**Year 9 Atoms and Radiation**

**Quiz 1 - Revision**

**Students should be able to:**

* Write definitions for the following:

atom isotope ion atomic number

anion cation mass number electron

proton neutron valence sub-atomic particle

element nucleus periodic table radiation

radioactive

* Describe and draw a diagram of an atom.
* Name the three particles that make up and atom. State the charge of each particle and its relative mass.
* Determine the number of protons, neutrons and electrons for a particular element given its atomic number (Z) and mass number (A).
* represent atomic structure of an element as
* define isotopes as an atom of the same type of element that has a different number of neutrons.
* State how an ion is formed.
* Recall the name and valency of these common ions:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| H+ | Mg2+ | Fe3+ | F- | O2- | N3- |
| Na+ | Ca2+ | Al3+ | Cl- | S2- | P3- |
| K+ | Fe2+ |  | Br- |  |  |
| Ag+ | Cu2+ |  | I- |  |  |
|  | Zn2+ |  |  |  |  |
|  | Pb2+ |  |  |  |  |

* explain how positive ions (cations) and negative ions (anions) are formed.
* use the valency of the ions listed above to write the chemical formula of ionic compounds.
* name simple ionic compounds
* State why some isotopes are radioactive.
* Name the three types of radiation and give a description of each.
* State the penetrating power of each of the three types of radiation.

**Revision Questions**

1. Match the following terms with their definitions.

|  |  |  |
| --- | --- | --- |
| Atom |  | * A charged atom, formed when an atom gains or loses electrons during a chemical reaction. |
| Atomic number |  | * The number of protons within the nucleus and defines the element. |
| Element |  | * The total number of protons and neutrons in the nucleus. |
| Isotopes |  | * Atoms of the same element with different numbers of neutrons. |
| Mass number |  | * All elements and elemental information arranged in order of increasing atomic number. |
| Periodic table |  | * The tiny building blocks of matter. Consist of a nucleus, which contains protons and neutrons, which is surrounded by electrons. |
| Ion |  | * A pure substance made up of only one type of atom. |

2. Draw a diagram of an atom identifying all the sub-atomic particles.

3. In the following table, summarise information about the structure of the atom.

A white rectangular object with black text

Description automatically generated

4. Complete the following table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Element** | **Mass**  **number** | **Atomic** **number** | **Number of**  **protons** | **Number of electrons** | **Number of**  **neutrons** |
| Beryllium | 9 | 4 |  | 4 |  |
| Platinum | 195 | 78 |  |  |  |
| Arsenic |  | 33 |  |  | 42 |
| Plutonium | 244 |  | 94 |  |  |
| Zirconium |  |  |  | 40 | 51 |

5. a) How are the electrons of atoms arranged?

b) How many electrons can fill the following shells?

* 1. first
  2. second
  3. third
  4. fourth

c) What is the valence shell of an atom?

d) Why is the valence shell so important?

6. State if each of the following statements are true or false.

|  |  |  |
| --- | --- | --- |
| **Statement** | **Write “True” or “False”** | **If “false”, Rewrite the statement to make it true.** |
| Protons and neutrons have approximately the same mass. |  |  |
| In a neutral atom the number of protons equals the number of neutrons. |  |  |
| The mass of an electron is one hundredth the mass of a proton.  The nucleus consists of protons and neutrons. |  |  |
| The atom is mainly empty space. |  |  |
| Most of the mass of an atom exists in the electron cloud. |  |  |
| An element is the simplest substance. It cannot be broken down to simpler substances by chemical reactions. |  |  |
| An ion is formed when an atom gains or loses protons. |  |  |

7. Give the number of protons, neutrons and electrons in each of the following neutral atoms.

a) 42He

b) 6429Cu

c) 4018Ar

d) 12753I

e) 19779Au

f) 23692U

8. a) What is an isotope?

b) Here are three isotopes of an element:

* 1. The element is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. The number 6 refers to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  3. The numbers 12, 13, and 14 refer to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  4. How many protons and neutrons are in the first isotope? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  5. How many protons and neutrons are in the second isotope? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  6. How many protons and neutrons are in the third isotope? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. a) How do atoms form ions?

b) Why will atoms form ions?

c) State what must happen to an atom to make it:

(i) a cation

(ii) an anion

10. The table below shows the atomic structures of five different particles.

|  |  |  |  |
| --- | --- | --- | --- |
| Particle | Protons | Electrons | Neutrons |
| R | 12 | 12 | 12 |
| S | 12 | 12 | 14 |
| T | 12 | 10 | 12 |
| X | 8 | 10 | 8 |
| Z | 9 | 9 | 10 |

a) Which of the particles is a negative ion? What is the charge on this ion?

b) Which of the particles is a positive ion? What is the charge on this ion?

c) Which of the particles are neutral atoms?

d) Which of the particles have the same atomic number?

e) Which of the particles have the same mass number?

11. Complete the table below by naming and writing the chemical formula of the compound that is formed when the following anions and cations are combined.

|  |  |  |  |
| --- | --- | --- | --- |
| **Cation** | **Anion** | **Formula of compound formed** | **Name of compound formed** |
| K+ | Cl- |  |  |
| Ca2+ | O2- |  |  |
| B3+ | F- |  |  |
| Zn2+ | Br- |  |  |
| Cr3+ | S2- |  |  |
| Cu2+ | P3- |  |  |

12. Complete the following table for the three types of radiation.

[A diagram of a solar panel

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|  |  |  |  |
| --- | --- | --- | --- |
| **Type of radiation** | **Symbol** | **What it is made from?** | **What stops it?** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

13. Calculate the atomic number and mass number of each of the following atoms after decay.

a) undergoes alpha decay

b) undergoes beta decay

c) undergoes alpha decay

d) undergoes beta decay