

# AQA Combined Science GCSE Trilogy

## Chemistry Paper 2 AO1 Questions

### *The Rate & Extent of Chemical Change*

1. How do you calculate the rate of a chemical reaction?
2. A chemical reaction produces 10g of hydrogen in 600s. What is the mean rate of the reaction?
3. What units can be used to measure the rate of a chemical reaction?
4. State 5 factors that can affect the rate of a chemical reaction.
5. For each of those 5 factors, explain how changing them affects the rate of the chemical reaction.
6. What is the collision theory of chemical reactions?
7. What is the activation energy?
8. What is a catalyst?
9. Are catalysts used up in a chemical reaction?
10. What do catalysts do?
11. What is a reversible reaction?
12. What is the symbol used in an equation to indicate a reversible reaction?
13. If a reversible reaction is exothermic in one direction, will it be exothermic or endothermic in the opposite direction?
14. When would a reversible reaction reach equilibrium?
15. (HT) What is Le Chatelier's principle?
16. (HT) For a system at equilibrium, what happens when the concentration of a reactant is increased?
17. (HT) For a system at equilibrium, what happens when the concentration of a product is decreased?
18. (HT) For a system at equilibrium, what happens when the temperature is increased?
19. (HT) For a system at equilibrium, what happens when the temperature is decreased?
20. (HT) For a gaseous reaction at equilibrium, what happens when the pressure is increased?
21. (HT) For a gaseous reaction at equilibrium, what happens when the pressure is decreased?

### *Organic Chemistry*

1. What is crude oil?
2. What is a hydrocarbon?
3. What is the general formula for the homologous series of alkanes?
4. Name the first 4 members of the alkanes.
5. Write the formula for each of the first 4 members of the alkanes.
6. Draw the displayed formula for the first 4 members of the alkanes.
7. What is fractional distillation?
8. Which fuels can be produced from crude oil using fractional distillation?
9. Which types of materials can be produced from crude oil by the petrochemical industry?
10. How does the boiling point of a hydrocarbon depend on its molecule size?
11. How does the viscosity of a hydrocarbon depend on its molecule size?
12. How does the flammability of a hydrocarbon depend on its molecule size?
13. What are the products of a complete combustion reaction of a hydrocarbon fuel?
14. Write the balanced symbol equation for the complete combustion of methane (CH<sub>4</sub>).
15. What is cracking?

16. What are the differences between catalytic cracking and steam cracking?
17. What are the general products of cracking?
18. Are alkenes more or less reactive than alkanes?
19. How can you test for alkenes using bromine water?
20. Write a balanced symbol equation for the cracking of dodecane ( $C_{12}H_{26}$ ) into hexane ( $C_6H_{14}$ ) and propene ( $C_3H_6$ )
21. Give an example to show why cracking is useful.

### *Chemical Analysis*

1. What is a pure substance?
2. How are melting and boiling points used to identify pure substances?
3. What is a formulation?
4. How are formulations made?
5. Give examples of some types of formulation.
6. What is chromatography used for?
7. What are the 2 phases in chromatography?
8. What is an  $R_f$  value?
9. How can you calculate an  $R_f$  value?
10. What would you expect to see on a chromatogram of a pure substance?
11. How would you test a test tube of gas for hydrogen?
12. How would you test a test tube of gas for oxygen?
13. How would you test a test tube of gas for carbon dioxide?
14. How would you test a test tube of gas for chlorine?

### *Chemistry of the Atmosphere*

1. What are the main 4 gases in the atmosphere?
2. Which gas makes up around 80% of the atmosphere?
3. Which gas makes up around 20% of the atmosphere?
4. What likely produced the gases in the early atmosphere?
5. How was the early atmosphere different to the modern atmosphere?
6. What was the process that converted the carbon dioxide in the atmosphere into oxygen?
7. What is the balanced symbol equation for this process?
8. By which 2 natural processes was atmospheric carbon dioxide reduced over time?
9. How were limestone deposits formed?
10. How was coal formed?
11. How was crude oil formed?
12. How was natural gas formed?
13. Name 3 greenhouse gases.
14. What effect do these gases have on the atmosphere?
15. Name at least 2 human activities that lead to an increase in the amounts of these greenhouse gases in the atmosphere.
16. How do scientists think human activities will increase the surface temperature of the planet?
17. Describe 4 possible effects of global climate change.
18. What is a carbon footprint?
19. How can a product's carbon footprint be reduced?
20. Which gases may be released into the atmosphere when a fuel is burned?
21. What are particulates?
22. What are the properties of carbon monoxide?
23. What are the effects of sulfur dioxide?

24. What are the effects of particulates?

#### *Using Resources*

1. What are the 4 main uses for humans of the Earth's resources?
2. What do humans primarily make from natural resources?
3. What is the difference between a finite and a renewable resource?
4. What is potable water?
5. Which dissolved substances might you expect to find in potable water that you wouldn't find in pure water?
6. In the UK, where does our potable water come from?
7. Which sterilising agents might be used to remove microbes from potable water?
8. What is desalination?
9. Name 2 possible methods for desalination of water.
10. What might need to be removed from sewage and agricultural waste water to make it potable again?
11. What might need to be removed from industrial waste water to make it potable again?
12. What are the processes involved in sewage treatment?
13. (HT) What is phytomining?
14. (HT) What is bioleaching?
15. (HT) How are metal compounds obtained from phytomining?
16. (HT) How are metal compounds obtained from bioleaching?
17. (HT) How can pure copper be obtained from solutions of copper compounds?
18. What is a Life Cycle Assessment (LCA)?
19. How can glass bottles be recycled?
20. How can metals be recycled?

#### **Practical Knowledge Needed:**

- How could you find the rate of reaction from a graph of the quantity of product formed against the time taken?
- How could you investigate how a change in concentration affects the rate of a reaction with a gaseous product?
- How could you investigate the catalytic effect of adding different metal salts to the decomposition reaction of hydrogen peroxide?
- How could you investigate the number of dyes present in a range of coloured sweets?
- What are the lab tests for the gases hydrogen, carbon dioxide, oxygen and chlorine?
- How could you show experimentally that oxygen gas is produced by photosynthesis?
- How can you test the pH of a water sample to check purity?
- How can you use evaporation to test potable water for dissolved solids?
- Describe the stages involved in distillation of water.

## Maths Skills Needed:

- Can you separate a set of 10 objects in the ratio 3:2?
- Can you calculate 73% of 200?
- Can you plot a line graph of the following data?

Y	X
2	6
4	12
6	18
8	24
10	30

- Can you calculate the gradient of that graph?
- Can you calculate the mean rate of reaction from a reaction that uses 5cm<sup>3</sup> of methane in 20 seconds?
- Can you balance a symbol equation?
- Can you use the general formula for an alkane (C<sub>n</sub>H<sub>2n+2</sub>) to determine the formula of the 12<sup>th</sup> alkane?
- Can you give the units of a boiling point?
- Can you calculate the R<sub>f</sub> value of a substance that moves 3.8cm when the solvent moves 5.0cm?
- Can you estimate the result of 48 + 53?
- Can you state the fraction of the atmosphere that is nitrogen?
- Can you round the result of 7 ÷ 9 to 3 significant figures?