5.1 Atomic Structure & The Periodic Table

https://www.youtube.com/watch?v=5lmrQKlSgHU&list=PLoeKqZ0YqLksbx2epi7hFRsadN-7ORMyZ

Atomic Structure

☐ I can describe the structure of an atom (protons, neutrons, electrons)

☐ I can define:

- atomic number
- mass number

☐ I can calculate numbers of subatomic particles

☐ I can explain what **isotopes** are

☐ I can explain why isotopes have the same chemical properties

Electronic Structure

☐ I can describe electron shells (2,8,8…)

☐ I can draw electron configurations for the first 20 elements

The Periodic Table

☐ I can explain how elements are arranged (atomic number)

☐ I can describe **groups and periods**

☐ I can explain properties of:

- Group 1 (alkali metals)
- Group 7 (halogens)
- Group 0 (noble gases)

AQA Combined Science - Chemistry Paper 1 Checklist

Filtration and Crystallisation

☐ I can describe **filtration** (separating insoluble solids from liquids)

☐ I can identify:

- residue
- filtrate

☐ I can describe **crystallisation** (getting solid crystals from a solution)

☐ I can explain why crystallisation is used instead of full evaporation

Simple Distillation

☐ I can describe **simple distillation**

☐ I can explain how it separates a solvent from a solution

☐ I can explain:

- evaporation
- condensation

Fractional Distillation

☐ I can explain fractional distillation

☐ I can explain how it separates liquids with different boiling points

☐ I can describe how it is used to separate crude oil into fractions

☐ I can explain why fractions have different uses

🧠 Retrieval + Exam Questions

🔹 Quick Recall

1. What charge does a proton have?
2. What is the atomic number?
3. What is an isotope?

🔹 Understanding

5. Why do isotopes have the same chemical properties?
6. Why are noble gases unreactive?

🔹 Application

8. An atom has atomic number 11 and mass number 23.
9. How many neutrons does it have?

🔹 6-Mark Exam Question

11. Explain how the structure of the atom has changed over time.

5.2 Bonding

https://www.youtube.com/watch?v=qHKt8fNxkPc&list=PLoeKqZ0YqLkuGDCr1ClxrvslTe3cUkdJs

Ionic Bonding

☐ I can define ionic bonding (transfer of electrons)

☐ I can explain how positive and negative ions form

☐ I can explain that ionic bonding is electrostatic attraction between oppositely charged ions

☐ I can draw dot and cross diagrams

☐ I can describe a giant ionic lattice structure

☐ I can explain properties of ionic compounds:

high melting/boiling points

conduct electricity when molten or dissolved

brittle

Covalent Bonding

☐ I can define **covalent bonding** (sharing electrons)

☐ I can draw **dot and cross diagrams**

☐ I can describe **simple molecular substances**

☐ I can explain why simple molecules have:

- low melting/boiling points
- do not conduct electricity

☐ I can describe **giant covalent structures**:

- diamond
- graphite

☐ I can explain why graphite conducts electricity

Metallic Bonding

☐ I can describe metallic bonding

☐ I can explain the sea of delocalised electrons

☐ I can describe the structure of metals (positive ions in a lattice)

☐ I can explain properties of metals:

- conduct electricity
- conduct heat
- malleable
- ductile

🧠 Retrieval + Exam Questions

🔹 Recall

1. What is ionic bonding?
2. What type of elements form ionic bonds?
3. What is covalent bonding?
4. What type of elements form covalent bonds?
5. What is metallic bonding?
6. What are delocalised electrons?

🔹 Understanding

1. Why do ionic compounds have high melting points?
2. Why do simple molecules have low boiling points?
3. Why does diamond have a high melting point?
4. Why do metals conduct electricity?
5. Why are metals malleable?

🔹 Application

1. Why does sodium chloride conduct electricity when molten but not when solid?
2. Explain why graphite conducts electricity but diamond does not
3. Explain why copper is used for electrical wiring

🔹 6-Mark

1. Explain ionic bonding and the properties of ionic compounds.
2. Compare simple molecular substances and giant covalent structures.
3. Explain metallic bonding and how it explains the properties of metals.

5.3 Quantitative Chemistry

https://www.youtube.com/watch?v=iqZseryB6co&list=PLoeKqZ0YqLktPUIcoo-QFso_IeC0uMoHm

Conservation of Mass

☐ I can state the **law of conservation of mass**

☐ I can explain that **atoms are not created or destroyed**

☐ I can explain why mass is conserved in a **closed system**

☐ I can explain why mass may appear to change in an **open system**

Relative Formula Mass (Mr)

☐ I can calculate **Mr**

☐ I can use the periodic table to find **Ar values**

The Mole Concept

☐ I can define a **mole**
☐ I can use:moles = mass ÷ Mr
☐ I can rearrange the equation
☐ I can balance symbol equations
☐ I understand that **coefficients = mole ratios (HT)**

Limiting Reactants (HT)

☐ I can define **limiting reactant**
☐ I can identify which reactant runs out first
☐ I can explain why it limits product formed

Concentration of Solutions

☐ I can calculate concentration in: g/dm³
☐ I can rearrange the formula

🧠Retrieval + Exam Questions

- Recall

1. What is a mole?
2. What does Mr mean?
3. What is concentration?

- Understanding

1. Why must equations be balanced?
2. Why does mass stay constant in a closed system?

- Application

1. Calculate moles if:
- mass = 20g
- Mr = 10

2. Calculate concentration:
- 8g in 2 dm^3

3. $Ca + 2HCl \rightarrow CaCl_2 + H_2$

   Calculate the mass of $CaCl_2$ formed from 40g of Ca

5.4 Chemical Changes

https://www.youtube.com/watch?v=L4DUGgfNqpE&list=PLoeKqZ0YqLkukmX8qodmlEDPKlVsvAAvR

Reactivity and Reactions

☐ I can recall the reactivity series

☐ I can explain that more reactive metals:

- lose electrons more easily

☐ I can describe reactions of metals with:

- water
- acids

☐ I can write word equations for these reactions

Extraction of Metals

☐ I can explain how metals are extracted depending on reactivity

☐ I can explain **reduction**

☐ I can describe:

- extraction using carbon
- extraction using electrolysis

Electrolysis

☐ I can define **electrolysis**

☐ I can identify:

- anode (+)
- cathode (–)

☐ I can explain movement of:

- cations → cathode
- anions → anode

Acids, Alkalis and pH

☐ I can describe the pH scale (0–14)

☐ I can define:

- acid
- alkali

☐ I can explain strong vs weak acids (HT)

☐ I can describe neutralisation

Making Salts

☐ I can describe how to make salts using:

- acid + metal
- acid + base

🧠Retrieval + Exam Questions

- Recall

1. What is the reactivity series?
2. What is electrolysis?
3. What is oxidation?

- Understanding

1. Why do more reactive metals lose electrons easily?
2. Why is aluminium extracted by electrolysis?
3. Why is titration needed for alkalis?

- Application

1. Predict if this reaction will happen:
   Iron + copper sulfate
2. What is produced at the cathode in electrolysis of NaCl (aqueous)?

- Practical / Method

9. Describe how to make a pure, dry salt from an insoluble base
10. Describe how to carry out a titration

- 6-Mark

11. Explain how the reactivity series can be used to predict reactions and extraction methods.
12. Explain the process of electrolysis and how products are formed at each electrode.
13. Explain how to prepare a soluble salt using titration.

5.5 Energy Changes

https://www.youtube.com/watch?v=YGx_YghvgIw&list=PLoeKqZ0YqLkvycqfHHw0yRm9nvOZ-JfxR

Exothermic and Endothermic

☐ I can define **exothermic reactions**
☐ I can define **endothermic reactions**
☐ I can interpret **energy level diagrams**
☐ I can explain bond breaking and making:

- breaking bonds = energy in
- making bonds = energy out

Energy Profile Diagrams

☐ I can interpret energy level diagrams
☐ I can identify:

- activation energy
- overall energy change

Bond Energy (HIGHER TIER)

☐ I can explain:

- breaking bonds = energy IN
- making bonds = energy OUT

☐ I can calculate energy changes using bond energies (HT)

Required Practical – Temperature Changes

☐ I can describe how to measure temperature change
☐ I can explain:

- use of thermometer
- insulation (polystyrene cup)

☐ I can identify exo vs endo from results

🧠Retrieval + Exam Questions

🔹 Recall

1. What is an exothermic reaction?
2. What is an endothermic reaction?
3. What is activation energy?

🔹 Understanding

3. Why do exothermic reactions release energy?
4. Why do endothermic reactions take in energy?

🔹 Application

4. Is respiration exothermic or endothermic? Explain
5. A reaction causes the temperature to drop.
   Is it exothermic or endothermic? Explain
6. Why is combustion always exothermic?

🔹 Data / Graph Skills

7. Draw and label an energy profile diagram for an exothermic reaction
8. Explain the difference between two energy diagrams

🔹 Higher Tier Calculation

9. Bond energies:

- Bonds broken = 600 kJ
- Bonds formed = 850 kJ

Is the reaction exothermic or endothermic? Calculate energy change

🔹 6-Mark

5. Explain energy changes in chemical reactions using bond energies.