Year 11 - 12

Bridging the Gap GCSE → A Level

A Level Chemistry

Summer 2023

A Level Chemistry
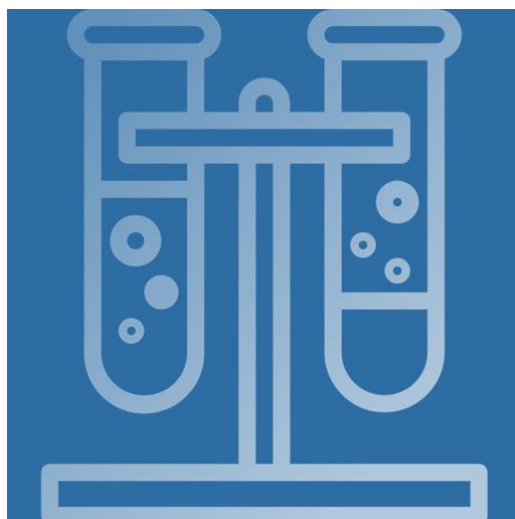
Course Breakdown

AS year

1. Elements of life (EL)
2. Developing fuels (DF)
3. Elements from the sea (ES)
4. The Ozone story (OS)
5. What's in a medicine (WM)

A2 year

6. The Chemical industry (CI)
7. Polymers and life (PL)
8. Oceans (O)
9. Developing metals (DM)
10. Colour by design (CD)

Recommended Reading

1. OCR A Level Salters' Advanced Chemistry Revision Guide, ISBN 978 0 19833 292 3
2. A-Level Chemistry: OCR B Year 1 & 2 Complete Revision & Practice with Online Edition, ISBN 978 1 78294 303 7
3. A-Level Chemistry: Essential Maths Skills, ISBN 978 1 78294 472 0
4. Calculations in AS/A Level Chemistry, ISBN 0 582 41127 0

Knowledge links to GCSE

- Isotopes,
- Titrations,
- Quantitative chemistry,
- Organic chemistry,
- Energy changes,
- Chemistry of the atmosphere,
- Chemical analysis,
- The periodic table,
- Le Chatelier's principles,
- the rate and extent of chemical changes,
- Transition metals.

Scholarly Articles

1. https://byjus.com/chemistry/periodic-table-elements/ (Periodic Table of Elements)
2. https://byjus.com/chemistry/electron-configuration/ (Electron Configuration)
3. https://byjus.com/chemistry/isomerism/ (Isomerism)
4. https://www.acs.org/content/acs/en/education/resources/highschool/chemmatters/pastissues/2020-2021/april-2021/sustainable-fashion.html (How to Make Fashion Sustainable)

Youtube Clips

1. https://www.youtube.com/watch?v=PmY1Dr2iQ_Q (The incredible chemistry powering your smartphone)
2. https://www.youtube.com/watch?v=4INdeZ5HYpw (A crash course in organic chemistry)
3. https://www.youtube.com/watch?v=Ykhn2psFmEM (Thermodynamics and Energy Diagrams)
4. https://www.youtube.com/watch?v=SV7U4yAXL5I (Enthalpy)
5. https://www.youtube.com/watch?v=BxUS1K7xu30 (The Ideal Gas Law)

Channels

Crash course - https://www.youtube.com/user/crashcourse
FreeScienceLessons - https://www.youtube.com/channel/UCqbOeHaAUXw9Il7sBVG3_bw
Snap revise - https://www.youtube.com/channel/UC8pOYw9kw8z9uOKgAZ7ki8w

A Level Chemistry

TASK 1

Read through each of the ten statements below. Decide whether you think each statement is true or false and make a note of your answers.

1. The total number and type of atoms present are the same at the start and end of a reaction.
2. The amount of substance, measured in moles, is the same at the start and end of a reaction.
3. The total mass of reactants is equal to the total mass of products for any reaction.
4. The total volume of gas is the same at the start and the end of a reaction.
5. The amount in moles is proportional to the number of particles for that substance.
6. One mole of methane molecules (CH_4) contains 1/5 mole of carbon atoms and 4/5 mole of hydrogen atoms.
7. One mole of methane molecules (CH_4) contains 1 mole of carbon atoms and 4 moles of hydrogen atoms.
8. 100 cm^3 of methane gas contains the same number of molecules as 100 cm^3 hydrogen gas at room temperature and pressure.
9. 100 cm^3 of methane gas at room temperature and pressure has the same mass as 100 cm^3 of hydrogen gas under the same conditions.
10. If 0.1 mol of magnesium atoms reacts with a solution containing 0.1 mol of hydrochloric acid, 0.1 mol of hydrogen molecules will be produced. (Hint – you may need to look up or work out the balanced equation for this reaction.)

TASK 2

For each of the statements in task 1 you will need to justify your true/false answer with an explanation or example. If you have decided that a statement is true, try to give an explanation using the chemical concepts and definitions you know. If you have decided that a statement is false, you could find an example of a chemical process, reaction, or balanced equation where it is not the case. You are free to look up information using whatever resources you have available to assist you with your explanations.
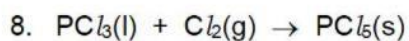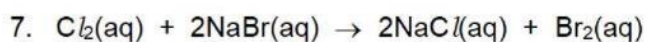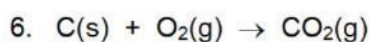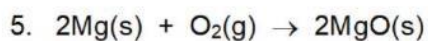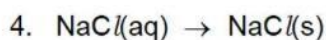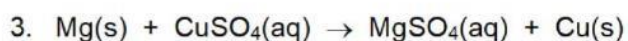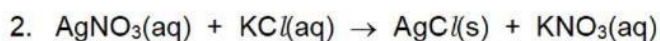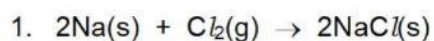
A Level Chemistry

TASK 3

From the equations below, decide whether:

A. Both electron transfer and ionic bonding take place during the reaction.

B. Only electron transfer takes place.

C. Only ionic bond formation takes place.

D. Neither electron transfer nor ionic bond formation take place.

Once you have decided, write the correct letter in the space provided.

1. $2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$ ⬜

2. $AgNO_3(aq) + KCl(aq) \rightarrow AgCl(s) + KNO_3(aq)$ ⬜

3. $Mg(s) + CuSO_4(aq) \rightarrow MgSO_4(aq) + Cu(s)$ ⬜

4. $NaCl(aq) \rightarrow NaCl(s)$ ⬜

5. $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$ ⬜

6. $C(s) + O_2(g) \rightarrow CO_2(g)$ ⬜

7. $Cl_2(aq) + 2NaBr(aq) \rightarrow 2NaCl(aq) + Br_2(aq)$ ⬜

8. $PCl_3(l) + Cl_2(g) \rightarrow PCl_5(s)$ ⬜

A Level Chemistry

TASK 4

Exothermic reactions

1. Write a definition of an exothermic reaction.

2. Draw an enthalpy profile diagram for an exothermic reaction.

Label the axes, ΔH and the activation energy.

3. Give an example of an exothermic reaction.

A Level Chemistry

Endothermic reactions

4. Write a definition of an endothermic reaction.

5. Draw an enthalpy profile diagram for an endothermic reaction.

    Label the axes, Δ*H* and the activation energy.

6. Give an example of an endothermic reaction.

A Level Chemistry

Bond enthalpy

7. Write a definition of bond enthalpy. (You might know this term as 'bond energy'.)

A Level Chemistry

Calculations
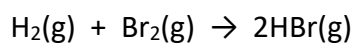
Remember:

  enthalpy change = energy required to break bonds – energy released in making bonds

or

  Δ_rH = Δ(bond enthalpies in reactants) – Δ(bond enthalpies in products)

8. Use bond enthalpies to calculate the enthalpy change for the following reaction.

$$H_2(g) \; + \; Br_2(g) \; \rightarrow \; 2HBr(g)$$

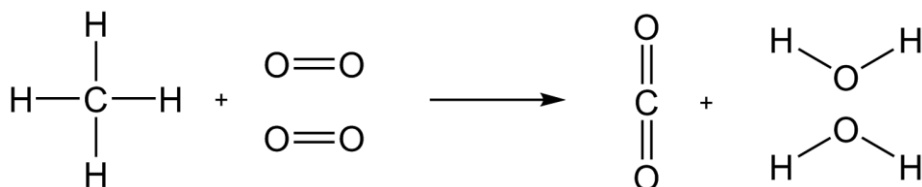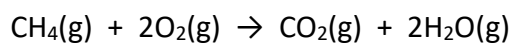| Bond	H–H	Br–Br	H–Br
Bond enthalpy / kJ mol^{-1}	438	193	366

Energy required to break bonds:

Energy released in forming new bonds:

Enthalpy change:

A Level Chemistry

9. Use bond enthalpies to calculate the enthalpy change for the combustion of methane.

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$$

Bond	C–H	C–C	O–H	C=O	O=O
Bond enthalpy / kJ mol⁻¹	413	347	464	805	498

Energy required to break bonds:
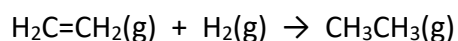
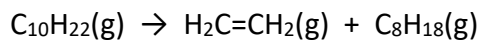Energy released in forming new bonds:

Enthalpy change:

A Level Chemistry

10.

Bond	C–H	C–C	H–H	C=C
Bond enthalpy / kJ mol^{-1}	413	347	436	612

Use the bond energies above to calculate

  a) the enthalpy change for the hydrogenation of ethene

$$H_2C=CH_2(g) \ + \ H_2(g) \ \rightarrow \ CH_3CH_3(g)$$

  b) the enthalpy change for the cracking of decane

$$C_{10}H_{22}(g) \ \rightarrow \ H_2C=CH_2(g) \ + \ C_8H_{18}(g)$$

A Level Chemistry

11. Explain in terms of bond breaking and bond formation why combustion reactions are exothermic but cracking reactions are endothermic.

A Level Chemistry