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| **Atoms and the periodic table** |

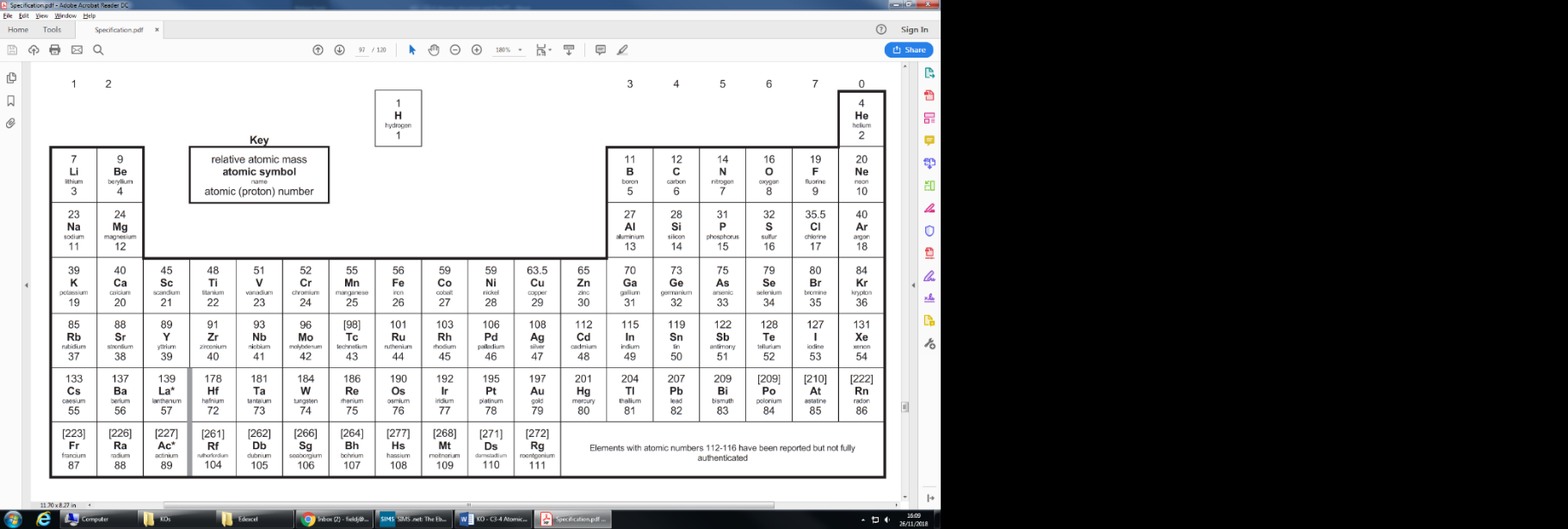
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| **Lesson sequence**   1. Structure of atoms 2. Detailed structure of atoms 3. Isotopes 4. Mendeleev’s periodic table 5. The modern periodic table 6. Electron configuration |

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| **1. Structure of atoms** | |
| **\*Particle** | The tiny pieces that all matter is made from. |
| **\*Atom** | The smallest independent particle. Everything is made of atoms. |
| **\*\*Size of atoms** | About 1 x 10-10 m in diameter. |
| **\*\*Dalton’s model of atoms** | - Tiny hard spheres  - Can’t be broken down  - Can’t be created or destroyed  - Atoms of an element are identical  - Different elements have different atoms |
| **\*Subatomic particles** | Smaller particles that atoms are made from. |
| **\*Proton** | Mass = 1  Charge = +1  Location = nucleus |
| **\*Neutron** | Mass = 1  Charge = 0  Location = nucleus |
| **\*Electron** | Mass = 1/1835 (negligible)  Charge = -1  Location = shells orbiting nucleus |
| **\*Nucleus** | Central part of an atom, 100,000 times smaller than the overall atom |

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| **2. Detailed structure of atoms** | |
| **\*\*Alpha particle** | Small positively charged particle made of two protons and two neutrons. |
| **\*\*Scattering** | When particles bounce back or change direction. |
| **\*\*Rutherford’s experiment** | Fired alpha particles at gold leaf, used a phosphor-coated screen to track where they went. |
| **\*\*Rutherford’s results** | Most alpha particles went through, some scattered (changed direction). |
| **\*\*Rutherford’s explanation** | Scattered particles hit a solid nucleus. Most did not hit it, therefore nucleus is small |
| **\*Atomic number** | The bottom number on the periodic table, gives the number of protons and electrons. |
| **\*Atomic mass** | The top number on the periodic table, gives the total protons and neutrons together. |
| **\*Number of protons** | The atomic number. |
| **\*Number of electrons** | The atomic number. |
| **\*Number of neutrons** | Atomic mass minus atomic number. |
| **\*Number of protons and electrons** | Equal, because each negative electron is attracted to a positive proton in the nucleus. |

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| **3. Mendeleev’s periodic table** | |
| **\*Dmitri Mendeleev** | Russian chemist, developed the periodic table. |
| **\*Mendeleev’s periodic table** | Ordered by increasing Ar, some elements switched according to their properties. |
| **\*Chemical properties** | Includes reaction with acid and formula of oxide. |
| **\*Physical properties** | Includes melting point and density. |
| **\*\*Gaps in Mendeleev’s periodic table** | Mendeleev left gaps where no known element fitted and predicted these would be filled with newly discovered elements. |
| **\*\*Eka-aluminium** | An element that Mendeleev thought would fill a gap. He predicted its properties, which matched gallium when discovered. |

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| **4. The modern periodic table** | |
| **\*Noble gases** | Gases that do not react: He, Ne, Ar, Kr. |
| **\*\*Moseley’s experiment** | Fired electrons at samples of elements and measured X-rays produced. |
| **\*\*Moseley’s results** | Energy of x-rays produced proportional to the positive charge of the element. |
| **\*\*Conc. from Moseley’s work** | The atomic number must be the number of protons in the atoms. |



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| **\*\*Pair reversals** | Elements (like Ar and K) that are not in order of increasing mass. |
| **\*\*Explaining pair reversals** | It means elements should be order elements by increasing atomic number instead. |

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| **6. Electron configuration** | |
| **\*Shells** | Electrons orbit atoms in shells. |
| **\*First shell** | Holds up to two electrons. |
| **\*Second shell** | Holds up to eight electrons. |
| **\*Third shell** | Holds up to eight electrons. |
| **\*Number of electrons** | Given by the atomic number. |
| **\*Filling shells** | Fill shells from the first shell out. Move up a shell when current one is full. |
| **\*Electron configuration** | The number of electrons in each shell (e.g. Al is 2.8.3). |
| **\*Outer shell** | The last shell with any electrons in it. |
| **\*\*Groups** | Columns in the periodic table, tell you the number of electrons in the outer shell. |
| **\*\*Periods** | Rows in the periodic table, tell you the number of electron shells. |