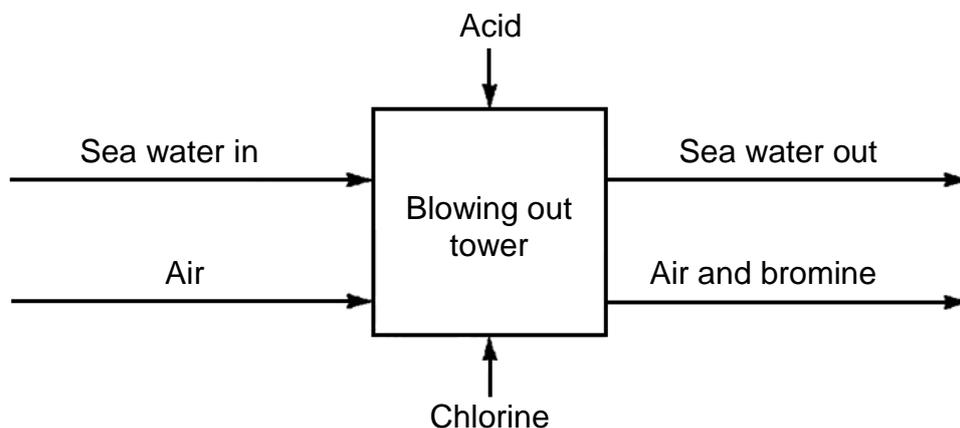


Oxidising or reducing agents

Name _____

1. The main source of bromine is the bromide ions in sea water. One stage in the production of bromine is shown in the diagram.

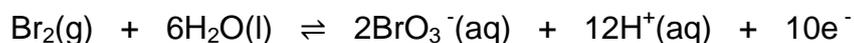


- (a) Write the balanced redox equation for the displacement reaction taking place in the blowing out tower.

You may wish to refer to page 12 of the data booklet.

1

- (b) The hydrolysis of bromine to bromate ions, BrO_3^- , reduces the yield of bromine.



Why does the addition of acid to the blowing out tower slow down the hydrolysis and increase the yield of bromine?

1
(2)

2. The idea of oxidation number leads to a systematic method of naming inorganic compounds.

The systematic name of KClO_3 is potassium chlorate (V) where the Roman numeral in brackets represents the oxidation number of the chlorine atom.

Simplified rules for working out oxidation numbers are:

all Group 1 metals have an oxidation number of +1;

oxygen has an oxidation number of -2;

the sum of the oxidation numbers of all atoms in the formula of a compound is zero.

- (a) Complete the table below.

Formula	Oxidation number of non-oxygen atom in the negative ion	Systematic name	Charge on the negative ion
KClO_3	+5	potassium chlorate(V)	-1
Na_2SO_4	+6		-2
	+7	potassium iodate(VII)	-1
Na_3PO_4			

- (b) In acid solution, potassium chlorate(V), $\text{KClO}_3(\text{aq})$, oxidises sodium iodide.

2

- (i) Write an ion-electron equation for the oxidation reaction.

1

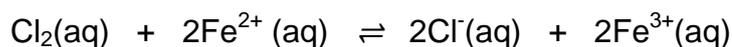
- (ii) During the reaction, chlorate(V) ions are reduced to form chlorine.



Complete the above to form the ion-electron equation.

1
(4)

3. The water in swimming pools can be kept sterile by the addition of chlorine which kills microorganisms. The chlorine levels in swimming pool water can be determined by titrating samples against acidified iron(II) sulphate solution. The reaction taking place is:



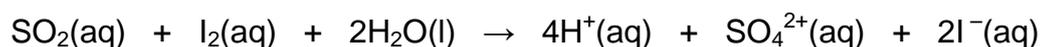
Write the ion-electron equation for the oxidation half-reaction.

1

4. Sulphur dioxide is added to wine as a preservative. A mass of 20 to 40 mg of sulphur dioxide per litre of wine will safeguard the wine without affecting its taste.

The concentration of sulphur dioxide in white wine may be found by titration with a standard solution of iodine.

The equation for the reaction which takes place is:



- (i) The indicator used in this reaction causes a change from blue to colourless at the end point. Name a substance which could be used as this indicator.

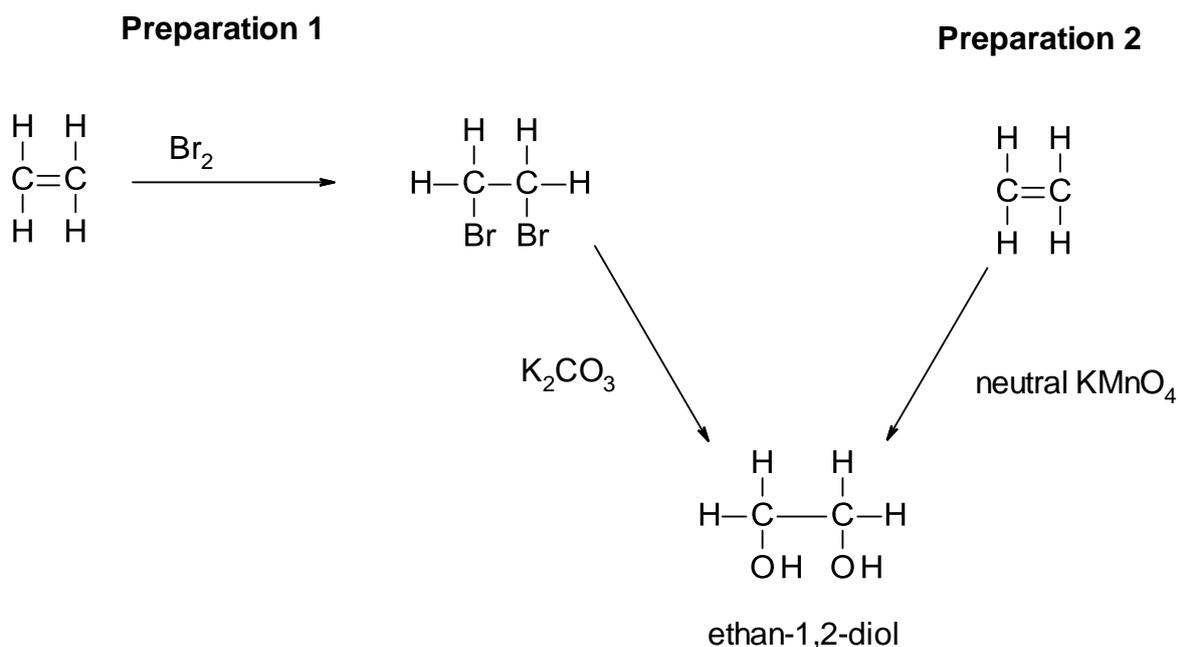
1

- (ii) Write the ion-electron equation for the reduction reaction taking place.

1

(2)

5. Ethane-1,2-diol is a colourless liquid used as anti-freeze in car radiators. It can be made in the laboratory from ethene.



In preparation 1, the reaction of K_2CO_3 produces the salt potassium bromide and carbon dioxide as by-products.

- a) Give the formula for another compound, not containing carbon, which would react with K_2CO_3 to produce the same salt and carbon dioxide.

1

In preparation 2, the KMnO_4 oxidises ethene in neutral aqueous solution. Complete the balancing of the ion-electron equation shown.



1
(2)

6. Write ion electron-half-equations for each of the following:

a) The oxidation of sulphite ions, SO_3^{2-} , to sulphate ions, SO_4^{2-}

b) The oxidation of bromine, Br_2 to bromate(V) ions, BrO_3^- ,

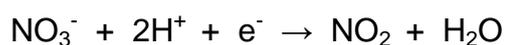
c) The reduction of manganese(IV) oxide, MnO_2 , to manganese(II) ions, Mn^{2+}

d) The reduction of xenon(VI) oxide, XeO_3 , to xenon gas, Xe

e) The oxidation of hydrogen sulphide, H_2S , to sulphur, S

10

7. Write the redox equation for the reaction between copper and concentrated nitric acid to give nitrogen dioxide:



2

Total = 23