**A. Reactivity series and displacement reactions as redox reactions**

1. Place these metals in order of their reactivity:

**Potassium, silver, copper, magnesium**

1. Name the two non-metals in the reactivity series.
2. Metals form positive ions. What is the scientific name for these positive ions?
3. Why is gold found in the Earth as an element rather than a compound?
4. HT – What is a redox reaction?
5. HT – Describe oxidation in terms of electrons.
6. HT – Describe reduction in terms of electrons.

**B. Extracting metals: Metal ores; oxidation and reduction; methods of extraction and biological methods of extraction**

1. What is an ore?
2. What is produced when metals react with oxygen?
3. What is this process called and why?
4. What is reduction in terms of oxygen?
5. What type of ions do metals produce?
6. Which is more reactive potassium or iron?
7. Which two non-metals can be included in the reactivity series?
8. Why is gold found as an element in the Earth?
9. How are metals, less reactive than carbon, extracted from their ores?
10. HT: Describe oxidation in terms of electrons.
11. HT: Describe reduction in terms of electrons.
12. Write the word equation for the reaction between lithium and water.
13. Write the balanced symbol equation for the reaction between lithium and water.
14. HT: Zinc can be extracted from zinc oxide by heating it with carbon in the blast furnace. Carbon monoxide is also produced. Which reactant is:
	1. Oxidised?
	2. Reduced?
15. Why is electrolysis used to extract aluminium form its ore?
16. Why is electrolysis an expensive way to extract metal from its ore?
17. Name the compound from which aluminium is extracted.
18. HT: What type of ores can phytomining and bioleaching be used on?
19. HT: Why are phytomining and bioleaching used?
20. HT: How does phytomining extract metals?

**C. Extracting metals: Recycling metals and life-cycle assessment**

1. What is a life-cycle assessment?
2. Life cycle assessments are carried out to assess the environmental impact of what stages of a product?
3. What areas of life cycle assessments can be easily quantified?
4. How can metals be recycled?
5. What are three advantages of recycling metals?

**D. Reversible reactions, dynamic equilibrium and the Haber process**

1. What is meant by a reversible reaction?
2. Draw the symbol for a reversible reaction.
3. What is meant by the term dynamic equilibrium?
4. What needs to happen for equilibrium to be reached?
5. The formation of ammonia is a reversible reaction between nitrogen and hydrogen. Where are these reactants extracted from?
6. Name the three conditions for the Haber process.

**E. Factors affecting dynamic equilibria (HT)**

1. What three factors can be changed in a system at equilibrium?
2. If the concentration of a reactant is increased what will happen to the products of the reaction?
3. What will happen to the amount of product in an endothermic reaction at equilibrium if the temperature is increased?
4. What will happen to the amount of product in an exothermic reaction at equilibrium if the temperature is increased?
5. What will happen to the amount of product in an endothermic reaction at equilibrium if the temperature is decreased?
6. What is meant by the term ‘gaseous reaction’?
7. What would happen to the position of equilibrium in a gaseous reaction if the pressure is increased?
8. Explain what will happen in the following reaction if we increase the concentration of the hydrogen and iodine?

**I2 (g) + H2 (g)**  **2HI (g)**

1. What will happen if we increase the temperature of the reaction below? Explain why you think this.

**N2 (g) + 3H2 (g)**  **2NH3 (g)**

1. Explain what will happen if we decrease the pressure in the reaction above.