YSGOL BRYNREFAIL

Subject – *CHEMISTRY* - *Double* Science– Unit – 2.1a and 2.1b

Year - 10

This half term: Skills, Knowledge and Understanding to be developed;

Skills - By the end of the Unit learners will be able to:

•Balance ionic formulas and chemical equations.
•Calculate the percentage of the composition and percentage of the product.
•Calculate the comparative and molecular relative atomic number of compounds
•Use fractions when calculating the value of Rf.

Higher tier learners only:

•re-arrange equation to calculate moles and use ratios when calculating reaction masses.

By the end of the Unit learners will know and understand:

•The difference between elements, compounds and mixtures.
•How to write chemical formulas of ions of the elements
•How to write chemical equations
•Physical methods of separating mixtures.
•What happens during chemical reactions.

Higher tier learners only:

•How to calculate formulas of component percentages
•How to combine masses that react and form in chemical reactions.
•The mole, Avogadro constant and how to calculate the moles of grams and vice versa

Keywords / Key Terms;

Element, compound, mixtures, atoms, molecules, ions, relative atomic mass, relative molecular mass, product percentage, composition percentage, filtration, evaporation, distillation, chromatography, exothermic, endothermic, chemical reactions, the mole, Avogadro constant.

Learning Outcomes	Success Criteria	Assessment	Homework
Learning Outcomes Activity 1 – Book 1.1a Elements as substances that cannot be broken down into simpler substances by chemical means and as the basic building blocks of all Elements as substances made up of only one type of atom How to represent elements using chemical symbols and simple molecules using chemical formulae	Learners should : • learn the definition of element and compound • be able to recognize some elements from their symbols in the periodic table and remember to put a large letter at the beginning of each and that the second letter (if there is one second) is small.		Revise work and prepare for the end of unit test.
Learning Outcomes Activity 2 Compounds as substances made of two or more different types of atom that are chemically joined and having completely different properties to its constituent elements How to represent simple molecules using a diagram and key	Learners should : • know that in a methane molecule, for example, the four hydrogen atoms surround a central carbon atom, rather than all being joined together in a row.		Revise work and prepare for the end of unit test.
Learning Outcomes Activity 3 Chemical reactions as a process of re-arrangement of the atoms present in the reactants to form one or more products, which have the same total number of each type of atom as the reactants Colour changes, temperature changes (exothermic/endothermic) and effervescence as evidence that a chemical reaction has taken place	Learners should : • know that these are indications that a chemical reaction has occurred. e.g. green copper(II) carbonate turns black on thermal decomposition and the reaction of sodium and water is exothermic and effervesces.		Produce a mind map of all the information related to Chemical Reactions

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Learning Outcomes	Success Criteria	Assessment	Homework
Learning Outcomes Activity 4 Atoms/molecules in mixtures not being chemically joined and mixtures being easily separated by physical processes such as filtration, evaporation, chromatography and distillation Chromatographic data analysis and R_f values	Learners should : • understand the principles behind each separation method e.g. in chromatography they should understand that the more soluble a substance, the further it is carried by the solvent. • recall the expression used to calculate R_f values.	Teacher assessment	Extended Writing on Distilling Past-examination questions on all of the work so far.
Learning Outcomes Activity 5 How to write the formulae of ionic compounds given the formulae of the ions they contain	Learners should : • be able to apply their knowledge to any given ion. using table of formulae for common ions (including compound ions) which will be included in all examination papers		Complete a grid of different formulas
Learning Outcomes Activity 6 How to represent chemical reactions using word equations How to represent chemical reactions using balanced chemical equations where the total relative mass of reactants and products is equal	Learners should : • be able to write word equations to represent chemical reactions. • be able to write and balance chemical equations. • be able to use the state symbols (s), (l), (g) and (aq) but they will not be required to include them in equations unless they are specifically asked to do so.		Revise the work of all the units to date for the test.
Learning Outcomes Activity 7 This 40-minute test on this unit and previous units - for assessment by the teacher.		End of unit test - Teacher assessment -% and grade	
Learning Outcomes Activity 8 – Book 1.1b Relative atomic mass and relative molecular (formula) mass	Learners should : • be able to calculate relative molecular (formula) masses using A_r values from the Periodic Table. • **higher tier candidates should know how A_r is different to mass number.**		Revise work and prepare for the end of unit test.
Learning Outcomes Activity 9 **The Avogadro constant and the mole and how to convert amount of substance in grams to moles and vice versa**	Learners should : • **recall the relationship between number of moles and mass in grams.**		Questions calculating moles.

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Learning Outcomes	Success Criteria	Assessment	Homework
Learning Outcomes Activity 10 The percentage composition of compounds The percentage yield of a chemical reaction	Learners should : • be able to carry out a range of calculations based on the percentage by mass of each element present in a compound. • recall the expression used to calculate percentage yield.		Revise work and prepare for the end of unit test.
Learning Outcomes Activity 11 **How to calculate the formula of a compound from reacting mass data**	Learners should : • **be able to deal with questions where the percentage composition of the compound is given, as well as examples where actual masses are provided.** • **show their working in questions of this type and should be made aware that data collected may possibly suggest a formula different to that which they know to be correct, e.g. incomplete reaction of magnesium with oxygen could provide data that gives Mg_2O as the formula for magnesium oxide.**	Teacher assessment	Questions calculating formulas of masses
Learning Outcomes Activity 12 **How to calculate the masses of reactants or products from a balanced chemical equation**	Learners should : • **think of this as a progression from a balanced symbol equation – and appreciate that considering the masses of reactants and products is a good opportunity to check that an equation is correctly balanced. The balanced equation will usually be given in examination questions on this section.**		Complete past paper questions on calculating masses that react Revise work and prepare for the end of unit test.
Learning Outcomes Activity 13 This 40-minute test on this unit and previous units - for assessment by the teacher.		End of unit test - Teacher assessment -% and grade	

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Subject – *CHEMISTRY - Double* Science– Unit – 2.3

Year - 10

This half term: Skills, Knowledge and Understanding to be developed;

Skills - By the end of the Unit learners will be able to:

- Plot accumulation curves and interpret data
- Calculate the solvency of solids using data given in question
- Investigate into how hard water samples are.
- Analyze results of investigations into types of water hardness and use these to calculate hardness in unknown samples.

By the end of the Unit learners will know and understand:

- Composition and treatment of the water supply
- Fluoridation of drinking water - advantages and disadvantages
- Investigate different types of water hardness
- Know which ions cause water hardness and how these ions have reached the water supply
- Different methods to soften hard water.

Keywords / Key Terms;

Composition, solubility curve, solid solubility, ions, sedimentation, filtration, chlorination, degradation, fluoride, hard water - permanent and temporary, slime, soap foam.

Learning Outcomes	Success Criteria	Assessment	Homework
Learning Outcomes Activity 1 The composition of water in 'natural' water supplies, including dissolved gases, ions, microorganisms and pollutants	Learners should : • Be aware that rainwater contains dissolved CO_2 (which lowers the pH) and O_2. • Know that groundwater contains ions such as Mg^{2+}, Ca^{2+}, Na^{+} and K^{+} from minerals dissolved as it permeates through rocks. • Be aware that man-made pollutants include fertilisers, pesticides and household and industrial waste. • Know natural pollutants include bacteria and viruses		Revise work and prepare for the end of unit test.
Learning Outcomes Activity 2 The need for a sustainable water supply to include reducing our water consumption, reducing the environmental impacts of abstracting, distributing and treating water	Learners should be able to : • Show an understanding that water is a resource ever more in demand as a result of increasing population and industrialisation, and that climate change could potentially cause water shortages all over the world, including the UK. • Appreciate that as demand outstrips supply, the cost of water will increase and that measures to conserve water have economic benefits for domestic, commercial and industrial consumers.		Revise work and prepare for the end of unit test.
Learning Outcomes Activity 3 The treatment of the public water supply using sedimentation, filtration and chlorination	Learners should know about: • Sedimentation – in reservoirs/tanks, larger solid particles settle under gravity • Filtration – through layers of sand and gravel, removes smaller insoluble particles • Chlorination – chlorine added to kill bacteria, prevents disease/makes it safe to drink .		Revise work and prepare for the end of unit test.

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Learning Outcomes	Success Criteria	Assessment	Homework
Learning Outcomes Activity 4 Desalination of sea water to supply drinking water including the sustainability of this process on a large scale	Learners should : • Know that the simplest method for desalination of sea water is distillation. This involves boiling sea water which uses large amounts of costly energy, preventing it from being a viable process in many parts of the world. • Be aware that other methods are also used, e.g. the use of membrane systems • Be able to discuss the potential of desalination as a source of drinking water in different parts of the world in terms of proximity to the sea, availability of 'cheap' energy and a country's wealth.		Revise work and prepare for the end of unit test.
Learning Outcomes Activity 5 The arguments for and against the fluoridation of the water supply in order to prevent tooth decay	Learners should : • Know that fluoridation of water supplies is a controversial issue. • Be able to present the arguments for and against the process. • Be aware that there is strong evidence to suggest that fluoride ions prevent tooth decay in young children. • Know that significant amounts of fluoride ions are found naturally in the water in some areas but fluoride can also be ingested from toothpastes and mouthwashes. • Be aware that the link between fluoride ions and a reduction in incidence of tooth decay has been established by surveying school children of various ages, and that the data is reliable because all school children are surveyed and only absentees on the day are excluded. • Understand that comparing data from one fluoridated area with that from one non-fluoridated area does not provide sufficient evidence to draw a valid conclusion, since other factors, such as social and economic backgrounds, also have an effect. • Know that many people object to proposals to fluoridate water supplies for a number of reasons. Fluoride can be harmful in high concentrations, e.g. causing discolouring or decay of teeth (fluorosis). High fluoride intake has also been linked to stomach and bone cancers and to infertility. • Some argue against fluoridation on the grounds that it is 'mass medication' and that no one should be forced to consume fluoride. • Realise that science cannot address ethical issues and therefore cannot answer the question as to whether or not it is correct to fluoridate water supplies. Science can only provide the facts and evidence required for people to form their own opinions. They should also be aware that information relating to the fluoridation of water supplies comes from many different sources and that some of these may be biased and may try to influence opinions.		Reading understanding and answering questions on drinking water fluoridation. Revise work and prepare for the end of unit test.

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Learning Outcomes	Success Criteria	Assessment	Homework
Learning Outcomes Activity 6 The interpretation of solubility curves Simple methods to determine solubility and produce solubility curves	Learners should : • Be able to interpret solubility curves to calculate the solubility of different solids at different temperatures and volumes of water • Be familiar with the following methods: ❖ Add known mass of solute (e.g. ammonium chloride) to a measured volume of water which ❖ will only dissolve a portion of the solute; filter, dry and weigh excess solute; determine solubility ❖ Add slightly more weighed solute (e.g. potassium chlorate) than will dissolve to a measured volume of water at room temperature; heat solution until all solute dissolves; allow to cool and record temperature at which crystals first appear; repeat several times with increasing volumes of water; determine solubility at each temperature; plot solubility curve		Complete past paper questions in the workbook Revise work and prepare for the end of unit test.
Learning Outcomes Activity 7 The causes of hardness in water and how to distinguish between hard and soft waters by their action with soap	Learners should : • Know that hardness in water is caused by the presence of Ca^{2+} and Mg^{2+} ions from dissolved calcium and magnesium compounds and that hard water forms a 'scum' and poor lather when shaken with soap solution. • Be able to describe in detail how the relative amount of hardness in different water samples can be determined, e.g. by measuring the volume of soap solution required to produce a given lather or by measuring the lather produced by a given volume of soap solution.		Revise work and prepare for the end of unit test.
Learning Outcomes Activity 8 The health benefits of hard water and its negative effects, e.g. on boiler elements	Learners should be able to : • Recall that calcium compounds dissolved in water have benefits for teeth and bones and also help reduce heart disease. • Boilers and hot water pipes become 'furred up' as calcium carbonate precipitates – boilers become less efficient and pipes can become completely blocked.		Revise work and prepare for the end of unit test.
Learning Outcomes Activity 9 The difference between temporary and permanent hardness	Learners should know: • That temporary hardness can be removed by boiling and that this leads to 'furring' of kettle elements as a result of formation of insoluble calcium carbonate. • **Higher tier candidates should be able to explain this in terms of the removal of hydrogencarbonate ions.**		Revise work and prepare for the end of unit test.

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Learning Outcomes	Success Criteria	Assessment	Homework
Learning Outcomes Activity 10 The processes used to soften water to include boiling, adding sodium carbonate and ion exchange; the advantages and disadvantages of different methods of water softening **and the explanation of how these methods work**	Learners should know: • Boiling – no need for expensive equipment; only useful for small volumes and does not remove permanent hardness • Adding sodium carbonate (washing soda) – removes both temporary and permanent hardness; limescale is formed which can block washing machine pipes • Ion exchange – removes temporary and permanent hardness and is a continuous process, uses concentrated sodium chloride which is cheap and widely available; exchange columns are expensive • **Boiling causes hydrogencarbonate ions to decompose forming calcium carbonate on the heating element. Adding sodium carbonate (washing soda) removes hardness by precipitating calcium carbonate. Candidates should be able to write appropriate equations for these reactions.** • **Ion exchange removes hardness because calcium (and magnesium) ions are exchanged for sodium ions on passing hard water through an ion exchange resin (two sodium ions needed for every calcium ion). Water coming from the resin contains sodium ions. All the sodium ions attached to an ion exchange resin are eventually 'used up' so no more hardness can be removed, but the resin can be 'regenerated' by being rinsed in a concentrated solution of sodium chloride.**		Complete past paper questions in the workbook Revise work and prepare for the end of unit test.
Learning Outcomes Activity 11 40-minute test on this unit and previous units - To be assessed by the teacher.		End of unit test - Teacher assessment -% and grade.	