**Year 9 Atoms and Radiation**

**Quiz 1 – Revision Answers**

**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+1 | Mg+2 | Fe+3 | F-1 | O2- | N-3 |
| Na+1 | Ca+2 | Al+3 | Cl-1 | S2- | P-3 |
| K+1 | Fe+2 |  | Br-1 |  |  |
| Ag+1 | Cu+2 |  | I-1 |  |  |
|  | Zn+2 |  |  |  |  |
|  | Pb+2 |  |  |  |  |

* 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 Atomic number Element Isotopes Mass number Periodic table Ion

Ion - 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.

Mass number - The total number of protons and neutrons in the nucleus.

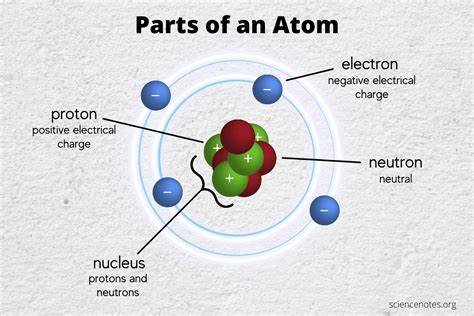
Isotope - Atoms of the same element with different numbers of neutrons.

Periodic Table - All elements and elemental information arranged in order of increasing atomic number.

Atom - The tiny building blocks of matter. Consist of a nucleus, which contains protons and neutrons, which is surrounded by electrons.

Element - 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.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Location** | **Charge** | **Mass** |
| **Protons** | Nucleus | Positive | 1 |
| **Neutrons** | Nucleus | Neutral | 1 |
| **Electrons** | Electron cloud | Negative | 1/2000 |

4. Complete the following table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element | Mass  number | Atomic number | Number of  protons | Number of electrons | Number of  neutrons |
| Beryllium | 9 | 4 | 4 | 4 | 5 |
| Platinum | 195 | 78 | 78 | 78 | 117 |
| Arsenic | 75 | 33 | 33 | 33 | 42 |
| Plutonium | 244 | 94 | 94 | 94 | 150 |
| Zirconium | 91 | 40 | 40 | 40 | 51 |

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

In shells/orbitals arranged around the nucleus.

b) How many electrons can fill the following shells? (2n2)

* 1. first 2
  2. second 8
  3. third 18
  4. fourth 32

c) What is the valence shell of an atom?

The outermost shell of the atom.

d) Why is the valence shell so important?

The electrons in this shell are responsible for all the atoms properties (physical and

chemical)

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

If they are false, alter the statement so that it becomes true.

a) Protons and neutrons have approximately the same mass. True

b) In a neutral atom the number of protons equals the number of neutrons. False

In a neutral atom the number of protons equals the number of electrons

c) The mass of an electron is one hundredth the mass of a proton. False

The mass of an electron is two thousandth the mass of a proton.

d) The nucleus consists of protons and neutrons. True

e) The atom is mainly empty space. True

f) Most of the mass of an atom exists in the electron cloud. False

Most of the mass of an atom exists in the nucleus.

g) An element is the simplest substance. It cannot be broken down to simpler

substances by chemical reactions. True

h) An ion is formed when an atom gains or loses protons. False

An ion is formed when an atom gains or loses electrons.

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

a) 42He 2 protons, 2 neutrons and 2 electrons

b) 6429Cu 29 protons, 35 neutrons and 29 electrons

c) 4018Ar 18 protons, 22 neutrons and 18 electrons

d) 12753I 53 protons, 74 neutrons and 53 electrons

e) 19779Au 79 protons, 118 neutrons and 79 electrons

f) 23692U 92 protons, 144 neutrons and 92 electrons

8. a) What is an isotope?

Isotopes are samples of an element with different numbers of neutrons in their atoms.

b) Here are three isotopes of an element:

* 1. The element is: Carbon
  2. The number 6 refers to the Atomic number or number of protons
  3. The numbers 12, 13, and 14 refer to the Mass number
  4. How many protons and neutrons are in the first isotope? 6p and 6n
  5. How many protons and neutrons are in the second isotope? 6p and 7n
  6. How many protons and neutrons are in the third isotope? 6p and 8n

9. a) How do atoms form ions?

Atoms form ions by losing or gaining electrons.

b) Why will atoms form ions?

To obtain the same electron configuration as a noble gas.

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

(i) a cation – the atom loses electrons

(ii) an anion – the atom gains electrons

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? X

What is the charge on this ion? -2

b) Which of the particles is a positive ion? T

What is the charge on this ion? +2

c) Which of the particles are neutral atoms? R, S and Z

d) Which of the particles have the same atomic number? R, S and T

e) Which of the particles have the same mass number? R and T

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- | KCl | Potassium chloride |
| Ca2+ | O2- | CaO | Calcium oxide |
| B3+ | F- | BF3 | Boron fluoride |
| Zn2+ | Br- | ZnBr2 | Zinc bromide |
| Cr3+ | S2- | Cr2S3 | Chromium sulfide |
| Cu2+ | P3- | Cu3P2 | Copper (II) phosphide |

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

[A diagram of a solar panel

Description automatically generated](http://gakuran.com/great-tohoku-earthquake-5/)

|  |  |  |  |
| --- | --- | --- | --- |
| **Type of radiation** | **Symbol** | **What it is made from?** | **What stops it?** |
| Alpha | α | 2 protons & 2 neutrons  (Helium nucleus) | Air  Paper |
| Beta | β | High speed electron | Aluminium |
| Gamma | γ | High energy wave | Thick lead  Concrete |

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

a) undergoes alpha decay atomic number = 90 and mass number = 234

b) undergoes beta decay atomic number = 7 and mass number = 14

c) undergoes alpha decay atomic number = 93 and mass number = 237

d) undergoes beta decay atomic number = 12 and mass number = 22