Section A Multiple Choice

1. An aqueous solution is obtained when:
   a. a substance dissolves in any liquid
   b. a substance is dissolved in water
   c. when a substance is mixed with water and doesn’t dissolve
   d. water is removed from a substance

2. The graph shows the relative amount of chemical substances which can be taken up by plants at different pH levels. The narrower the bar the harder it is for plants to take up elements.

   ![Graph showing pH levels and uptake of elements]

   *If a plant needs a large intake of boron, magnesium and phosphorus, what is the best pH level for growing this plant?*
   a. 5.5
   b. 6.0
   c. 6.5
   d. 7.0

3. An unnamed element which we will call Biddellonium (symbol By) has an atomic number of 12. When the element reacts chemically what is most likely to occur?
   a. It will lose one electron.
   b. It will lose two electrons.
   c. It will gain two electrons.
   d. It will share two electrons.

4. The element chlorine is an example of:
   A. an alkali metal
   B. an alkaline earth metal
   C. a halogen
   D. a noble gas

5. Most of the elements in the periodic table are:
   A. metalloids
   B. metals
   C. non-metals.
   D. gases
6 Isotopes are:
   A different atoms of the same element with a different number of protons
   B different atoms of the same element with a different number of electrons
   C different atoms of the same element with different mass numbers.
   D different atoms of the same element with different atomic numbers.

7 The maximum number of electrons in the second (or L) shell of an atom is:
   A 2
   B 4
   C 8
   D 18

8 The atoms that form covalent bonds are formed by:
   A the sharing of electrons
   B the sharing of protons
   C the sharing of neutrons
   D the attraction of ions.

9 Which of the following shows the correct electron dot structure of carbon dioxide?

   A
   B
   C
   D

   ANSWER IS A

10 Which of the following is not an ionic compound?
   A NaCl
   B CaCl₂
   C CO₂
   D AgNO₃

11 Which of the following elements is not a metalloid?
   A sodium
   B arsenic
   C germanium
   D silicon
12 Which of the following processes is an example of a chemical change?
A magnesium ribbon is surrounded by bubbles when it is placed in hydrochloric acid solution
B a mist forms when you breathe onto cold glass
C ice melts as you hold it in the palm of your hand
D a litre of water boils dry in a saucepan

13 A chemical reaction occurs when a strip of copper is placed in silver nitrate solution. The balanced equation for this reaction is:
A \[ \text{Cu (s)} + 2 \text{AgNO}_3 (\text{aq}) \rightarrow 2\text{Ag (s)} + \text{Cu (NO}_3)_2 (\text{aq}) \]
B \[ 2\text{Cu (s)} + 2 \text{Ag(NO}_3)_2 (\text{aq}) \rightarrow 2\text{Ag (s)} + 2\text{Cu (NO}_3)_2 (\text{aq}) \]
C \[ \text{Cu (s)} + \text{Ag(NO}_3)_2 (\text{aq}) \rightarrow \text{Ag (s)} + \text{Cu (NO}_3)_2 (\text{aq}) \]
D \[ 2\text{Cu (s)} + \text{AgNO}_3 (\text{aq}) \rightarrow 2\text{Ag (s)} + \text{Cu (NO}_3)_2 (\text{aq}) \]

14 Which one of the following compounds would you expect to be insoluble in water?
A \( \text{CaCO}_3 \)
B \( \text{CuSO}_4 \)
C \( \text{KNO}_3 \)
D \( \text{NaCl} \)

15 Which of the following chemical reactions is an example of a decomposition reaction?
A zinc reacts with oxygen to produce zinc oxide
B \[ \text{Cu (s)} + 2 \text{AgNO}_3 (\text{aq}) \rightarrow \text{Ag (s)} + \text{Cu(NO}_3)_2 (\text{aq}) \]
C methane gas burns to produce carbon dioxide and water
D \[ \text{ZnCO}_3 (\text{s}) \rightarrow \text{ZnO (s)} + \text{CO}_2 (\text{g}) \]
1. One product used to clean contact lenses involves pouring an aqueous solution of hydrogen peroxide into a platinum coated disc. The hydrogen peroxide decomposes, producing water and oxygen gas. Without the platinum disc the decomposition reaction takes place too slowly to be useful.

\textit{(Chemical symbols: hydrogen peroxide is } \text{H}_2\text{O}_2, \text{platinum is } \text{Pt})

\begin{itemize}
  \item[a)] Name the reactants
  \[ \text{H}_2\text{O}_2, \text{hydrogen peroxide} \]
  \item[b)] Name the products.
  \[
  \text{water and oxygen gas}
  \]
  \item[c)] Write a word equation to fully describe the chemical reaction.
  \[
  \text{hydrogen peroxide} \rightarrow \text{water and oxygen gas}
  \]
  \item[d)] Write complete and balanced chemical equation to fully describe the chemical reaction. (show states)
  \[
  2 \text{H}_2\text{O}_2 (\text{aq}) \rightarrow 2 \text{H}_2\text{O (l)} + \text{O}_2 (\text{g})
  \]
\end{itemize}
2 For the element phosphorus: 
   a) What is the atomic number? 15

   b) What is the mass number? 31

   c) Draw a labeled diagram to show the location of electron in the shells.

   d) Where are the protons and neutrons located? nucleus

   e) What is meant by isotopes? different atoms of the same element with different mass numbers so they have different numbers of neutrons.

3 a) How many electrons have been gained or lost by each of the following ions? (6 marks)
   i. Na\(^+\) lost 1
   iii. Al\(^{3+}\) lost 3
   ii. NO\(_3^-\) gained 1
   iv. S\(^{2-}\) Gained 2
b  Oxygen is a gas which consists of molecules which are made up of pairs of oxygen atoms.
   i. Which type of chemical bond joins the atoms in pairs? **covalent**

   ii. Draw a Lewis (electron dot diagram) to show this molecule

   ![Lewis diagram of O2]


c  Aluminium combines with the oxide ion to form the compound aluminium oxide.
   i. Write the formula for aluminium oxide. **Al₂O₃**

   ii. Is the bonding covalent or ionic? **ionic**
4 (5 marks)
a A chemical reaction occurs when a strip of magnesium is placed in nitric acid (HNO₃) solution.
i. Name the products. **Magnesium nitrate and hydrogen gas**

ii. Write the balanced equation for this reaction. \( \text{Mg} + 2\text{HNO}_3 \rightarrow \text{Mg(NO}_3\text{)}_2 + \text{H}_2 \)

iii. Name the type of reaction. **Metal + acid \rightarrow salt + hydrogen gas**

b When a hydrocarbon burns in air a combination reaction occurs. *The chemical formula for octane is C₈H₁₈.*

*Write the balanced equation for octane (found in petrol) burning in air.*

\[ 2\text{C}_8\text{H}_{18} (g) + 25\text{O}_2(g) \rightarrow 16\text{CO}_2(g) + 18\text{H}_2\text{O}(g) \]

5 Reaction types

a What is a decomposition reaction? **Chemical reaction in which a compound is broken down into simpler compounds, or even into elements.**

Write the balanced equation for the reaction when calcium carbonate is decomposed \( \text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2 \)

i. What is a combination reaction? **Chemical reaction in which two simpler compounds or two elements are combined to make a more complex compound.**

ii. Write a full balanced equation for the reaction when iron and sulphur react. \( \text{Fe} + \text{S} \rightarrow \text{FeS} \)
c Balance each of the following chemical equations. (3)

i. \[ 2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO} \]

ii. \[ \text{Fe} + 3\text{CuNO}_3 \rightarrow 3\text{Cu} + \text{Fe(NO}_3)_3 \]
6  Examine the list of chemical reactions labelled (i) – (iv) below. (4 marks)
   (i)  zinc reacts with oxygen to produce zinc oxide (some heat emitted)
   (ii)  Cu (s) + 2 AgNO₃ (aq) → 2Ag (s) + Cu(NO₃)₂ (aq)
   (iii)  methane gas burns to produce carbon dioxide and water
   (iv)  ZnCO₃ (s) → ZnO (s) + CO₂ (g)

Which one or more of the reactions, (i) – (iv) can be described as:

(a) a decomposition reaction  iv

(b) a combination reaction  i

(c) a combustion reaction  iii

(d) a displacement reaction  ii

7  In neutralisation reactions acids and bases react.  (5 marks)
   a)  Write a balanced equation to show the neutralisation of Sulphuric acids with
       Potassium Hydroxide  2 KOH + H₂SO₄ → K₂SO₄ + 2 H₂O

   b)  The pH of sulphuric acid is low between 0-2 and the pH of Potassium
       Hydroxide high between 14-12

   c)  Name two pieces of apparatus that you would use to do a titration for this
       reaction. Any from conical flask, burette, pipette and pipette filler

   d)  Explain how to correctly use one of these. See power point slide off LG for
       this

   e)  What is the purpose of the indicator? To easily detect colour change when
       base has been neutralized by the acid.
The following pairs of solutions were mixed with each other and the results were observed. (4 marks)

i. Copper (II) Chloride and Zinc Nitrate no precipitate
ii. Barium Nitrate and Sodium Sulphate
iii. Ammonium Carbonate and Copper Chloride

a) Write word equations for one of these reactions.

Barium Nitrate + Sodium Sulphate $\rightarrow$ Barium Sulphate + Sodium Nitrate

OR

Ammonium Carbonate + Copper Chloride $\rightarrow$ Copper Carbonate + Ammonium Chloride

b) Apart from precipitation, name the type of reaction. **Double displacement**
c) Write the formula for precipitates formed. \( \text{BaSO}_4 \text{ OR CuCO}_3 \)

d) Write a balanced equation for \textbf{another one} of the reactions which formed a precipitate (show states)

\[
\text{(NH}_4\text{)}_2\text{CO}_3 (aq) + \text{CuCl}_2(aq) \rightarrow \text{CuCO}_3 (s) + 2\text{NH}_4\text{Cl} (aq)
\]

\[
\text{OR}
\]

\[
\text{Ba(NO}_3\text{)}_2 (aq) + \text{Na}_2\text{SO}_4 (aq) \rightarrow 2\text{NaNO}_3 (aq) + \text{BaSO}_4 (s)
\]