Q1.

This question is about redox reactions.

(a) State, in terms of electrons, the meaning of the term oxidising agent.

_____

(1)

(b) $Cr_2O_7^{2-}$ can oxidise SO_3^{2-} in acidic conditions to form Cr^{3+} and SO_4^{2-}

Deduce a half-equation for the oxidation of SO_3^{2-} to SO_4^{2-}

Deduce a half-equation for the reduction of $Cr_2O_7^{2-}$ to Cr^{3+}

Deduce the overall equation for the oxidation of SO_3^{2-} by $Cr_2O_7^{2-}$

Half-equation for the oxidation of SO_3^{2-} to SO_4^{2-}

_____

Half-equation for the reduction of $Cr_2O_7^{2-}$ to Cr^{3+}

_____

Overall equation

_____

(3)

(Total 4 marks)

Q2.

Which compound contains a chlorine atom with an oxidation state of +4?

A $KClO_4$ ⬭

B CCl_4 ⬭

C ClO_2 ⬭

D ClO_2F ⬭

(Total 1 mark)

Q3.

NO_2^- ions can be reduced in acidic solution to NO How many electrons are gained when each NO_2^- ion is reduced?

A 1 ○

B 2 ○

C 3 ○

D 4 ○

(Total 1 mark)

Q4.

Which compound contains chlorine in an oxidation state of +1?

A Cl_2O ○

B $KClO_3$ ○

C ClF_3 ○

D CCl_4 ○

(Total 1 mark)

Q5.

In which conversion is the metal reduced?

A $Cr_2O_7^{2-} \rightarrow CrO_4^{2-}$ ○

B $MnO_4^{2-} \rightarrow MnO_4^-$ ○

C $TiO_2 \rightarrow TiO_3^{2-}$ ○

D $VO_3^- \rightarrow VO^{2+}$ ○

(Total 1 mark)

Q6.

Which equation does **not** represent a redox reaction?

A $Mg + 2\,HCl \rightarrow MgCl_2 + H_2$ ⬭

B $CH_4 + 2\,O_2 \rightarrow CO_2 + 2\,H_2O$ ⬭

C $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$ ⬭

D $CuO + 2\,HCl \rightarrow CuCl_2 + H_2O$ ⬭

(Total 1 mark)

Q7.

V_2O_5 can be used as a catalyst in the Contact Process.

Which is a step in the Contact Process in which the vanadium is oxidised?

A $SO_2 + V_2O_5 \longrightarrow SO_3 + 2VO_2$ ⬭

B $SO_3 + 2VO_2 \longrightarrow SO_2 + V_2O_5$ ⬭

C $2VO_2 + \frac{1}{2}O_2 \longrightarrow V_2O_5$ ⬭

D $V_2O_5 \longrightarrow 2VO_2 + \frac{1}{2}O_2$ ⬭

(Total 1 mark)

Q8.

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)

Q9.

Which of these species is the best reducing agent?

A Cl_2 ⬭

B Cl^- ⬭

C I_2 ⬭

D I^- ⬭

(Total 1 mark)

Q10.

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)

Q11.

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)

Q12.

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)

Q13.

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)

Q14.

Which of these is **not** a redox reaction?

A $Cu_2O + H_2SO_4 \longrightarrow CuSO_4 + Cu + H_2O$ ⬭

B $MgO + 2HCl \longrightarrow MgCl_2 + H_2O$ ⬭

C $SnCl_2 + HgCl_2 \longrightarrow Hg + SnCl_4$ ⬭

D $MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$ ⬭