Organic chemistry II (alkanoic acids and alkanols)

1. A student mixed equal volumes of Ethanol and butanoic acid. He added a few drops of concentrated Sulphuric (VI) acid and warmed the mixture
   (i) Name and write the formula of the main products
      Name……………………………………
      Formula…………………………………..
   (ii) Which homologous series does the product named in (i) above belong?

2. The structure of the monomer phenyl ethene is given below:-

   a) Give the structure of the polymer formed when four of the monomers are added   together
   b) Give the name of the polymer formed in **(a)** above
3. Explain the environmental effects of burning plastics in air as a disposal method
4. Write chemical equation to represent the effect of heat on ammonium carbonate
5. Sodium octadecanoate has a chemical formula $CH_3(CH_2)_6 COO^-Na^+$, which is used as soap.
   Explain why a lot of soap is needed when washing with hard water
6. A natural polymer is made up of the monomer:

   (a) Write the structural formula of the repeat unit of the polymer
   (b) When 5.0 x 10^{-5} moles of the polymer were hydrolysed, 0.515g of the monomer were obtained.
      Determine the number of the monomer molecules in this polymer.
   (C = 12; H = 1; N = 14; O =16)
7. The formula below represents active ingredients of two cleansing agents **A** and **B**
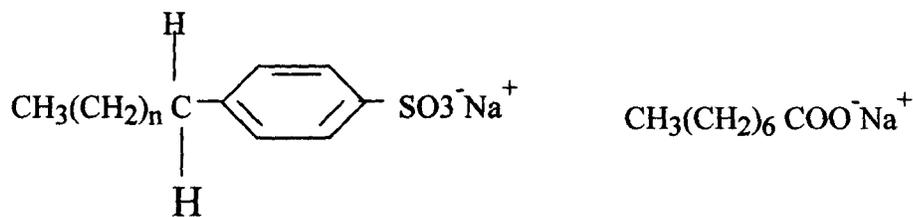

   Agent A   Agent B
   Which one of the cleansing agents would be suitable to be used in water containing magnesium hydrogen carbonate? Explain

8. Study the polymer below and use it to answer the questions that follow:

(a) Give the name of the monomer and draw its structures
(b) Identify the type of polymerization that takes place
(c) State **one** advantage of synthetic polymers

9. Ethanol and Pentane are miscible liquids. Explain how water can be used to separate a mixture of ethanol and pentane

10.

(a) What is absolute ethanol?
(b) State **two** conditions required for process **G** to take place efficiently

11. (a) (i) The table below shows the volume of oxygen obtained per unit time when hydrogen peroxide was decomposed in the presence of manganese (IV) Oxide. Use it to answer the questions that follow:-

Time in seconds	Volume of Oxygen evolved (cm^3)
0	0
30	10
60	19
90	27
120	34
150	38
180	43
210	45
240	45
270	45
300	45

(i) Plot a graph of volume of oxygen gas against time
(ii) Determine the rate of reaction at time 156 seconds
(iii) From the graph, find the time taken for $18cm^3$ of oxygen to be produced
(iv) Write a chemical equation to show how hydrogen peroxide decomposes in the presence of manganese (IV) Oxide

(b) The diagram below shows how a Le'clanche (Dry cell) appears:-

Mixture of powdered carbon and MnO_2

Carbon rod

Zinc can

Paste $NH4Cl$ and $CaCl_2$
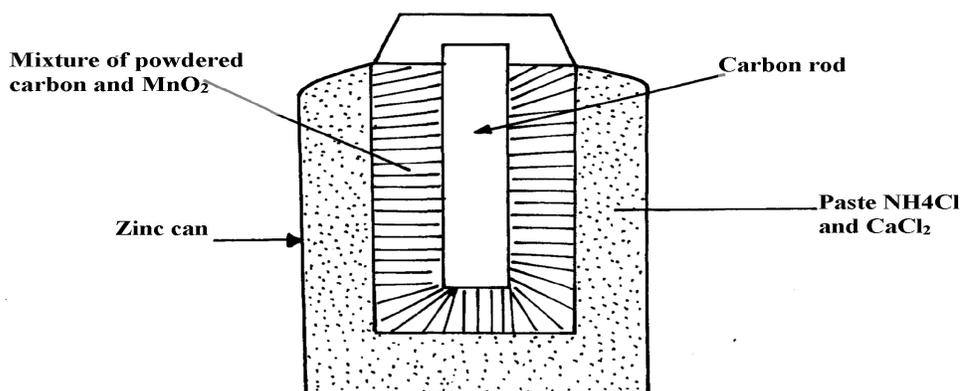
(i) What is the function of MnO_2 in the cell above?
    (ii) Write the equation of a reaction that occurs at the cathode
    (iii) Calculate the mass of Zinc that is consumed when a current of 0.1amperes flows
        through the above cell for 30minutes (1F =96500c Zn =65)
12.   (a) Give the IUPAC names of the following compounds:
     (i) $CH_3COOCH_2CH_3$ *

    (ii)

    (b) The structure below shows some reactions starting with ethanol. Study it and answer
       the questions that follow:

    (i) Write the formula of the organic compounds **P** and **S**   *
    (ii) Name the type of reaction, the reagent(s) and condition for the reactions in the following steps
:-
       (I) Step I   *
       (II) Step II   *
       (III) Step III   *
    (iii) Name reagent **R**   ………………………………………………………………… *
    (iv) Draw the structural formula of **T** and give its name   *
    (v) (I) Name compound **U**…………………………………………………………..
       (II) If the relative molecular mass of **U** is 42000, determine the value of n (**C**=12, **H**=1)
    (c) State why C_2H_4 burns with a more smoky flame than C_2H_6 *
13.   a) State **two** factors that affect the properties of a polymer
    b) Name the compound with the formula below :
    $CH_3CH_2CH_2ONa$
    c) Study the scheme below and use it to answer the questions that follow:-

i) Name the following compounds:-
   I. Product **T** .... II. **K** ....
   ii) State **one** common physical property of substance **G**
   iii) State the type of reaction that occurred in step **J**
   iv) Give **one** use of substance **K**
   v) Write an equation for the combustion of compound **P**
   vi) Explain how compounds CH_3CH_2COOH and $CH_3CH_2CH_2OH$ can be distinguished chemically
   vii) If a polymer **K** has relative molecular mass of 12,600, calculate the value of **n** (H=1 C =12)

14.   Study the scheme given below and answer the questions that follow:-

(a) (i) Name compound **P** ....
   (ii) Write an equation for the reaction between CH_3CH_2COOH and Na_2CO_3
(b) State **one** use of polymer **Q**
(c) Name **one** oxidising agent that can be used in **step II** ....
(d) A sample of polymer **Q** is found to have a molecular mass of 4200. Determine the number of monomers in the polymer   (H = 1, C = 12)
(e) Name the type of reaction in **step I** ....
(f) State **one** industrial application of **step III**
(g) State how burning can be used to distinguish between propane and propyne. Explain your answer
(h) 1000cm³ of ethene (C_2H_4) burnt in oxygen to produce Carbon (II) Oxide and water vapour.
   Calculate the minimum volume of air needed for the complete combustion of ethene
   (Air contains 20% by volume of oxygen)

15.   (a) Study the schematic diagram below and answer the questions that follow:-

(i) Identify the following:

      Substance **Q** ....

      Substance **R**...

      Gas **P**...

(ii) Name:

      Step 1..

      Step 4..

(iii) Draw the structural formula of the major product of step **5**

(iv) State the condition and reagent in step **3**

16.   Study the flow chart below and answer the questions that follow
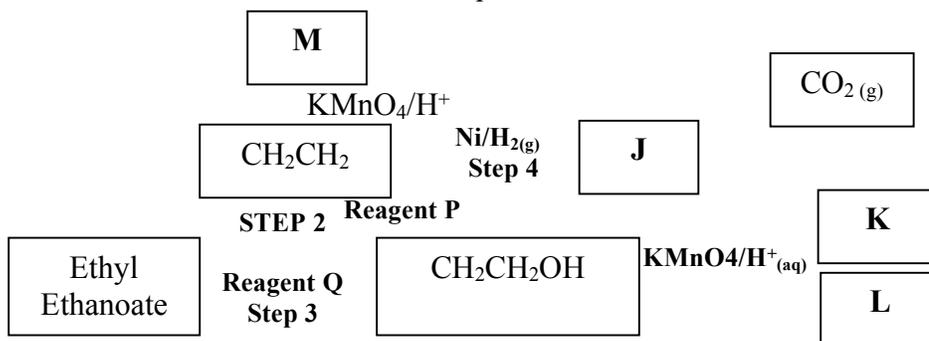
(a) (i) Name the following organic compounds:

      M...

      L...

  (ii) Name the process in step:

          Step 2 ....

          Step 4 ....

(iii) Identify the reagent **P** and **Q**

(iv) Write an equation for the reaction between $CH_3CH_2CH_2OH$ and sodium

17.   a) Give the names of the following compounds:

i) $CH_3CH_2CH_2CH_2OH$ ....

ii) CH_3CH_2COOH ....

iii) $CH_3C - O\text{-} CH_2CH_3$ ....

18.   Study the scheme given below and answer the questions that follow;
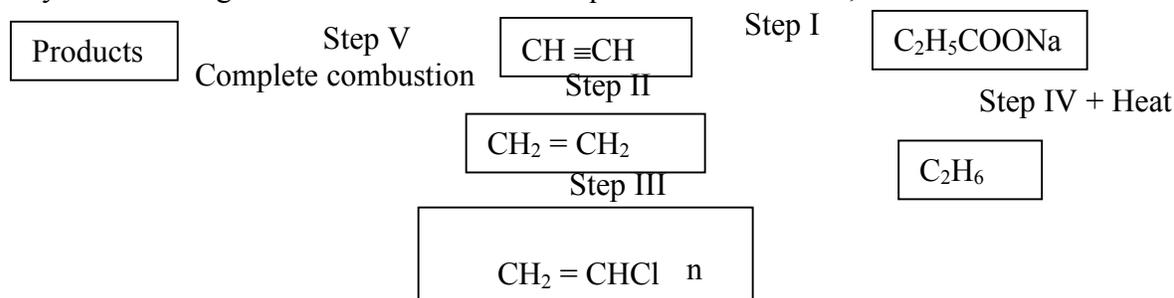
i) Name the reagents used in:

       Step I: ……………………………………………………………………………

       Step II ……………………………………………………………………………

       Step III ……………………………………………………………………………

ii) Write an equation to show products formed for the complete combustion of $CH = CH$

iii) Explain **one** disadvantage of continued use of items made form the compound formed in step III

19.   A hydrated salt has the following composition by mass. Iron 20.2 %, oxygen 23.0%, sulphur 11.5%, water 45.3%

i) Determine the formula of the hydrated salt (Fe=56, S=32, O=16, H=11)

ii) 6.95g of the hydrated salt in **c(i)** above were dissolved in distilled water and the total volume made to 250cm³ of solution. Calculate the concentration of the resulting salt solution in moles per litre. (Given that the molecula mass of the salt is 278)

20. Write an equation to show products formed for the complete combustion of $CH = CH$

iii) Explain **one** disadvantage of continued use of items made form the compound formed in step III

21.   Give the IUPAC name for each of the following organic compounds;
     i) $CH_3 - CH - CH_2 - CH_3$

            OH
     ii)$CH_3 - CH - CH_2 - CH_2 - CH_3$

           C_2H_5
     iii)$CH_3COOCH_2CH_2CH_3$
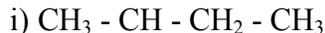
22.   The structure below represents a cleansing agent.
   O

    $R - S - O^-Na^+$

    O
   a) State the type of cleansing agent represented above
   b) State **one** advantage and one disadvantage of using the above cleansing agent.

23.   The structure below shows part of polymer .Use it to answer the questions that follow.
    CH_3 CH_3 CH_3
    | | |
  — CH - CH_2 – CH- CH_2 - CH – CH_2—
   a) Derive the structure of the monomer
   b) Name the type of polymerization represented above
24.   The flow chart below represents a series of reactions starting with ethanoic acid:-
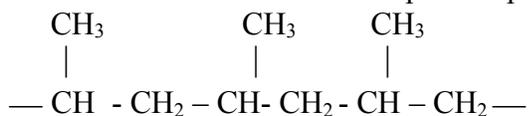
   (a) Identify substances **A** and **B**
   (b) Name the process **I**

25.   a) Write an equation showing how ammonium nitrate may be prepared starting with
     ammonia gas
   (b) Calculate the maximum mass of ammonium nitrate that can be prepared using 5.3kg of
    ammonia (H=1, N=14, O=16)

26.   (a) What is meant by the term, esterification?
   (b) Draw the structural formulae of **two** compounds that may be reacted to form ethylpropanoate

27.   (a) Draw the structure of pentanoic acid
   (b) Draw the structure and give the name of the organic compound formed when ethanol
   reacts with   pentanoic acid in presence of concentrated sulphuric acid

28. The scheme below shows some reactions starting with ethanol. Study it and answer the questions that follow:-

(i) Name and draw the structure of substance **Q**
(ii) Give the names of the reactions that take place in **steps 2** and **4**
(iii) What reagent is necessary for reaction that takes place in step 3

29. Substances **A** and **B** are represented by the formulae **ROH** and **RCOOH** respectively. They belong to two different homologous series of organic compounds. If both A and B react with potassium metal:
(a) Name the common product produced by both
(b) State the observation made when each of the samples **A** and **B** are reacted with sodium hydrogen carbonate
  (i) **A**
  (ii) **B**

30. Below are structures of particles. Use it to answer questions that follow. In each case only electrons in the outermost energy level are shown

key
P = Proton
N = Neutron
X = Electron

U
18P
22N.

V
17P
18N

V
19P
19N
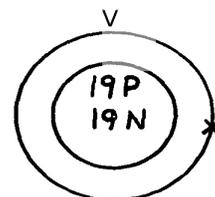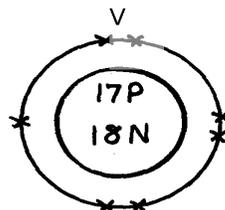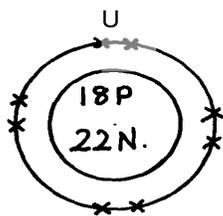
(a) Identify the particle which is an anion

31. Plastics and rubber are extensively used to cover electrical wires.
(a) What term is used to describe plastic and rubbers used in this way?
(b) Explain why plastics and rubbers are used this way

32.   The scheme below represents the manufacture of a cleaning agent **X**

        (a) Draw the structure of **X** and state the type of cleaning agent to which **X** belong
        (b) State **one** disadvantage of using **X** as a cleaning agent
33.   **Y** grams of a radioactive isotope take 120days to decay to 3.5grams. The half-life period
        of the isotope is 20days
        (a) Find the initial mass of the isotope
        (b) Give **one** application of radioactivity in agriculture
34.   The structure below represents a polymer. Study and answer the questions that follow:-

        (i) Name the polymer above...
        (ii) Determine the value of **n** if giant molecule had relative molecular mass of 4956
35. $RCOO^-Na^+$ and $RCH_2OSO_3^-Na^+$ are two types of cleansing agents;
        i) Name the class of cleansing agents to which each belongs
        ii) Which one of these agents in **(i)** above would be more suitable when washing with water
            from the Indian ocean. Explain
        iii) Both sulphur (IV) oxide and chlorine are used bleaching agents. Explain the difference
            in their bleaching properties

36.   The formula given below represents a portion of a polymer

        (a) Give the name of the polymer
        (b) Draw the structure of the monomer used to manufacture the polymer