

OXIDATION AND REDUCTION

Syllabus reference 9.2.4

1 Classify each of the following statements as true (T) or false (F). For those statements that are false, rewrite the statement so it is correct.

a A displacement reaction involves the transfer of ^{e⁻} protons between a metal and a metal ion.

F

b Reduction is the gain of electrons by a substance.

T

c When copper loses two electrons to form Cu^{2+} it is ^{oxidized.} reduced.

F

d An oxidation reaction is always accompanied by a reduction reaction.

T

e A more active metal will displace a less active metal from a solution of its ions.

T

f For positive monatomic ions the oxidation state is always ^{same as its charge} +1.

F

g The oxidation number of manganese in MnO_2 is ⁴ +1.

F

h For any redox reaction the number of electrons lost must be equal to the number of electrons gained.

T

i In the reaction $\text{CuO(s)} + \text{H}_2\text{(g)} \rightarrow \text{Cu(s)} + \text{H}_2\text{O(l)}$ copper goes from an oxidation state of ² +1 to 0.

F

j For any neutral compound the sum of the oxidation numbers of the atoms in the molecule must equal zero.

T

2 By referring to the Activity Series select four metals which will displace:

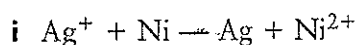
a nickel from a solution of nickel nitrate

Fe, Cr, Zn, Al

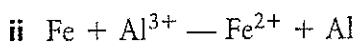
b copper from a solution of copper sulfate

Pb, Sn, Ni, Fe

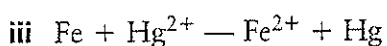
- 3 a In which direction (left to right) will the following reactions occur? If no reaction occurs write 'no reaction'.



right



left



right

- b Write the correct balanced equation for each of the reactions above.



- 4 a Which is the strongest reductant out of Pb, Al, Fe and Cu, and which is the weakest?

Strongest - Al

Weakest - Cu

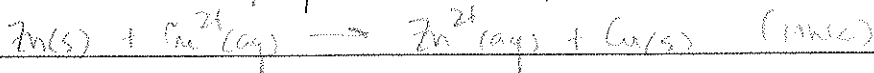
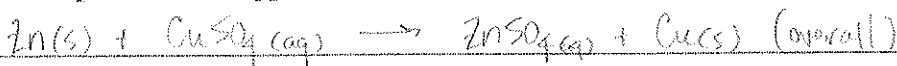
- b Which is the strongest oxidant out of K^+ , Ag^+ , Al^{3+} and Ni^{2+} , and which is the weakest?

Strongest - Ag^+

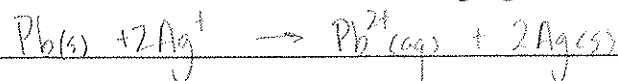
Weakest - K^+

- 5 Write balanced ionic equations for the following.

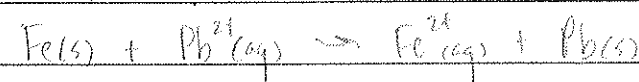
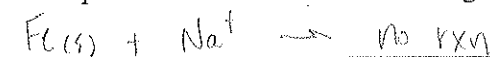
- a zinc is placed in a copper sulfate solution



- b lead is added to a solution containing Ag^+ ions

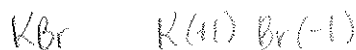


- c iron is placed in a solution containing Na^+ and Pb^{2+} ions

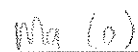


- 6 Give the oxidation number of each of the following elements.

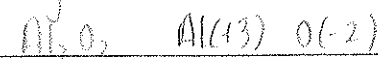
- a potassium bromide



- b magnesium



- c aluminium oxide



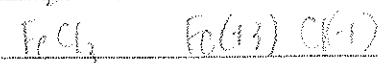
- d iron(II) chloride



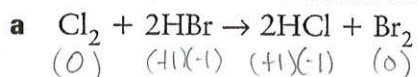
- e iodine



- f iron(III) chloride



7 Identify the species that is oxidised and the species that is reduced in each of the following reactions. Name the oxidant and reductant.

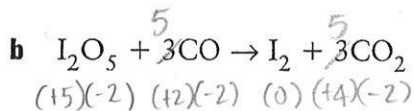


$\text{Cl}_2(0) \rightarrow \text{Cl}(-1)$ reduction

oxidant $\Rightarrow \text{Cl}$

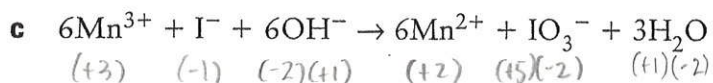
$\text{Br}(-1) \rightarrow \text{Br}_2(0)$ oxidation

reductant $\Rightarrow \text{Br}$



$\text{I}(+5) \rightarrow \text{I}(0)$ reduction

$\text{C}(+2) \rightarrow \text{C}(+4)$ oxidation



$\text{Mn}(+3) \rightarrow \text{Mn}(+2)$ reduction

$\text{I}(-1) \rightarrow \text{I}(+5)$ oxidation