Unit content	Pearson	Study	Review
Area of study 1: Atoms and elements			
Science as a Human Endeavour 1 ○ Findings from a range of scientific experiments contributed to the understanding of the atom, enabling scientists, including Dalton, Thomson, Rutherford, Bohr and Chadwick to develop models of atomic structure and make reliable predictions about the mass, charge and location of the sub-atomic particles.	**2.1**		
• the structure of the periodic table is based on the atomic number and the properties of the elements	**2.2**		
• isotopes are atoms of an element with the same number of protons but different numbers of neutrons and are represented in the form A X (IUPAC) or X-A	**2.3**		
• isotopes of an element have the same electron configuration and possess similar chemical properties but have different physical properties	**2.3**		
• the relative atomic mass (atomic weight), Ar is the ratio of the average mass of the atom to 1/12 the mass of an atom of ^{12}C; relative atomic masses of the elements are calculated from their isotopic composition	**2.3**		
• mass spectrometry involves the ionisation of substances and the separation and detection of the resulting ions; the spectra which are generated can be analysed to determine the isotopic composition of elements and interpreted to determine relative atomic mass	**2.4**		
• the location of electrons within atoms can be represented using electron configurations	**3.1 / 3.2**		
• the ability of atoms to form chemical bonds can be explained by the arrangement of electrons in the atom and in particular by the stability of the valence electron shell	**3.1 / 3.2**		
• atoms can be modelled as a nucleus, surrounded by electrons in distinct energy levels, held together by electrostatic forces of attraction between the nucleus and electrons;	**3.2**		
• the elements of the periodic table show trends across periods and down main groups, including in atomic radii, valencies, 1st ionisation energy and electronegativity as exemplified by groups 1, 2, 13–18 and period 3	**3.3**		
• flame tests and atomic absorption spectroscopy (AAS) are analytical techniques that can be used to identify elements; these methods rely on electron transfer between atomic energy levels and are shown by line spectra	**3.4/3.5**		
• the presence of specific ions in solutions can be identified by observing the colour of flame tests	**3.4/3.5**		

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• metallic bonding can be modelled as a regular arrangement of atoms with electrostatic forces of attraction between the nuclei of these atoms and their delocalised electrons that are able to move within the three-dimensional lattice	**4.2**		
• the metallic bonding model can be used to explain the properties of metals, including malleability, thermal conductivity, generally high melting point and electrical conductivity;	**4.1 – 4.3**		
• (metal) nanomaterials are substances that contain particles in the size range 1–100 nm and have specific properties relating to the size of these particles which may differ from those of the bulk material	**4.4**		
• elements are represented by symbols	**1.1**		
• materials are pure substances with distinct measurable properties, including melting and boiling points, reactivity, hardness and density; or mixtures with properties dependent on the identity and relative amounts of the substances that make up the mixture	**1.2 / 1.3**		
• pure substances may be elements or compounds which consist of atoms of two or more elements chemically combined; the formulae of compounds indicate the relative numbers of atoms of each element in the compound	**1.1**		
• differences in the physical properties of substances in a mixture, including particle size, solubility, density, and boiling point, can be used to separate them	**1.3**		
Area of study 2: Combining elements			
• chemical bonds are caused by electrostatic attractions that arise because of the sharing of electrons between participating atoms; the valency is a measure of the bonding capacity of an atom	**5.1**		
• ions are atoms or groups of atoms that are electrically charged due to a loss or gain of electrons; ions are represented by formulae which include the number of constituent atoms and the charge of the ion (for example, O^{2-}, SO_4^{2-})	**5.2** **6.1 / 6.2**		
• ionic bonding can be modelled as a regular arrangement of positively and negatively charged ions in a crystalline lattice with electrostatic forces of attraction between oppositely charged ions	**5.3**		
• the ionic bonding model can be used to explain the properties of ionic compounds, including high melting point, brittleness and non-conductivity in the solid state; the ability of ionic compounds to conduct electricity when molten or in aqueous solution can be explained by the breaking of the bonds in the lattice to give mobile ions	**5.1/5.2**		
• the formulae of ionic compounds can be determined from the charges on the relevant ions (refer to Appendix 2)	**5.3 – 5.5**		

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• the properties of covalent molecular substances, including low melting point, can be explained by their structure and the weak intermolecular forces between molecules; their non-conductivity in the solid and liquid/molten states can be explained by the absence of mobile charged particles in their molecular structure	**6.1**		
• chemical bonds are caused by electrostatic attractions that arise because of the sharing of electrons between participating atoms	**6.2**		
• molecular formulae represent the number and type of atoms present in the molecules (refer to Appendix 2)	**6.2**		
• covalent bonding can be modelled as the sharing of pairs of electrons resulting in electrostatic forces of attraction between the shared electrons and the nuclei of adjacent atoms	**6.2**		
• Lewis structure (E.D.D) diagrams can be used to explain the shapes of molecules	**6.2**		
• molecular structural formulae (condensed or showing bonds) can be used to show the arrangement of atoms and bonding in covalent molecular substances	**6.2**		
• the type of bonding within ionic, metallic and covalent substances explains their physical properties, including melting and boiling points, conductivity of both electricity and heat and hardness	**4.1/5.1/6.1**		

EXTRA NOTES: