1.

$2CuSO_4(aq) + 4KI(aq) \rightarrow 2CuI(s) + (1)I_2(aq) + 2K_2SO_4(aq)$

Describe the type of reaction shown by this equation. Explain your answer in terms of electron transfer.

- Redox
- Copper ions gained electrons AND iodide ions lost electrons

2.

$2H_2SO_4 + 14HI \rightarrow 7I_2 + 8H_2O + H_2S + S$

Explain why this reaction is redox in terms of oxidation number.

- Oxidation number of I increases from -1 to 0 = oxidation/ reducing agent
- Oxidation number of S decreases from +6 to 0 OR -2 = reduction/ oxidising agent

3.

**(i)** Complete Table 2.1 to show the maximum oxidation number of the elements Na to P in their chlorides.

**Table 2.1**

| element | Na | Mg | Al | Si | P |
|---|---|---|---|---|---|
| maximum oxidation number | | | | | |

| element | Na | Mg | Al | Si | P |
|---|---|---|---|---|---|
| maximum oxidation number of elements in chlorides | (+)1 | (+)2 | (+)3 | (+)4 | (+)5 |

(ii) State what determines maximum oxidation number of elements in Period 3.
The number of outer/ valence electrons

4. When KI(aq) is added to CuSO4(aq) the blue-coloured solution turns brown and a white precipitate of CuI(s) is seen.

.....$Cu^{2+}$ + .....$I^-$ → .....CuI + .....

a. Complete the equation for the reaction

$2Cu^{2+} + 4I^- \rightarrow 2CuI + I_2$

b. Identify oxidising agent in this reaction. Explain in terms of electron transfer
Cu2+ OR CuSO4 AND
copper (species / ion) has gained / taken electron(s) from iodide (ion)

5. Define reducing agent
   Species that donates electrons
6.

Aqueous bromine reacts with methanoic acid to form hydrogen bromide and carbon dioxide gas.

$$Br_2(aq) + HCO_2H(aq) \rightarrow 2HBr(aq) + CO_2(g)$$

The table shows the oxidation numbers of bromine and carbon in the species involved in this reaction.

| | Br in $Br_2$ | C in $HCO_2H$ | Br in HBr | C in $CO_2$ |
|---|---|---|---|---|
| oxidation number | 0 | +2 | –1 | +4 |

Identify the oxidising agent in this reaction. Explain your reasoning with reference to oxidation numbers.
Br / bromine as the oxidation number of Br decreases / goes from 0 → –1 OR
Bromine as it causes oxidation number of C (in methanoic acid) to increase / go from (+)2 → (+)4

7. State what determines the maximum oxidation number of elements in Period 3.
   - number of outer/valence electrons

8. State why the maximum oxidation number of aluminium is different from that of phosphorus.
   - different number of valence/outer shell electrons

9.

$Bi_2O_3$ can be used to form $NaBiO_3$, as shown in equation 1.

equation 1 $Na_2O + Bi_2O_3 + O_2 \rightarrow 2NaBiO_3$

Identify the reducing agent in equation 1.
- Bi2O3

10. Explain the term oxidising agent.
    - a substance that oxidises another by removing electrons from it / causing electron loss // reduced by gaining electrons

11. Define reducing agent.
    - species that donates electrons

12. State the type of redox reaction in which the same species is both oxidised and reduced simultaneously.
    - Disproportionation