PRIMARY SIX
SELF STUDY MATERIALS
ENGLISH LANGUAGE
PRIMARY SIX
LESSON 1: Use of Adverbs
Learning Outcomes
By the end of this lesson, you should be able to:

i) identify ways of doing things.

ii) use of adverbs in your daily life activities.

You will need:
• a pen
• a book

Introduction
An adverb is a word that tells more about a verb, an adjective and another adverb. Adverbs tell us how an action is done: when? why? how? and where?

Examples

i) The cyclist is riding slowly.

ii) Children should cross the road carefully.

Activity 1
Use the correct form of the word in the brackets to complete the sentences below. Examples have been given to guide you.

1. Tino cleverly avoided the punishment. (clever)

2. Uganda's population is steadily rising. (steady)

3. St Thomas choir sang the second compulsory song ______________. (beauty)

4. The host welcomed us ______________. (cheer)

5. We ____________________ waited for his return from Ojipaku market. (patience)

6. Italians have seen the ______________ worse coronavirus attacked. (worse)

7. They answered the question_________________. (wise)

8. A machete is _______________ bigger than a knife. (usual)

9. The hungry boy ate the mango ________________. (greed)

10. The hunter ______________ attacked the lion in its den. (brave)

Activity 2
Order of Adverbs
When more than one adverb is used in a sentence, they usually follow in this order: manner (how?), place (where?) and time (when?).

Example
The pedestrian crossed the road carefully (how?) at the zebra crossing (where?) yesterday (when?).

From the sentences below, underline the adverbs of manner, place and time.

1. The traffic officer called the driver loudly at the junction in the morning.

2. Many cyclists ride carelessly at the traffic lights every day.

3. The bus driver spoke politely to the passenger on the bus on Tuesday.

4. My mother nicely made cakes from the kitchen last weekend.

5. It rained heavily in our area last year.

LESSON 2: Informal Letter Writing
Learning Outcomes
By the end of this lesson, you should be able to:

i) express your views on safety on the road.

ii) write a letter about safety on the road.

Introduction
Letter writing is one way of sending a message between or among people. You can write a letter to a friend, parents, relatives and many others.

Activity 1

1. (a) Write a letter to your father appreciating him for his effort to keep everybody well in this period of COVID-19 pandemic. Wish him a longer stay in this life. Use your school address.

(b) The letter below has some words missing. Using the words in the box, complete it by filling in the gaps correctly.

reap advise purpose academic not arua discussions hear dear examinations
1. CASE STUDY
(a) Behavioural characteristics associated with a strong need for achievement Ben... A'LEVEL
KEDRETH ASIIMWE, 
MBARARA HIGH SCHOOL ALLAN AHABWE BUHAMIZO, 
NTARE SCHOOL
THE TEACHERS

SECTION A

1. CASE STUDY
(a) Behavioural characteristics associated with a strong need for achievement Ben... A'LEVEL
KEDRETH ASIIMWE, 
MBARARA HIGH SCHOOL ALLAN AHABWE BUHAMIZO, 
NTARE SCHOOL
THE TEACHERS

SECTION B
SCHOOL BUSINESS CLUB
Note: In the final exams, use the past tense in all questions referring to business clubs. Evidence must be provided except in questions requiring personal opinion.

(c) Business ethics the club maintained towards customers:
- The club members were polite to customers
- Served customers with cheerfulness
- Charged affordable prices
- Respected customers views and suggestions
- Kept customers' promises
- Used accurate weights and measures
- Provided after sales services
- Members were always honest with customers
- Selling high quality products

(d) (i) The objectives of sales promotion of your project were:
- To introduce new products in school
- To attract and retain customers
- To maintain sales
- To outcompete other rivals like the school canteen
- To establish effective coordination between advertising and sales
- To target a particular segment of the market where products are to be sold

NB: No evidence is required

SECTION C

1. CASE STUDY
(a) Behavioural characteristics associated with a strong need for achievement Ben... A'LEVEL
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SECTION B
SCHOOL BUSINESS CLUB
Note: In the final exams, use the past tense in all questions referring to business clubs. Evidence must be provided except in questions requiring personal opinion.

(c) (i) Challenges that were faced by the business:
- Inadequate funds
- Limited market
- Limited space for operation
- Challenge of low entrepreneurial skills
- Interference from school administration
- Inadequate time
- Unethical behaviours from rival businesses around school
- Low technology
- Lack of continuity during holidays
- Being despised by teachers and students

NB: Evidence is required

(ii) How the challenges were managed:
- The club acquired a loan from the school
- Intensifying advertising amongst students to increase the market
- More knowledge on business was acquired to boost the entrepreneurial ability
- Some time of loss was utilised on top of the normal weekend time
- The business acquired some machines to use in place of manual work

SECTION C
FIELD ATTACHMENT/FIELD TRIP
Note: evidence is required for questions on field attachment and field trip except on questions requiring personal opinion.

4. Description of the business visited
Refer to question 2. (a).

(b) Forms of written communication used by the business:
- Letters
- Memos
- Circulars
- Reports
- Notices

(c) Methods used by the business to manage credit sales:
- Fixing the minimum amount/value of credit sales
- Giving a shorter credit period
- Inducing debtors to pay like giving discounts
- Documenting all credit sales
- Reminding debtors to pay
- Using authorised personal to approve credit sales; e.g, accountant
- Asking for collateral security
- Imposing late penalty payment on debtors
- Contracting independent legal companies
- Insuring against bad debtors
- Factoring/selling off the debts
- Providing convenient means of payment; e.g, mobile money.

(d) Insurance policies the business can use to reduce losses that arise out of bad debts:
- Workmen's compensation policy
- Endowment policy
- Business interruption insurance
- Endowment policy

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- Endowment policy
ENTREPRENEURSHIP EDUCATION QUESTIONS (AENT004)

1. You have started a new mineral water bottling company, competing with other business in the same industry. 
   a) Give the vision and mission statement of your company.
   b) Design an advert for promoting your products.
   c) Develop a programme for launching your products.
   d) Write a letter to the District Environment Officer requesting for advice on how to reduce the business effects to the environment.
   e) 2. You own a factory producing plastics and customers are complaining about the quality of your products.
   a) Write a memo to the production manager about the complaints raised by customers.
   b) Prepare guidelines to be followed by the workers for improving the quality of the products.
   c) Design a market survey guide for your new products.
   d) Design a Stock card for your improved products.

3. You want to revive a meat packing factory in Mbarara town by inviting shareholders to discuss about restocking the farm, installing new machines and recruiting employees.
   a) Write a notice inviting shareholders for the meeting to discuss the revival of the project.
   b) Develop a programme for recruiting employees.
   c) Design a market survey guide for your new products.
   d) Prepare an organisational plan for the factory.

4. The following information relates to ABFINE ENTERPRISES LTD being projectors for the month of July, August SEPT and OCTOBER 2019.
   i) On July lst 2019 cash balances was shs 26,000,000
   ii) The Sales manager expects to sell goods on credit worth shs 40,000,000 monthly.
   iii) Payment from credit customers is expected as follows, 60% of credit in the month of sale and the balance in the month following sale.
   iv) The monthly cash sales are expected to be shs 60,000,000. A Commission of 10% is paid to the sales men each time cash is received.
   v) Monthly cash purchases worth 40,000,000 are expected to be made.
   vi) A delivery van is to be bought in the month of August 2019 at a cost of shs 35,000,000.
   v) Monthly wage bill is estimated to be shs 12,000,000 but an increase of 10% is expected in the month of October 2019.
   vii) A loan interest of 5% per month is expected in the month of October 2019.

5. MARYHILL HIGH SCHOOL STAFF CANTEEN INCOME STATEMENT FOR THE PERIOD ENDING 31ST DECEMBER 2019

<table>
<thead>
<tr>
<th>Liabilities</th>
<th>shs</th>
<th>Assets</th>
<th>shs</th>
<th>shs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital</td>
<td>89,000,000</td>
<td>Fixed Assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add: Net Profit</td>
<td>35,000,000</td>
<td>Building</td>
<td>82,000,000</td>
<td></td>
</tr>
<tr>
<td>Less: Drawings</td>
<td>10,000,000</td>
<td>Furniture</td>
<td>50,000,000</td>
<td></td>
</tr>
<tr>
<td>Net worth</td>
<td>114,000,000</td>
<td>Total Fixed Assets</td>
<td>132,000,000</td>
<td></td>
</tr>
<tr>
<td>Long Term Liabilities</td>
<td></td>
<td>Stock</td>
<td>47,000,000</td>
<td></td>
</tr>
<tr>
<td>3 Year Loan</td>
<td>72,000,000</td>
<td>Debtors</td>
<td>38,000,000</td>
<td></td>
</tr>
<tr>
<td>Current Liabilities</td>
<td></td>
<td>Bank</td>
<td>25,000,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cash</td>
<td>18,000,000</td>
<td></td>
</tr>
<tr>
<td>Creditors</td>
<td>40,000,000</td>
<td>Total Current Assets</td>
<td>128,000,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>260,000,000</td>
<td></td>
<td></td>
<td>260,000,000</td>
</tr>
</tbody>
</table>

MARYHILL HIGH SCHOOL STAFF CANTEEN BALANCE SHEET AS AT 31ST DECEMBER 2019

Questions:
Calculate the following ratios using the balance

a) i) Gross profit margin
   ii) Net profit to sales
   iii) Net profit to owners equity
   iv) Acid test ratio
   v) Stock turnover
   vi) Fixed Assets turnover
   vii) Gearing ratio

b) Interpret the following ratios above
   i) Gearing ratio
   ii) Net profit to sales

6. NSIKYE ENTERPRISE LTD is a VAT registered business dealing in the Production of chicken marsh and employs a number of workers who include: Tushemereirwe, Abaine, Okumu and Turyahikayo who are paid monthly salary of shs 200,000, shs 300,000, shs 400,000 and shs 800,000 respectively.

Given the Income (PAYE) tax rate as follows:

<table>
<thead>
<tr>
<th>Chargeable Income (monthly income)</th>
<th>Tax Liability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – shs 235,000</td>
<td>NIL</td>
</tr>
<tr>
<td>Exceeding shs 235,000 but Not exceeding shs 335,000.</td>
<td>10% of the amount by which chargeable Income exceeds shs 235,000.</td>
</tr>
<tr>
<td>Exceeding shs 335,000 but Not exceeding shs 410,000.</td>
<td>Shs 10,000 plus 20% of the amount by which chargeable income exceeds shs 335,000.</td>
</tr>
<tr>
<td>Shs 410,000 and above</td>
<td>Shs 25000 plus 30% of the amount by which chargeable income exceeds shs 410,000.</td>
</tr>
</tbody>
</table>

Compute the Income tax payable by

i) Tushemereirwe
ii) Abaine
iii) Turyahikayo
iv) Okumu
1. For a uniform function in the range $a < x < b$

- The function, $f(x) = \frac{1}{b-a}$
- Therefore, $f(x) = \begin{cases} \frac{1}{b-a}, & a < x < b \\ 0, & \text{elsewhere} \end{cases}$

For the lower quartile

\[
\frac{1}{b-a} \int_a^b dx = \frac{1}{4} \left[ x \right]_a^b = \frac{b-a}{4} = \frac{9-a}{4} \tag{ii} \]

(ii) $(i)$

\[
\frac{9-a}{b-a} = \frac{3}{5-a} \quad \frac{3}{4} - \frac{3}{5-a} = \frac{9-a}{3} = 3 \]

\[
9-a = 15 - 3a \\
2a = 6 \\
a = 3
\]

From

\[
\frac{5-a}{b-a} = \frac{1}{4} \\
\frac{5-3}{b-a} = \frac{1}{4} \\
8 = b-3 = 11
\]

\[.: a = 3, b = 11\]

\[
E(X) = \int_a^b x \cdot \frac{1}{b-a} dx = \frac{x^2}{2(b-a)} \bigg|_a^b = \frac{b^2-a^2}{2(b-a)} \]

\[
= \frac{(b+a)(b-a)}{2(b-a)} = \frac{b+a}{2} \cdot 11 + \frac{1}{2} = 7
\]

\[.: E(X) = 7\]

2. \[
\begin{align*}
\Delta x &= 100 < 0.5 \\
\Delta x &= 100 = 0.5 \\
\Delta x &= 100 = 0.05 \\
\Delta x &= 100 = 0.001
\end{align*}
\]

\[
P = \frac{xy}{z} = \frac{xy}{2z} = \frac{xy}{z}
\]

Let

\[
\Delta P = x(y \Delta x + x \Delta y) - xy \Delta z = \frac{y \Lambda x}{z} + \frac{x \Lambda y}{z} - \frac{xy \Delta z}{z}
\]

Maximum possible absolute error

\[
|\Delta P| = \left| \frac{y \Lambda x}{z} + \frac{x \Lambda y}{z} - \frac{xy \Delta z}{z} \right|
\]

\[
|\Delta P| \leq \left| \frac{y \Lambda x}{z} \right| + \left| \frac{x \Lambda y}{z} \right| - \left| \frac{xy \Delta z}{z} \right|
\]

Relative error

\[
\frac{\Delta P}{P} = \frac{|\Delta P|}{P} \leq \frac{1}{z} \left| \frac{y \Lambda x}{z} \right| + \frac{1}{z} \left| \frac{x \Lambda y}{z} \right| - \left| \frac{xy \Delta z}{z} \right|
\]

\[
\leq \frac{1}{z} \left| \frac{y \Lambda x}{z} \right| + \frac{1}{z} \left| \frac{x \Lambda y}{z} \right| - \left| \frac{xy \Delta z}{z} \right| \leq 0.005 + 0.0045 + 0.0002 \leq 0.0097
\]

Therefore the maximum possible relative error in $\frac{xy}{z}$ is 0.0097

3. \[
\text{Position of the median value is } \frac{N}{2} = \frac{50}{2} = 25\text{th value}
\]

The median is 160 cm (the upper class boundary of the class whose cumulative frequency is 25)

(ii) Range of the middle 60% of the candidates height

\[
\text{Middle 60% range = 80th and 20th percentile range}
\]

\[
148 < x < 152
\]

\[
152 < x < 156
\]

\[
156 < x < 160
\]

\[
160 < x < 164
\]

\[
164 < x < 168
\]

\[
168 < x < 172
\]

(i) \[
\text{Median } = \frac{\left( \frac{N}{2} - cf \right)}{f_c} \times C
\]

\[
E(X) = \frac{\int_a^b x \cdot \frac{1}{b-a} dx}{\int_a^b \frac{1}{b-a} dx} = \frac{b^2-a^2}{2(b-a)} = \frac{b+a}{2} \cdot 11 + \frac{1}{2} = 7
\]

\[.: E(X) = 7\]

4. \[
\text{The position of the 80th percentile } P_{80} = \frac{80}{100} \times 154.5 = 123.6 \text{ cm}
\]

\[
\text{The position of the 20th percentile } P_{20} = \frac{20}{100} \times 154.5 = 30.9 \text{ cm}
\]

\[.: P_{80} = 123.6 \text{ cm, } P_{20} = 30.9 \text{ cm}\]

5. \[
\text{Mass, } m = 12\text{ kg}
\]

\[
\text{Work done (W.D) } = \int_0^F dP = \int_0^{12} dP = \int_0^{12} P \cdot \frac{dt}{P} = \int_0^{12} \frac{dt}{12} = \left[ \frac{t}{12} \right]_0^{12} = \frac{12}{12} = 1\text{ joules}
\]

\[.: E(X) = 13860\text{ joules}\]

Therefore work done is 13860 joules

6. \[
\text{The position of the 80th percentile } P_{80} = \frac{80}{100} \times N = \frac{80}{100} \times 50 = 40\text{th value}
\]

\[
\text{The position of the 20th percentile } P_{20} = \frac{20}{100} \times N = \frac{20}{100} \times 50 = 10\text{th value}
\]

\[
\text{The position of the 80th percentile } P_{80} = \frac{80}{100} \times N = \frac{80}{100} \times 50 = 40\text{th value}
\]

\[
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\[.: E(X) = 13860\text{ joules}\]
SECTION B

9. Probability of success, \( p = \frac{2}{20} = 0.1 \)

Probability of failure, \( q = 1 - 0.1 = 0.9 \)

Sample size \( n = 500 \)

\[ P(47 < x < 62) = P(48 \leq x \leq 61) \]

mean, \( \mu = np = 500 \times 0.1 = 50 \)

Variance, \( \sigma^2 = npq = 500 \times 0.1 \times 0.9 = 45 \)

Standard deviation \( \delta = \sqrt{45} \)

\[ = p(48 \leq x \leq 61) = p(48 \leq z \leq 61) \]

\[ = p(0.373 < z < 1.714) \]

\[ = p(0.373 < z < 1.714) = p(0 < z < 0.373) + p(0 < z < 1.714) \]

\[ = 0.1454 + 0.4567 = 0.6021 \]

The probability that between 47 and 62 patients are found with sickle cell is 0.6021

b. \( n = 120, \ \bar{x} = 16.5, \ \delta^2 = 18, \ \bar{\delta} = \sqrt{18} \)

\( \alpha = 0.04, \ \frac{\alpha}{2} = 0.02 \)

\( 0.48, 0.48 \)

\( -\frac{\alpha}{2}, \ \frac{\alpha}{2} \)

11. a) \[ h = \frac{1}{2}\arccos \left( \frac{\bar{x} - x}{\bar{x} + x} \right) \]

\[ \int_{\frac{\pi}{12}}^{\frac{\pi}{4}} \frac{1}{\sqrt{2 - \cos x}} \, dx = 1.369(3dp) \]

Exact value of \[ \int_{\frac{\pi}{12}}^{\frac{\pi}{4}} \frac{1}{\sqrt{2 - \cos x}} \, dx \] (obtain this value by direct integration of the function given using methods of integration learnt in paper 1)

\[ \int_{\frac{\pi}{12}}^{\frac{\pi}{4}} \frac{1}{\sqrt{2 - \cos x}} \, dx = 1.37017 \] (We have quoted the value in the interest of space)

The exact value = 1.370 (3dp)

Percentage error = relative error \times 100%

Exact value - approximate value \times 100%

\[ \frac{1.370 - 1.369}{1.369} \times 100% = 0.729927% \]

Therefore the percentage error in the estimation is 0.073% (3dp)

12(i) Let \( a \)

Email be denoted by E

Letter be denoted by L

Telephone be denoted by T

Receiving be denoted by R

\[ P(R) = P(R/E) + P(R/L) + P(R/T) \]

\[ = P(R/E) \times P(E) + P(R/L) \times P(L) + P(R/T) \times P(T) \]

\[ = 0.6, 0.8, 0.2, 0.1, 0.3 \]

\[ = 0.6 \times 0.4 + 0.8 \times 0.1 + 0.1 \times 0.5 = 0.37 \]
**Pass A’Level**

**CHEMISTRY ANSWERS (ACHEMS005)**

**THE TEACHERS**

**MOSHE MOGOJO, ZEETA HIGH SCHOOL**

**ANDREW HANNINGTON (SREKHE), BISHOP’S SENIOR SCHOOL - NUNO**

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**Qn.1** (a) 50g of water dissolved 30g of Y

1000g of water dissolves \( \frac{1000 \times 30}{50} = 600g \)

6.2°C

Freezing point depression caused by 600g of Y

1.86°C

Freezing point depression caused by \( \frac{1.86 \times 600}{6.2} = 180g \)

(b) RFM of \((CH_2O)n=180\)

\(12 \times n + 1 \times 2n + 16 \times n = 180\)

\(30n = 180\)

\(n = 6\)

Molecular formula of Y is \(C_6H_{12}O_6\)

**Qn.2** (a) Silicon in silicon (IV) oxide is unable to form double bonds with oxygen so it satisfies its valence by forming single bonds with four oxygen atoms. This leads to a giant molecular structure with a network of covalent bonds in which the heat energy at room temperature is not enough to break the bonds to cause melting hence remaining in solid state. Carbon in carbon dioxide is able to form double bonds with oxygen so it satisfies its valence by forming double bonds with only two oxygen atoms. This leads simple discrete molecules held with weak Vanderwaals forces

**Qn.3** Ethene to \(CH_3CONH_2\)

\[H_2C=CH_2 \xrightarrow{H_2O/H^+ \text{ warm}} CH_3CH_2OH \xrightarrow{K_2CO_3/H^+ \text{ heat}} CH_3CO_2H \xrightarrow{\text{solid lime heat}} CH_4 \xrightarrow{Cl_2 \text{ Conc. NH}_3 \text{ U.V. light}} CH_3Cl + \text{HCl}\]

in which the heat energy at room temperature is enough to break them to cause evaporation hence remaining in gaseous state.

b) Ammonium nitrate is readily soluble in water because the ammonium ion is a conjugate acid of ammonia making it a weaker base than water. So water molecule abstracts a proton from it thereby undergoing hydrolysis. The standard enthalpy of solution has a positive value because the lattice energy for ammonium nitrate is greater than its hydration energy.

**Qn.4**

(a) \(SiO_2 + 2OH^-\text{(aq)} \rightarrow SiO_2^{2-}\text{(aq)} + H_2O(\text{l})\)

(b) \(BeO(s) + 2OH^-\text{(aq)} \rightarrow BeO_2^{2-}\text{(aq)} + H_2O(\text{l})\)

(c) \(3Cl_2(g) + 6KOH\text{(aq)} \rightarrow 5KCl\text{(aq)} + KClO_3\text{(aq)} + 3H_2O(\text{l})\)

**Qn.5** (a) Graham’s law states that the rate of diffusion of a gas is inversely proportional to the square root of its density at constant temperature and pressure.

(b) Let the rate of diffusion of \(CO_2\) be \(R_{CO_2}\)

Then the rate of diffusion of \(CO_2\) be \(R_{CO_2}\)

\[
\frac{R_{CO_2}}{R_{CO_2}} = \sqrt{\frac{M_{CO_2}}{M}}
\]

\[
\frac{112}{120} = \sqrt{\frac{M_{CO_2}}{M}}
\]

\[
\frac{112}{120} = \sqrt{\frac{44}{M}}
\]

\[
112^2 = 44 \times M
\]

\[
M = \frac{44 \times 112^2}{120^2} = 38.3
\]

**Qn.6**

(a) \(Sn(s) + 2HCl(g) \rightarrow SnCl_2(s) + H_2(g)\)

Condition: dry hydrogen chloride gas and heated tin

(b) \(Sn(s) + 2Cl_2(g) \rightarrow SnCl_4\)

Condition: heated tin and dry chlorine

**Qn.7**

(a) \((CH_3)CBr \rightarrow 2\text{-bromomethylpropane}\)

(b) \((CH_3)CBr \rightarrow (CH_3)C-CH_2 + NaBr\)

(c) Mechanism:

\[(CH_3)_2C \xrightarrow{Br^-} (CH_3)C+=Br^- \xrightarrow{H^-} (CH_3)C+=H^+ \]

**Qn.8**

(a) The radius of an ion is smaller than that of the corresponding atom because after removal/loss of electrons, the number of protons becomes greater than the remaining electrons. So the unbalanced out positive charge increases the effective nuclear charge such that the electrons of the ion are drawn closer to the nucleus hence contraction in the size of the ion.

b) Along the series lithium to caesium, both nuclear charge and screening effect increase. However screening effect increases faster than nuclear charge since as protons are added to the nucleus the number of electrons increases on increasing number of principal energy levels. Consequently the effective nuclear charge progressively decreases hence expansion in the size of the atoms.

(c) Lithium among the alkali metals has the highest hydration energy.

**Qn.9**

(a) Propan-1-ol and propan-2-ol Reagent: concentrated hydrochloric acid and anhydrous zinc chloride.

With propan-1-ol: no observable change at room temperature

With propan-2-ol: a cloudy solution is formed in 5-10 minutes

*b) But-1-yn and but-2-yn* Reagent: ammoniacal silver nitrate solution.

WithBut-1-yn : a white precipitate is formed.

With but-2-yn: no observable change

**Qn.10**

(a) (i) Osmotic pressure is the pressure which must be applied on the solution end to prevent the passage of solvent molecules into the solution through a semipermeable membrane.

(ii) Conditions under which laws of osmotic pressure are not obeyed.

When the solution is not dilute.

When association or dissociation occurs.

When there is a chemical reaction between solute and solvent.

(b) Mass of polymer used = 1.24g

Volume of solution used = 100cm³

\[
\frac{100 \times 10^3}{1000} = 0.1dm^3
\]

\[
x=\frac{mRT}{M} = \frac{1.24 \times 0.0821 \times (25+273)}{1.24 \times 0.0821 \times 298}
\]

\[
M=1.3 \times 10^3 \times 0.1
\]

RMM of the polymer is = 9786.2

**Qn.11**

(a) **Benzene**

Chlorine reacts with benzene under sunlight to form 1, 2, 3, 4, 5, 6-hexachlorocyclohexane

(b) **Sodium hydroxide**

Chlorine reacts with cold dilute sodium hydroxide forming sodium chloride, sodium carbonate (I) and water.

**Qn.12**

a)

i) Let the rate of diffusion of \(Y\) be \(X\)

Then the rate of \(Y\)

\[
R_y = \sqrt{\frac{M_{O}}{M_y}}
\]

\[
M_y = 54.08g
\]

\[
x = \frac{\sqrt{32}}{\frac{1.3x}{M_y}}
\]

\[
1 = \frac{32}{M_y}
\]

\[
n = \frac{54.08}{14n} = 5
\]

\[
1.13 \times 10^3
\]

Molecular formula of \(Y\) is \(C_6H_{12}O_6\)

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Turn to next page
**Qn.13**

(a) (i) CH₄ (g) + 4Cl₂(aq) → CCl₄(l) + 4HCl(l)

(b) PbO(s) + 2HCl(aq) → PbCl₂(s) + H₂O(l)

(b) Carbon tetrachloride does not decompose on heating while lead (IV) chloride decomposes to lead (II) chloride and chlorine gas.

PbCl₂(s) → PbCl₂(s) + Cl₂(g)

(c) Lead (IV) ion in Lead (IV) chloride has got a bigger charge hence lower charge density. This gives it lower polarizing power than lead (II) ions in lead (II) chloride, so it does not distort the electron cloud of the chloride ion resulting in complete transfer of electrons thus ionic character of the (lead) II chloride.

In Lead (II) chloride has got a smaller charge hence lower charge density. This gives it higher polarizing power than lead (IV) ions in lead (IV) chloride so it does not distort the electron cloud of the chloride ion resulting in electron sharing instead of complete transfer of electrons thus covalent character of lead (IV) chloride. Lead (II) ion

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**Qn.14**

CH₃C≡CH + NaLiNH → CH₃C≡CNa + Br⁻

CH₃C≡CNa + Br⁻ → CH₃C≡CBr + Na⁺

CH₃C≡CNa + Br⁻ → CH₃C≡CNa + Br⁻

**Mechanism**

CH₃C≡CNa + Br⁻ → CH₃C≡CBr + Na⁺

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**Qn.15**

(a) A soap is the sodium or potassium salt of a fatty acid while a detergent is a sodium or potassium salt of alkylated benzene sulphonate.

H₂C – O – CO – R

H⁺ – O – CO – R + 3NaOH → 3RCOONa + NaOH

H₂C – O – CO – R

(c) Cleansing action of soap

Soap acts by lowering the surface tension between water and dirt. This is so because soap contains a hydrophobic part which dissolves in the dirt and a hydrophilic part which is attracted to the water. On agitation, the dirt dislodges off the fabric into the water.

(d) i) It does not form scum with hard water.

(ii) It is non-biodegradable

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**Qn.17**

(a) CH₂OH

(b) CH₂OH

(c) HC = CH + NaLiNH → CH₃C≡CNa + Cl²⁻ → CH₃C≡CH