SESSION 16: CHEMISTRY CONSOLIDATION

Key Concepts

In this session we will focus on summarising what you need to know about:

- Types of reactions
- Chemical bonding
- Chemical calculations
- Chemical systems

X-ample Questions

Question 1

1.1 Identify the type of reaction in each of the following examples:

a. $NaOH + HC\ell \rightarrow NaC\ell + H_2O$ (1)

b. $HC\ell + H_2O \rightarrow H_3O^+ + C\ell^-$ (1)

c. $CuO + H_2 \rightarrow Cu + H_2O$ (1)

d. $C_3H_6 + Br_2 \rightarrow C_3H_6Br_2$ (1)

1.2 State whether the following reactions will take place spontaneously or not.

a. $F_2 + KC\ell \rightarrow KF + C\ell_2$ (2)

b. $I_2 + LiC\ell \rightarrow LiI + C\ell_2$ (2)

c. $C\ell_2 + NaBr \rightarrow NaC\ell + Br_2$ (2)

d. $Br_2 + CaI_2 \rightarrow CaBr_2 + I_2$ (2)

1.3 Identify whether the following are redox reactions or not.

a. $CuSO_4 + H_2S \rightarrow CuS + H_2SO_4$ (2)

b. $Cu + 2H_2SO_4 \rightarrow CuSO_4 + 2H_2O + SO_2$ (2)

c. $Na_2SO_3 + H_2SO_4 \rightarrow Na_2SO_4 + SO_2 + H_2O$ (2)

d. $Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + CO_2 + H_2O$ (2)

1.4 Give one term for each of the following descriptions:

a. A substance that donates electrons (1)

b. A substance that accepts electrons (1)

c. A solution that has a known concentration (1)

1.5 Complete the following by giving the balanced chemical equation for each reaction":

a.	Elimination reaction for: $CH_3 - \underset{\displaystyle OH}{\underset{\vert}{CH}} - CH_3$	(2)
b.	$CH_2 = CHCH_3$ + HBr	(2)

c. Neutralisation of sulphuric acid and sodium hydroxide (2)
d. Redox reaction between potassium and oxygen (2)
e. Oxidation half reaction for the reaction in 1.5 d (2)

1.6 Concentrated sulphuric acid reacts with copper.

a. Name the oxidising agent in the reaction (1)
b. Write the equation of the oxidation half reaction (2)
c. Write the formula of the gas that is produced (1)

Copper is now added to dilute nitric acid

The two reactions on the reduction potential table that are used are given below.

$NO_3^- + 4H^+ + 3e^- \leftrightarrows NO + 2H_2O$
$Cu^{2+} + 2e^- \leftrightarrows Cu$

1.7 By referring to the given reactions

a. Name the substance that reacts as a reducing agent (1)
b. Name the substance that is reduced (1)
c. Write the oxidation half reaction (2)

Question 2

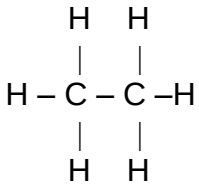
Study the following table showing the relevant bond energies:

BOND	BOND LENGTH (pm)	BOND ENERGY ($kJ.mol^{-1}$)
C - C	154	348
C = C	134	619
C ≡ C	120	835
C - O	143	358
C – H	109	411

A chemical bond is a resultant (net) attractive force between two atoms.

2.1 From the table, identify the factors that influence the strength of the bond between atoms. Cleary state how it influences the bond strength. (6)

2.2 Study the diagram below:



Calculate the amount of energy needed to break the bonds between atoms in the diagram. (3)

Question 3

3.1 Draw the Lewis structure for ammonia. (2)

3.2 Determine the electronegativity difference and the shape of the molecule and use this to explain whether

a. The bonds are polar. (2)

b. The molecule is polar. (2)

c. Draw a pressure against volume graph to show the relationship between p and volume if an ideal gas is used in the investigation. On the same set of axes show the possible deviation when ammonia is used. (3)

3.3 Calculate the percentage composition of ammonia. (4)

3.4 Ammonia is produced in the Haber process, according to the following equation:

N_2 (g) + $3H_2$ (g) → $2NH_3$ (g)

21g of nitrogen and 7g of hydrogen are placed in a closed container. Calculate:

a. identify the limiting reactant. (2)
b. number of moles of reactant not used up. (3)
c. the number of molecules of ammonia produced. (5)

Question 4

CFCs are non-reactive molecules that are used as propellants in aerosols and coolants in refrigerating systems. These molecules decompose ozone in the atmosphere. When CFCs in the atmosphere are exposed to UV radiation from the sun, reactive chlorine atoms are emitted. These are called radicals. The chlorine radicals act as a catalyst to break ozone into oxygen.

4.1 Why is it important that we control the emission of chemicals that break ozone down? Why do we need the ozone layer? (2)

4.2 Where do we find the ozone layer? (1)

4.3 Write equations to show, and explain how ozone molecules are Made. (8)

4.4 Write chemical equations to show how CFC's break ozone molecules down. (4)

Question 5

Describe how green house gases cause a warning effect (global warming). (7)

Question 6

6.1 Name 5 energy sources. (5)
6.2 What are biofuels? (2)
6.3 Explain why wind is a renewable energy source. (2)
6.4 Maize and other crops are grown for the production of ethanol which is added to fuel. Discuss a disadvantage of this. (3)