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Year 10 Overview 2024-25 – *Chemistry*

Date	Wk	Week	Units Studied & Learning Outcomes
8 weeks (12 Lessons) (38Days)			
2-Sep	A	1	Overview of Unit/No. lessons • Structure of the Atom and the Periodic Table (7 lessons) • Bonding (4 lessons) Lesson **Sequence** of Content: 1, 2 & 3. Size of the atom, isotopes, ions & standard form (3 lessons) 4 – 7. Groups of the periodic table & transition metals (4 lessons) 8, 9 & 10. Ionic bonding & properties (3 lessons) 11. Simple covalent molecules & properties (1 lesson) 12. Polymers and large molecules (1 lesson)
9-Sep	B	2	
16-Sep*	A	3	
23-Sep	B	4	
30-Sep	A	5	
7-Oct	B	6	
14-Oct	A	7	
21-Oct	B	8	

Prior	Current	Next
Year 8 – Periodic table Year 9 – atomic structure	Explain trends in the Periodic table Explain structures and properties of ionic and simple covalent structures	Year 12 – trends in the Periodic table & orbitals Year 11 – electrolysis (links to ion formation)

- **GW**: recall groups of the Periodic Table & different types of bond
- **BI:** describe properties of elements in different groups of the Periodic Table and properties of different types of bond
- **EW**: explain trend in groups of the Periodic Table and explain properties of structures in relation to their bonding

- Recall of knowledge, application of knowledge, identify patterns from observations, interpret data about properties

Assessment:
- Quick quiz
- Exam style questions
- Q&A
- Interleaving

Foundational concepts:
Atomic structure & the periodic table
- Understand the size of the atom
- Understand the development of the periodic table
- Understand properties of group 1, 7 and 0 in the periodic table
- Understand properties of transition metals (SEPARATES)
- Understand structure and properties of ionic bonds and simple covalent structures

Tier 2/3 Vocabulary
- Glossaries, quick quizzes, within exam questions, PowerPoints.

- **KW:** Atom, nucleus, proton, neutron, electron, ion, isotope, alkali metals, hydroxide, halogens, noble gases, ionic, electrostatic, conduction, covalent, intermolecular, forces, lattice, transition metal, catalyst

Links to root words (etymology):
- The **periodic table** is so called for the arrangement, in which similar properties recur at intervals in elements in the same area as you read down the rows of the table.
- Isotope "having the same place," from Greek isos "equal" (see **iso-**) + topos "place" (see **topos**); so called because, despite having different atomic weights, the various forms of an element occupy the same place on the periodic table.

History:
- 400 B.C. Democritus' atomic theory posited that all matter is made up small indestructible units he called atoms.
- To write with colours -- literally translated from its Greek roots chroma and graphein , chromatography was first developed by the Russian botanist Mikhail Tswett in 1903 as he produced a colourful separation of plant pigments through a column of calcium carbonate.

Career links – CSI investigator use separation techniques to test samples collected from crime scenes

Equality Diversity and Inclusion (EDI) links?
- Maria Goeppert-Mayer won a Nobel Prize for formulating the nuclear shell model which made it possible to understand how the nucleus of an atom works
- Scientists from different nationalities
- Mildred Cohn – pioneer of stable isotopic tracers

Misconceptions:
- Atomic 'mass' instead of 'weight'
- Alkali metals are alkaline

- Ionic conduct because of delocalised electrons
- Small molecules have low melting and boiling point due to weak bonds

Half-Term — **7** weeks (10-11 lessons) (35 Days)

4-Nov	A	9
11-Nov	B	10
18-Nov	A	11
25-Nov	B	12
2-Dec	A	13
9-Dec	B	14
16-Dec	A	15

Overview of Unit/No. lessons
Bonding & properties of structures (5 lessons)
Rate and extent of chemical reactions (5 lessons)

Lesson **Sequence** of Content:
1 & 2. Giant covalent structures (2 lessons)
3. Graphene & fullerenes (1 lesson)
4 & 5. Metallic bonding & alloys (2 lesson)
6. Nanoparticles (1 lesson)
7. Rate of reaction – factors that affect rate (1 lesson)
8 & 9. Rate of reaction – surface area (2 lessons)
10. Rate of reaction - concentration (1 lesson)

Prior	Current	Next
Year 9 – atomic structure Year 8 – chemical reaction Year 9 – reactions of metals	Explain structures and properties of giant covalent structures & metallic structures Identify factors that affect the rate of reaction Explain how factors affect the rate of reaction Describe ways to measure rate of reaction	Year 12 – rate of reaction Year 12 – rate of reaction

- **GW**: recall different types of bond, Identify some factors that affect rate of reaction
- **BI**: describe properties of different types of bond, Describe how different factors affect the rate of reaction
- **EW:** explain properties of structures in relation to their bonding, Explain how the different factors affect the rate of reaction using the collision theory

Recall of knowledge, application of knowledge, identify patterns from observations, interpret data

Assessment:
- Quick quiz
- Exam style questions
- Q&A
- Interleaving
- Practical skills
- Interpretation & evaluation skills
- Data analysis skills

Foundational concepts:
Structures, properties & substances

- Understand the structure and properties of giant covalent structures
- Understand the structure and properties of graphene and fullerenes
- Understand structure and properties of metallic bonding
- Understand properties and applications of nanoparticles
- Understand how to calculate and measure the rate of a chemical reaction
- Understand how surface area, concentration, temperature & catalyst affect the rate of a chemical reaction
- Understand how to calculate rate of reaction
- Understand how to explain rate of reaction in terms of the collision theory
- Understand how to measure the rate of reaction

Tier 2/3 Vocabulary
- Glossaries, quick quizzes, within exam questions, PowerPoints.

KW: covalent, intermolecular, graphene, graphite, fullerene, nanotube, nanoparticle, concentration, surface area, catalyst, metal, alloy, electrostatic, rate, activation energy, particles, surface area, concentration, temperature, catalyst, collisions

Links to root words (etymology):
- nano- best explained as "very small."
- Graphene - from Greek graphein "write"
- Collide - Latin collidere "to strike together"
- Temperature - from Latin temperature, sense of "degree of heat or cold"

Careers:
Applied Research & Product Development, Cheminformatics, Chemical Engineering, Chemical Technology, Industrial Management, Laboratory Management, Project Management

History:
- Early history Its structure was determined from single-crystal diffraction in 1924. The theory of graphene was first explored by P. R. Wallace in 1947 as a starting point for understanding the electronic properties of 3D graphite.
- In antiquity, bronze was the first alloy, or combination of metals, that impacted humanity. The Sumerians in the third millennia BC, developed an alloy of 90 per cent copper to 10 per cent tin.

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- nanoparticles were used by artisans as far back as the ninth century Mesopotamia for generating a glittering effect on the surface of pot.

EDI:

- Scientists from different nationalities
- crystallographer June Sutor, C–H···O bonding hypothesis

Misconceptions:

- Atomic 'mass' instead of 'weight'
- Alkali metals are alkaline
- Carbon is a metal due to some of its properties
- Metals conduct because of positive metal ions

Christmas Holiday 6 weeks (9 lessons) (30 Days)

6-Jan	B	16
13-Jan	A	17
20-Jan	B	18
27-Jan	A	19
3-Feb	B	20
10-Feb	A	21

Overview of Unit/No. lessons
Rate and extent of chemical reactions (6 lessons)
Energy changes (4 lessons)

Lesson **Sequence** of Content:
1 & 2. Rate of reaction - temperature (2 lessons)
3. Rate of reaction - catalyst (1 lessons)
4, 5 & 6. Required practical – rate of reaction (2 lessons)
7. Energy changes during a reaction – exothermic & endothermic (1 lesson)
8. Reversible reactions (1 lesson)
9 & 10. Equilibrium (2 lessons)

Prior	Current	Next
Year 8 – chemical reaction Year 9 – reactions of metals Year 8 – exothermic & endothermic reactions	Explain how factors affect the rate of reaction Describe ways to measure rate of reaction Explain how energy is transferred during chemical reactions	Year 12 – rate of reaction Year 12 – Dynamic equilibrium

- **GW**: Identify some factors that affect rate of reaction, State what an exothermic & endothermic reaction are
- **BI:** Describe how different factors affect the rate of reaction, Describe what happens to temperature during an exothermic and endothermic reaction
- **EW**: Explain how the different factors affect the rate of reaction using the collision theory, Explain in terms of energy what an exothermic and endothermic reaction are

Recall of knowledge, application of knowledge, identify patterns in data, interpret data, analyse results, evaluate practical procedures, carry out practical procedures, write practical methods

Assessment:

- Quick quiz
- Exam style questions
- Q&A

Foundational concepts:
Chemical reactions

- Understand how to calculate and measure the rate of a chemical reaction
- Understand how surface area, concentration, temperature & catalyst affect the rate of a chemical reaction
- Understand how to calculate rate of reaction
- Understand how to explain rate of reaction in terms of the collision theory
- Understand how to measure the rate of reaction
- Understand what an exothermic and endothermic reaction are
- Understand what a reversible reaction is
- Understand what equilibrium is
- Understand how changing conditions effects equilibrium (HIGHER)

Tier 2/3 Vocabulary

- Glossaries, quick quizzes, within exam questions, PowerPoints.

KW: rate, activation energy, particles, surface area, concentration, temperature, catalyst, collisions, exothermic, endothermic, temperature, reversible, equilibrium, yield

Links to root words (etymology):

- Collide - Latin collidere "to strike together"
- Temperature - from Latin temperature, sense of "degree of heat or cold"
- Equilibrium - from Latin aequilibrium "an even balance

Careers: chemical operator, chemical engineer, catalysis & reaction engineer, development engineer, field engineer, field chemist, operations technician

History:

- The art of producing alcohol from sugar by fermentation is known from the beginning of human history. The first known use of inorganic catalysts is from 1552 when Valerius Cordus (1514-1554) used sulfuric acid to catalyze the conversion of alcohol to ether (Cordus, 1575).

- Interleaving
- Practical skills
- Interpretation & evaluation skills
- Data analysis skills

EDI:
Scientists from different nationalities

Misconceptions:
- Particles move 'more' rather than faster
- Bigger pieces have a bigger surface area

Half-Term 6 weeks (9 lessons) (29 Days)

25-Feb	B	22	INSET 24th Feb
3-Mar	A	23	
10-Mar	B	24	Overview of Unit/No. lessons • Treatment of water (3 lessons)
17-Mar	A	25	
24-Mar	B	26	Lesson **Sequence** of Content:
31-Mar	A	ST1	1. Purity & formulations (1 lesson) 2. Potable water (1 lesson) 3. Waste water (1 lesson) 4 – 5. Required practical – Water (3 lessons) 6 -9. Revision

Prior	Current	Next
Year 7 – Acids & Alkalis	Explain how to determine the mass of solute in water	

- **GW**: state the difference between potable and pure water
- **BI:** describe how potable & waste water are treated
- **EW**: explain the stages in treatment of potable and waste water

Recall of knowledge, application of knowledge, interpret data, analyse results, carry out practical procedures, write practical methods, recall equations, rearrange equations, complete multi-step calculations

Assessment:
- Quick quiz
- Exam style questions
- Q&A
- Interleaving
- Practical skills
- Interpretation & evaluation skills
- Data analysis skills

Foundational concepts:
Earths resources

- Understand what a pure substance and formulation are
- Understand how to obtain potable water and how it is treated
- Understand how to treat waste water

Tier 2/3 Vocabulary
- Glossaries, quick quizzes, within exam questions, PowerPoints.

KW: pure, formulation, potable, sludge, effluent, sedimentation, sterilisation, filtration, sewage

Links to root words (etymology):
- Latin potabilis "drinkable"

Careers: waste water engineer, water distribution engineer, ecologist, ocean environmental scientist, design engineer, electrical engineer, project manager

History:
- Historical introduction. The concept of chemical equilibrium was developed after Berthollet (1803) found that some chemical reactions are reversible.
- Fritz Haber filed a German patent in 1908 for the synthesis of ammonia for which he won a Nobel Prize in Chemistry in 1918.
- Early evidence of distillation was also found related to alchemists working in Alexandria in Roman Egypt in the 1st century. Distilled water has been in use since at least c. 200, when Alexander of Aphrodisias described the process.

EDI:
- Scientists from different nationalities
- Understanding of water treatment in different parts of the world
- Understanding of sanitation and waste water in different parts of the world
- Discussion of water shortages and lack of safe drinking water in certain parts of the world

Misconceptions:
- Waste water is used for drinking water
- Potable water comes from sea water in the UK
- Potable water is pure

Easter Holiday 5 weeks (7-8 lessons) (23 Days)

22-Apr	B	ST1	Easter Monday 21st

Foundational concepts:

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28-Apr	A	ST1	Early May bank hol 6/5
5-May	B	30	Overview of Unit/No. lessons • Quantitative Chemistry (6 lessons)
12-May	A	31	Lesson **Sequence** of Content: 1 – 3. Exam Feedback (3 lessons) 4. QC – Relative formula mass (1 lesson) 5. QC – Moles (1 lesson) 6 & 7. QC – Concentration of solutions (2 lessons)
19-May	B	32	

Prior	Current	Next
Year 8 – Chemical reactions Year 9 – reactions of metals and balancing equations	Understand how to carry out a range of chemical calculations	Year 11 – yield, atom economy, titration calculations Year 12 – moles & quantities

- **GW**: Calculate relative formula mass
- **BI:** Rearrange an equation to change the subject of the calculation
- **EW**: Complete multi-step calculations

Recall of knowledge, application of knowledge, interpret data, analyse results, carry out practical procedures, write practical methods, recall equations, rearrange equations, complete multi-step calculations

Assessment:
- Quick quiz
- Exam style questions
- Q&A
- Interleaving
- Practical skills
- Interpretation & evaluation skills
- Data analysis skills
- Quantitative skills

Quantitative Chemistry

- Understand how to calculate Relative formula mass
- Understand how to calculate the number of moles in a given mass
- Understand how to calculate the mass of solid in a solution

Tier 2/3 Vocabulary
- Glossaries, quick quizzes, within exam questions, PowerPoints.

KW: moles, concentration, volume, mass

Links to root words (etymology):
- Atom - Latin atomus "indivisible particle," from Greek atomos "uncut, indivisible,"

Careers: Analytical Chemist, Chemical Engineer, Chemistry Teacher, Forensic Scientist, Geochemist, Hazardous Waste Chemist, Materials Scientist, Pharmacologist

History:
- The name mole is an 1897 translation of the German unit Mol, coined by the chemist Wilhelm Ostwald in 1894 from the German word Molekül (molecule). However, the related concept of equivalent mass had been in use at least a century earlier.
- In 1865 Loschmidt used kinetic molecular theory to estimate the number of particles in one cubic centimeter of gas at standard conditions.

EDI:
- Scientists from different nationalities

Hypatia – (370 – 415) first woman to have taught maths

Half-Term 7 weeks (10-11 lessons) (34 Days)

2-Jun	A	33	SJBF INSET 4/7
9-Jun	B	34	Overview of Unit/No. lessons • Quantitative Chemistry (6 - 10 lessons) • Energy changes (2 lessons)
16-Jun	A	35	Lesson **Sequence** of Content: 1 & 2. QC – Reacting masses (2 lessons) 3. QC - Moles to balance equations & limiting reactants (1 lesson) 4. QC - Yield (1 lesson) 5. QC - Atom economy (1 lesson) 6. QC - Volumes of gases (1 lesson) 7. QC - Titration & titration calculations (2-3 lessons) 8. Reaction profiles (1 lesson) 9 & 10. Bond energies (2 lessons)
23-Jun	B	36	
30-Jun	A	37	
7-Jul	B	38	
14-Jul	A	39	

Prior	Current	Next

Foundational Concepts:
Quantitative chemistry & chemical reactions

- Understand how to calculate the masses of reactants & products from balanced symbol equations
- Understand how to use moles to balance equations
- Understand how to draw and interpret reaction profiles
- Understand how to calculate bond energies
- Understand how to calculate atom economy
- Understand how to calculate yield
- Understand how to calculate volume of gases
- Understand how to carry out a titration
- Understand how to complete titration calculations
- Understand how to draw a reaction profile
- Understand how to explain a reaction in terms of bond making and breaking
- Understand how to calculate bond energies

Year 7 – Acids & Alkalis Year 8 – Chemical reactions Year 9 – reactions of metals and balancing equations Year 9 & 10 exothermic & endothermic reactions	Understand how to carry out a range of chemical calculations Understand how to draw a reaction profile	Year 11 – yield, atom economy, titration calculations Year 12 – moles & quantities Year 12 – enthalpy changes & bond energies

- **GW**: Calculate relative formula mass & Draw a reaction profile
- **BI:** Rearrange an equation to change the subject of the calculation and draw and label a reaction profile
- **EW**: Complete multi-step calculations and explain a reaction profile in terms of bond making and breaking

Recall of knowledge, application of knowledge, interpret data, analyse results, carry out practical procedures, write practical methods, recall equations, rearrange equations, complete multi-step calculations

Assessment:
- Quick quiz
- Exam style questions
- Q&A
- Interleaving
- Quantitative skills

Tier 2/3 Vocabulary
- Glossaries, quick quizzes, within exam questions, PowerPoints.

KW: moles, concentration, volume, mass, titration, economy, exothermic, endothermic, bond

Links to root words (etymology):
- Atom - Latin atomus "indivisible particle," from Greek atomos "uncut, indivisible,"

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- In 1865 Loschmidt used kinetic molecular theory to estimate the number of particles in one cubic centimeter of gas at standard conditions

EDI:
- Scientists from different nationalities
- Sofia Kovalenskaya (1850 – 1891) first woman to receive a doctorate in mathematics

Misconceptions:
- Energy is released when bonds are broken

(Total: 189 Days)

Prompt Questions

Now that the revised curriculum has been taught, please consider the Implementation and Impact of the curriculum you taught. What changes might need to be made to the Curriculum Intent (See Curriculum Map and Overviews) in light of this year's experiences?

Please revisit the prompts from last year:

- What are the Key concepts for this unit?
- How will it link to wider disciplinary knowledge/cultural capital: history, culture, authentic artefacts, music, art, literature?
- How does it build on prior knowledge and link to other units, concepts, years, GCSE?
- What is it intended students will have learned?
  - For each Unit? By the end of the Year?
    - GW: ; BI: ; EW
- Is it worth summarising in a knowledge organiser?
- **Assessment: how do you know they have learned the foundational concepts, curriculum and wider disciplinary knowledge? Does assessment look like GCSE light? Should it?**
- Skills used/learned
- Tier 2/3 vocabulary ((Etymology e.g. of Greek/Latin)