXTEND YOUR UNDERSTANDING

7 There were many men responsible for our current level of understanding of the atom. Draw a timeline that includes the name of each scientist, the year of his discovery and what he discovered.

400 BC: Democritus: first suggested that all matter is made of tiny particles called atoms

1800’s – John Dalton: the atomic theory of matter. All matter is made of atoms. All the atoms of a particular element are identical, Atoms are rearranged in a chemical reaction, Compoundsare formed when two or more different kinds of atoms join together and atoms can never be made or destroyed during a chemical reaction

1897 – JJ Thomson: Plum pudding model of the atom. Atoms are positive with scattered negative bits

1908 - 1913 – Rutherford, Geiger and Marsden. Gold foil experiment proves that atoms have a positively charged nucleus (no scattered negatives), disproving JJ Thomson

1913: Niels Bohr. Electrons orbit the positive nucleus in energy levels. Lower energy electrons are closer to the nucleus

1932: Chadwick. The nucleus contains Neutrons (no charge) and Protons (positive charge). Neutrons and protons have approximately the same mass.