1 Which of these shows nitrogen in its correct oxidation states in the compounds given?

	NH_3	N_2O	HNO_2	
A	+ 3	−1	+ 5	⬭
B	−3	+ 1	+ 3	⬭
C	−3	+ 1	−5	⬭
D	+ 3	−1	−3	⬭

(Total 1 mark)

2 Which species contains an element with an oxidation state of +4?

A NO_2^+ ⬭

B ClO_3^- ⬭

C H_2SO_3 ⬭

D PCl_5 ⬭

(Total 1 mark)

3 Which of the following shows chlorine in its correct oxidation states in the compounds shown?

	HCl	$KClO_3$	HClO	
A	−1	+3	+1	⬭
B	+1	−5	−1	⬭
C	−1	+5	+1	⬭
D	+1	+5	−1	⬭

(Total 1 mark)

4 Which one of the following is **not** a redox reaction?

A $Br_2 + SO_2 + 2H_2O \rightarrow SO_4^{2-} + 4H^+ + 2Br^-$

B $SnCl_2 + HgCl_2 \rightarrow Hg + SnCl_4$

C $Cu_2O + H_2SO_4 \rightarrow CuSO_4 + Cu + H_2O$

D $2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$

(Total 1 mark)

5 Refer to the unbalanced equation below when answering this question.

$$K_2Cr_2O7 + 3H_2C_2O_4 + \_H_2SO_4 \longrightarrow Cr_2(SO_4)_3 + \_H_2O + 6CO_2 + K_2SO_4$$

What is the reducing agent in this reaction?

A H^+ ⬭

B $C_2O_4^{2-}$ ⬭

C K^+ ⬭

D $Cr_2O_7^{2-}$ ⬭

(Total 1 mark)

6 In which reaction is hydrogen acting as an oxidising agent?

A $Cl_2 + H_2 \longrightarrow 2HCl$ ⬭

B $(CH_3)_2CO + H_2 \longrightarrow (CH_3)_2CHOH$ ⬭

C $N_2 + 3H_2 \longrightarrow 2NH_3$ ⬭

D $2Na + H_2 \longrightarrow 2NaH$ ⬭

(Total 1 mark)

7 In which reaction is the metal oxidised?

A $2Cu^{2+} + 4I^- \longrightarrow 2CuI + I_2$ ⬭

B $[Fe(H_2O)_6]^{3+} + Cl^- \longrightarrow [Fe(H_2O)_5(Cl)]^{2+} + H_2O$ ⬭

C $[CoCl_4]^{2-} + 6H_2O \longrightarrow [Co(H_2O)_6]^{2+} + 4Cl^-$ ⬭

D $Mg + S \longrightarrow MgS$ ⬭

(Total 1 mark)

8 Refer to the unbalanced equation below when answering this question.

$$K_2Cr_2O7 + 3H_2C_2O_4 + \_H_2SO_4 \longrightarrow Cr_2(SO_4)_3 + \_H_2O + 6CO_2 + K_2SO_4$$

In the balanced equation the mole ratio for sulfuric acid to water is

A 1 : 4 ⬭

B 1 : 2 ⬭

C 4 : 7 ⬭

D 4 : 9 ⬭

(Total 1 mark)

9 Photochromic glass contains silver ions and copper ions. A simplified version of a redox equilibrium is shown below. In bright sunlight the high energy u.v. light causes silver atoms to form and the glass darkens. When the intensity of the light is reduced the reaction is reversed and the glass lightens.

$$Cu^+(s) + Ag^+(s) \rightleftharpoons Cu^{2+}(s) + Ag(s)$$

clear glass dark glass

When the photochromic glass darkens

A the Ag^+ ion is acting as an electron donor.

B the Cu^+ ion is acting as a reducing agent.

C the Ag^+ ion is oxidised.

D the Cu^+ ion is reduced.

(Total 1 mark)

10 Which of these is a redox reaction?

A $CaO + SiO_2 \longrightarrow CaSiO_3$ ⬭

B $H_2SO_4 + Na_2O \longrightarrow Na_2SO_4 + H_2O$ ⬭

C $NaBr + H_2SO_4 \longrightarrow NaHSO_4 + HBr$ ⬭

D $Mg + S \longrightarrow MgS$ ⬭

(Total 1 mark)

Mark schemes

1 B **[1]**

2 C **[1]**

3 C **[1]**

4 D **[1]**

5 B **[1]**

6 D **[1]**

7 D **[1]**

8 C **[1]**

9 B **[1]**

10 D **[1]**