

## OXIDATION AND REDUCTION 11

- Historically, chemists defined oxidation as
  - the process in which a substance loses oxygen.
  - the process in which a substance gains oxygen.
  - the process in which a substance gains hydrogen.
  - the process in which a substance gains electrons.
- Which of the following statements is FALSE?
  - A substance is oxidised when it gains oxygen.
  - A substance is reduced when it gains hydrogen.
  - A substance is oxidised when it loses electrons.
  - A substance is reduced when it loses carbon.
- Which of the following is the BEST definition of the term 'oxidation' as used today?
  - Oxidation is the process in which a substance reacts with oxygen.
  - Oxidation is the process in which a substance loses oxygen.
  - Oxidation is the process in which a substance donates electrons to another substance.
  - Oxidation is the process which involves a decrease in the oxidation number of the substance being oxidised.
- Which one of the following statements is FALSE?
  - Oxidation and Reduction occur simultaneously.
  - The substance which donates the electrons in an oxidation-reduction reaction is called the oxidising agent.
  - The oxidising agent is the substance which is reduced in an oxidation-reduction reaction.
  - An increase in the oxidation number of a substance suggests that the substance has been oxidised.
- What is the oxidation number of Mn in  $\text{MnO}_2$ ?

a) +2	b) +4
c) -2	d) -4
- What is the oxidation number of Cr in  $\text{Cr}_2\text{O}_7^{-2}$ ?

a) +2	b) +3
c) +6	d) +12

7. Which one of the following does NOT represent an oxidation-reduction reaction?

- a)  $\text{Zn(s)} + 2\text{H}^+(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{H}_2(\text{g})$
- b)  $\text{C(s)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
- c)  $\text{Cl}_2(\text{g}) + 2\text{I}^-(\text{aq}) \rightarrow 2\text{Cl}^-(\text{aq}) + \text{I}_2(\text{s})$
- d)  $\text{Pb}^{2+}(\text{aq}) + 2\text{I}^-(\text{aq}) \rightarrow \text{PbI}_2(\text{s})$

The next three questions refer to the following *unbalanced* oxidation-reduction equation:



8. Correctly balanced, the coefficients from left to right in the above equation would be

- a) 1, 5, 6, 1, 5, 8
- b) 2, 5, 6, 2, 5, 8
- c) 2, 5, 10, 2, 5, 8
- d) 2, 5, 8, 2, 5, 8

9. The substance which has been oxidised in the above reaction is

- a)  $\text{MnO}_4^-$
- b)  $\text{H}_2\text{S}$
- c)  $\text{H}^+$
- d) S

10. The oxidation number of sulfur in this reaction has changed from

- a) -2 to 0
- b) +2 to 0
- c) 0 to -2
- d) 0 to +2

11. How many hydrogen ions would be shown in the balanced half equation involving the reduction of  $\text{SO}_4^{2-}(\text{aq})$  to  $\text{SO}_2(\text{g})$ ?

- a) 1
- b) 2
- c) 3
- d) 4

12. A substance which gives up electrons readily is

- a) known as an oxidising agent.
- b) easily reduced.
- c) a good reducing agent
- d) would readily accept protons.

13. In the laboratory, you would have studied displacement reactions of metals, in which metal strips were placed in solutions containing metal ions.  
In which ONE of the following would you expect a displacement reaction to occur?
- Copper metal in an aqueous solution of iron (II) sulfate.
  - Copper metal in an aqueous solution of silver nitrate.
  - Zinc metal in an aqueous solution of magnesium nitrate.
  - Copper metal in an aqueous solution of zinc nitrate.

14. In the oxidation-reduction reaction shown below:



- Each copper atom donates one electron.
- Each silver atom donates one electron.
- Each copper atom gains two electrons.
- Each silver ion gains one electron.

The next **three** questions refer to the displacement reaction which occurs when zinc metal is placed in a solution of copper sulfate.



15. Consider the FOUR statements below which describe what may happen in the above reaction:
- The colour of the solution becomes paler.
  - The zinc metal becomes coated with copper metal.
  - The colour of the solution does not change.
  - The solution changes to a more intense blue colour.

Which of these statements is/are true?

- I only.
  - II only.
  - I and II.
  - II and III.
  - II and IV.
16. Which substance is oxidised in the reaction described above?
- Zinc metal.
  - Copper metal.
  - Zinc ions.
  - Copper ions.

17. The oxidising agent in the previous reaction would be
- a) zinc metal.
  - b) copper metal
  - c) zinc ions.
  - d) copper ions.
18. In the following redox reaction showing halogen displacement,
- $$\text{Br}_2(\text{l}) + 2\text{I}^-(\text{aq}) \rightarrow 2\text{Br}^-(\text{aq}) + \text{I}_2(\text{s})$$
- a) bromine is the reducing agent.
  - b) bromine has been reduced.
  - c) iodine is the stronger oxidising agent.
  - d) iodine has been reduced.

The next **two** questions refer to the following information:

A student wishes to investigate halogen-halide ion displacement reactions. He does this by adding solutions of potassium chloride, potassium bromide and potassium iodide to some chlorine water (Chlorine water is an aqueous solution containing dissolved chlorine molecules. It can be made by bubbling gaseous chlorine through water.)

19. Which of the following ions would displace the chlorine from solution?
- a)  $\text{Br}^-$
  - b)  $\text{I}^-$
  - c)  $\text{Br}^-$  and  $\text{I}^-$
  - d) All of the ions  $\text{Cl}^-$ ,  $\text{Br}^-$  and  $\text{I}^-$
20. Which of the following occurs when potassium iodide is added to chlorine water?
- a) There is no reaction.
  - b) The solution changes from pale yellow to green.
  - c) The solution changes from orange to pale yellow.
  - d) The solution changes from pale yellow to bright pink/purple.