C7 – Further Chemistry

Revision Questions

**C7.1 Green Chemistry**

1. What are ‘bulk’ and ‘fine’ chemicals?
2. Name three examples of bulk chemicals and three examples of fine chemicals.
3. Give reasons why government regulations are important in the chemical industry.
4. Define ‘green chemistry’.
5. What does ‘chemical feedstock’ mean?
6. What does ‘chemical purity’ mean, and why is it important to monitor this?
7. What is ‘atom economy’ and how is it calculated?
8. What is ‘activation energy’?
9. How does a catalyst lower the activation energy?
10. Some industries use enzyme catalysts. Why does using enzymes as catalysts place restrictions on their use?
11. How is relative atomic formula calculated?
12. Show how to calculate masses of reactants and products from balanced equations.

**C7.2 Alcohols, carboxylic acids and esters**

1. What are alkanes?
2. What are the names and molecular formulae of the four smallest alkanes?
3. Write the molecular formula of methane, then draw a ball and stick model to show the shape of this molecule.
4. What are the products formed when alkanes burn in air?
5. Why don’t alkanes react with water?
6. What are alkenes?
7. Define ‘saturated’ and ‘unsaturated’ in terms of molecular structure.
8. Write a balanced symbol equation for the combustion of ethene.
9. Give the molecular and structural formula of methanol.
10. Give two uses each for methanol and ethanol.
11. What is a ‘functional group’?
12. How do the physics properties of ethanol compare to ethane and water?
13. Why do alcohols burn in air?
14. Compare the reactions of sodium with alcohols, alkanes and water.
15. Why is there a limit to the concentration of ethanol that can be made by fermentation?
16. How can ethanol concentration by increased to 30-40%. What products are made in this way?
17. Why does the fermentation of ethanol have an optimum temperature and optimum pH?
18. Describe how ethane converted into ethanol (via ethane)
19. What is the functional group of carboxylic acids?
20. Draw the structural formula of methanoic and ethanoic acid.
21. Describe the smell of carboxylic acids?
22. What are the products of the reactions of carboxylic acids with:
    1. Metals
    2. Alkalis
    3. Carbonates
23. Which carboxylic acid is vinegar?
24. What is a weak acid? Why are carboxylic acids weak acids?
25. What are strong acids? Name two strong acids.
26. How are esters made?
27. What do esters smell like?
28. How are esters used commercially?
29. Show how an ester is made from a carboxylic acid and an alcohol.
30. Describe the four steps in the process of making a liquid ester (beginning with heating under reflux).
31. Fats are esters. What are the acids and alcohols used to make them?
32. What is the molecular difference between vegetable oils and animal fats?

**C7.3 Energy changes in chemistry**

1. What do the terms ‘exothermic’ and ‘endothermic’ mean?
2. Show exothermic and endothermic reactions using energy level diagrams.
3. What is produced when chemical bonds are broken? What is required to form new chemical bonds?
4. How can activation energy be found using an energy level diagram?

**C7.4 Reversible reactions and equilibria**

1. What does ⇌ mean?
2. What is a dynamic equilibrium?
3. Why is the Haber process for fixing nitrogen so important?
4. What is the formula of ammonia?
5. Where are the feedstocks for the Haber process sourced?
6. How is the yield of ammonia increased?
7. What does increasing the temperature and pressure do to the yield?
8. Why is a catalyst used in the Haber process?
9. How is nitrogen fixed in nature?
10. Why are scientists so interested in studying enzymes in nature?

**C7.5 Analysis**

1. What is the difference between a qualitative and quantitative analysis?
2. Why are ‘standard procedures’ so important when collecting samples for analysis?
3. Describe the method of paper chromatography.
4. In chromatography what is a ‘mobile phase’ and what is a ‘stationary phase’?
5. What are ‘aqueous’ and ‘non aqueous’ solvents?
6. Describe why different substances move different distances in chromatography using the concept of dynamic equilibrium between the mobile and stationary phases.
7. Why are’ standard reference materials’ needed in chromatography?
8. What is the difference between paper and thin layer (TLC) chromatography?
9. What is an R*f* value and how is it calculated?
10. Why are ‘locating agents’ sometimes used in paper and thin layer chromatography?
11. Describe the process of gas chromatography.
12. What does the term ‘retention time’ mean in the context of gas chromatography?
13. What are the six stages of a quantitative analysis?
14. Concentrations of solutions are measured in g/dm3. What does this mean? How many cm3 are there in a dm3?
15. What is the procedure for carrying out an acid-base titration?
16. What are systematic and random errors?
17. What is the difference between accurate and precise data?