PRIMARY SIX
SELF STUDY MATERIALS

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 beautifully. (beauty)

4. The host welcomed us cheerfully. (cheer)

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

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

7. They answered the question wisely. (wise)

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

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

10. The hunter bravely 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.
SECTION A (20 MARKS)

1(a)(i) Paid employment is where an individual works for another person/organisation and is paid a wage or salary on a regular specified basis for a specific assignment given while yet/but/whereas self-employment is where someone starts his own income-generating project in which he/she employs himself to earn a living.

(ii) Reasons self employment may not easily be attained in Uganda

- Limited entrepreneurial skills
- Low income levels
- Unfavourable economic conditions; e.g., inflation
- Unfavourable government policies; e.g., high taxes
- Undeveloped/poor infrastructure
- Financial mismanagement/embezzlement/ corruption
- Poor business planning
- Limited capital/finance
- High operational costs
- Limited supply of raw material
- Inadequate supply of utilities; e.g., power
- Political instability
- High competition

(b) Hindrances to promoting small and medium enterprises in Uganda

- Unsuitable location of the business
- Limited market for business products
- Poor management of the business e.g poor records
- Poor handling of customers; e.g., failure to handle their complaints
- Limited market research; e.g., information relating to customer needs
- Overexpansion which limits management
- Inadequate capital/finance to start/expand business
- Choosing a business that is not profitable/ poor choice of business
- Low quality products offered for sale
- Inadequate credit facilities/loans
- Inadequate support services/utilities; e.g., water
- Limited skilled manpower
- Unreliable source of raw materials
- Unfavourable government policies; e.g., high taxes
- High competition
- Limited skills of the owner
- Political instabilities; e.g., wars
- Industrial unrest/workers’ strikes
- Natural calamities
- Using poor technology
- Overdependence on family labour

(c) (i) Tools used in efficient time management

- Choosing the quickest, safest and most convenient time
- Making quick decisions
- Selecting priorities
- Delegating duties
- Avoiding unnecessary interruptions
- Conducting meetings properly

(ii) Methods of time wastage in business

- Talking to people about personal matters
- Holding unnecessarily long meetings
- Allowing too many interruptions at work
- Being disorganised
- Failing to make decisions in time
- Failing to delegate work
- Being late/absent from duty
- Unnecessary long procedures/bureaucracy
- Lack of time warning tools
- Lack of administrative hierarchy

SECTION B (80 MARKS)

2(a) Justifying the need for adopting changes in business

- Increases efficiency/output/productivity
- To respond to customer needs
- Facilitating growth opportunities
- Encouraging innovation
- To help in challenging the status quo; i.e., change result in new ways of doing things
- To foster team work due to continued consultations
- To determine the direction of the economy
- To cope with competition

(b) Effects of business struggle for customers

- Positive effects
  - cope with change in company strategy
  - Coping with change in company strategy

- Negative
  - Creates unemployment
  - Lowers business profits
  - Misleads customers
  - Lowers self-esteem of the losing entrepreneur
  - Leads to production of fake goods

4(a). Components of entrepreneurial environment that influence business intentions

- Economic factors; i.e., conducive economic factors encourage entrepreneurial intentions from unfavourable economic factors.
- Demographic factors; e.g., high population encourages entrepreneurial intentions unlike low population.
- Political factors; e.g., political stability encourages entrepreneurial intentions unlike political instability.
- Socio-cultural factors; conducive socio-cultural factors encourage entrepreneurial intentions unlike unfavourable global factors.
- Global factors; conducive global factors encourage entrepreneurial intentions unlike unfavourable technology

(b) Economic factors that discourage entrepreneurial intentions

- Unfavourable economic policy; e.g., closed market economy
- Hard/harsh administrative issues; e.g., hard rules and regulations
- Unfavourable infrastructure; e.g., poor roads
- Poor financial system; e.g., poor banking systems
- Unnecessary/excessive legal requirements; e.g., unclear laws
- Resource scarcity; e.g., lack of raw materials

5(a) Community threats that affect development in Uganda

- Corruption which involves redirecting resources for private benefit
- Exploitation; i.e., taking unfair advantage of a person
- Diseases; e.g., cancer
- Violence; e.g., domestic violence
- Poverty; e.g., due to unlimited incomes
- Discrimination; i.e., unfair treatment of one person/group due to judgements about their origin, religion, gender, etc.
- Dependency; i.e., relying on someone/ something for help or support
- Dishonesty; i.e., lies or misleading actions
- Environmental degradation; i.e., all human activities that negatively affect the environment and reduce its productivity; e.g., pollution

(b) Possible solutions to community threats in Uganda

- Strengthening/implementing government laws of punishing the corrupt officials
- Increasing education/awareness of masses
- Increasing opportunities for the disadvantaged
- Improving hygiene/cleanliness
- Empowering the community; e.g., through education
- Encouraging the establishment of income-generating activities
- Improving the quality of education system
- Involving community members in making decisions
- Controlling environmental degradation through aforesaid

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**ENTREPRENEURSHIP EDUCATION QUESTIONS (AENT003)**

### SECTION A: CASE STUDY

**1. Read the case study below and answer the questions that follow.**

Ben, a graduate of Kyambogo University, completed his training in Building and Construction Engineering in 2014. From the time he joined the university, the highly motivated and action-oriented Ben was determined to start his own business of consultancy in building and construction as well as operating a hardware shop. He formulated concrete and moderate goals based on his abilities and efforts.

Before generating the business idea, Ben convinced himself of his strong internal involvement with the goals and personal responsibility for the outcome. He was satisfied with his skills, interest and the amount of personal capital he could raise. He analysed the business environment to create opportunities, read related literature about the industry, sought advice from entrepreneurs in similar business and learnt from feedback to see if right methods were used and right goals were set.

Ben has established a business in Mbarara town. The ground level of the building houses the hardware shop while the upper level is for the consultancy office. The business is run under the name Modern Building and Construction Centre. To protect the business against risks, Ben insured his business with an insurance company.

He ensures that there is high efficiency in the business, he delegates duties, selects priorities and motivates staff. During his free time, he reads useful materials, he uses computers to reduce paper work and keeps diaries for noting down activities to be performed. He has instructed his sales persons and representatives to strictly sell on cash basis to retailers and wholesalers who benefit from a 10% discount.

**Questions**

(a) What behavioural characteristics associated with a strong need for achievement does Ben possess?
(b) Identify the factors that affected Ben’s choice of business idea.
(c) Describe the basic steps Ben could have followed when taking out the insurance policy.
(d) How does Ben ensure better time management in business?
(e) (i) What benefits are enjoyed by Modern Building and Construction Centre for selling goods on a cash basis?
(ii) What challenges may be faced by the business if it sells goods on credit basis?

### SECTION B: SCHOOL BUSINESS CLUB

2. With reference to the school business project operated by your school business club:

(a) Give the general description of the business project.
(b) How did the business maintain the safety of its assets?
(c) What business ethics did you observe towards customers?
(d) (i) What were the objectives of sales promotion of your project?
(ii) Give the benefits of sales promotion to the business.

### SECTION C: FIELD ATTACHMENT/TRIP

4. For any business enterprise you were attached to:

(a) Describe the business you were attached to.
(b) Outline the forms of written communication used by the business.
(c) Explain the methods used by the business to manage credit sales.
(d) Suggest the insurance policies the business can undertake to minimise the likely risks.
(e) What measures are used by the business to ensure discipline of employees?

5. For any field trip you made as individual or as a group:

(a) Give the general description of the business.
(b) Outline four factors which favoured its location.
(c) Using the SWOT analysis identify the strengths of the business.
(d) (i) Explain the marketing mix strategies used in the business.
(ii) What challenges are faced in marketing business products?

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**MATHS PAPER 2 QUESTIONS (AMATH005)**

### SECTION A (40 MARKS)

1. The continuous random distribution X is uniformly distributed in the interval $a < x < b$. The lower quartile is 5 and the upper quartile is 9. Find the (i) value of a and b (ii) $E(X)$

2. The numbers $a$, $b$, $c$ are rounded off with corresponding percentage errors of 0.5, 0.45 and 0.02, calculate the maximum possible relative error made in $a + b - c$.

3. The heights (cm) of senior six candidates in a certain school were recorded as in the table below.

<table>
<thead>
<tr>
<th>Height (cm)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>148 - 152</td>
<td>5</td>
</tr>
<tr>
<td>152 - 156</td>
<td>8</td>
</tr>
<tr>
<td>156 - 160</td>
<td>12</td>
</tr>
<tr>
<td>160 - 164</td>
<td>15</td>
</tr>
<tr>
<td>164 - 168</td>
<td>6</td>
</tr>
<tr>
<td>168 - 172</td>
<td>4</td>
</tr>
</tbody>
</table>

Calculate the: (i) median height (ii) range of the middle 60% of the candidates heights.

4. Forces $(i + j)$, $(4i - j)$ and $(3i - 2j)$ N act at points with position vectors $(2i + 2j)$, $(4i + 4j)$ and $(4i - 2j)$ m respectively. Show that the forces reduce to a couple

5. A body of mass 12 kg moves along a curve under the action of a resultant force $F$ N. At time $t$ seconds the position vector $r$ of the body is $r = 4t^2 + r^3 + \frac{1}{2}$. $\mathbf{k}$

(a) Find an expression for $F$ in terms of $t$.
(b) Find the work done by $F$ between $t = 1$ and $t = 4$.

6. A discrete random variable $Y$ has the probability distribution function given by

<table>
<thead>
<tr>
<th>$x$</th>
<th>$P(X=x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0.1</td>
</tr>
<tr>
<td>6</td>
<td>0.4</td>
</tr>
<tr>
<td>7</td>
<td>0.1</td>
</tr>
<tr>
<td>8</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Find the: (i) value of $b$ (ii) $E(5X - 7)$

7. A lorry covers a distances of 25.6 m and 32 m in the fourth and eighth seconds of its motion respectively. Determine the acceleration of the lorry. (5 Marks)

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**ANSWERS (AENT002)**

6(a) Beneficiaries of accounting information that is prepared within a business

- Owners and the management of the business for purposes of decision making
- Employees of the business; e.g., to find out whether the organisation shall meet their salary payments
- Creditors; to determine the creditworthiness of the business
- Government; to assess taxes
- Donors; to decide whether to give assistance to the business
- Investors; to know the financial position of business before purchasing shares.
- Competitors that are in the same business or related business; to develop counter competitive strategies
- Researchers/students need information for study purposes.
- Shareholders; to calculate the amount of dividends.
- Customers for consumer protection and requesting for social responsibility.

(b) Significance of systematic financial recording of all business transactions

- Helps government to assess taxes
- Helps financial institutions to make decisions in giving loans
- Helps a business to calculate financial position
- Helps investors to decide whether to invest in the business
- Acts as a tool of control; i.e., it allows the business to keep accurate data concerning its resources
- Helps a business to plan for expansion; e.g., on sales, purchaser, etc.
- Acts as future reference; e.g., reminding the entrepreneur when the transaction took place.
- Showing debtors and creditors of the business for easy follow-up
- Comparison of different business to determine which business is better
- Measures the performance of the business manager; i.e., good management is reflected in the profit made.
- Shows the most profitable products or departments and loss-causing products

7(a) Circumstance under which communication may be effective

- When the message is clear
- When the message is correct
- If the message is complete; i.e., contains all factors
- In case the sender is precise; i.e., specific
- If the sender is courteous; i.e., avoids hurting others
- When the receiver is considerable; i.e., uses positive words
- When there is proper timing
- When the environment is good

(b) Factors considered when selecting the channel of communication

- Language to be used in the message
- The nature of the message to be communicated
- Speed and urgency of the message
- The coverage of the medium
- The cost of communication channel
- The social and education status of the sender and receiver
- Availability of communication medium
- Secrecy and confidentiality of the message
- Age group of the receiver
- Level of feedback required
- Message performance; e.g., need for reference
- Government policy on the medium
14. (a) Show that the equation \( x^2 - 5x + 2 = 0 \) has a root in the interval \( x = 4 \) and \( x = 5 \). Hence use linear interpolation to find a better approximation to the root of the equation.

(b) Use the approximation above, in each of the formulae below twice.

(i) \( x_{n+1} = \frac{x_n^2 + 2}{x_n} \)

(ii) \( x_{n+1} = \left( \frac{5 - \frac{2}{x_n}}{2} \right) \)

(c) State a more suitable formula for approximating the root of the equation \( x^2 - 5x + 2 = 0 \). Hence find the root of the equation approximate to 3 decimal places. (12 marks)

15. A continuous random variable \( X \) has a probability distribution function given by

\[
f(x) = \begin{cases} 
\frac{2}{13} (x + 1) & 0 < x < a \\
\frac{2}{13} (5 - x) & a < x < b \\
0 & \text{elsewhere}
\end{cases}
\]

(a) Determine the values of \( a \) and \( b \). (6 marks)

(b) Find \( F(x) \) and sketch it. (6 marks)

(c) Calculate the relative molecular mass of \( W \). (Kf=1.86°C per 1000g of water).

16. (a) A body of mass 5 kg slides a distance of 8 m down a rough plane inclined at an angle of \( \sin^{-1} \frac{3}{5} \) to the horizontal. If the coefficient of friction is 0.4, find the velocity attained by the body. (6 marks)

(b) A particle of mass 50 kg is suspended by two light inelastic strings of lengths 9 m and 12 m attached to two points distant 15 m apart. Calculate the tensions in the strings. (6 marks)

(a) In every case, the radius of an ion is smaller than that of the corresponding atom. Explain.

(b) The osmotic pressure of a solution containing 1.24 percent of a polymer is 3.1x10^(-5) atm at 25°C. Determine the relative molecular mass of the polymer.

11. Describe the reaction(s) between chlorine and:

(a) Benzene

(b) Sodium hydroxide

12. Oxygen diffuses through a porous plug in 1.3times than an alkylene \( Y \)

(a) Calculate the formula mass of \( Y \).

(b) Describe the reaction(s) between chlorine and:

(i) Identify \( Y \).
Qn1. (a) Mn; 1S^22S^22P^63S^23P^64S^23d^5

(b) Manganese is a transition element because it has a partially filled d-sub energy level in at least one of its ions or oxidation states.

c) Hot manganese reacts with steam forming trimanganese tetroxide and hydrogen gas.

3Mn(s) + 4H_2O(g) \rightarrow Mn_3O_4(s) + 4H_2(g)

Manganese is oxidized by hot concentrated sulphuric acid to form Manganese (II) sulphate and hydrogen gas.

Mn_3O_4(s) + 4H_2SO_4(l) \rightarrow 3MnSO_4(aq) + 4H_2O(l) + O_2(g)

b) Manganese reacts rapidly with dilute sulphuric acid to form Manganese (II) sulphate and hydrogen gas.

Mn(s) + 2H_2SO_4(l) \rightarrow MnSO_4(aq) + 2SO_2(g) + 2H_2O(l) + 51.8 kJ

(c) Express your observation.

(d) i) White precipitate insoluble in excess turns brown on standing.

\[ \text{Mn(OH)}_2(s) + 2\text{H}^+ (aq) \rightarrow \text{Mn}^{2+}(aq) + 2\text{H}_2\text{O}(l) \]

\[ \text{K}_\text{sp} = 2.9 \times 10^{-15} \text{ mol dm}^{-3} \]

Qn2.

Volume of HCl added (cm^3)

<table>
<thead>
<tr>
<th>PH</th>
<th>10.8</th>
<th>9.9</th>
<th>9.4</th>
<th>9.1</th>
<th>8.7</th>
<th>8.3</th>
<th>8.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vol</td>
<td>19.4</td>
<td>19.8</td>
<td>20.2</td>
<td>20.6</td>
<td>21.2</td>
<td>22.6</td>
<td>28</td>
</tr>
<tr>
<td>PH</td>
<td>7.8</td>
<td>7.3</td>
<td>3.9</td>
<td>3.5</td>
<td>3.2</td>
<td>2.9</td>
<td>2.5</td>
</tr>
</tbody>
</table>

a) A graph of PH against volume of HCl added (cm^3)

b) i) The boiling point of 2-nitrophenol is lower than that of 4-nitrophenol, yet they have the same molecular mass. Explain this observation.

The boiling point (bp) of a compound is influenced by the intermolecular forces present in it. In 2-nitrophenol, the nitro group is oriented only in one direction, while in 4-nitrophenol, the nitro groups are oriented in two different directions. This results in stronger intermolecular forces in 4-nitrophenol, leading to a higher boiling point.

ii) Bromocyclohexane to cyclohexanone

\[ \text{CH}_2\text{C} \rightarrow \text{CH} \]
EF is C₈H₈O

\[
\text{MF of Q} = \frac{\text{Mass of Q}}{\text{Volume}}
\]

Mass of Q = 5.357g

\[
P = \frac{m}{\text{Mr} \cdot RT}
\]

\[
\text{Mr} = \frac{5.357 \times 8.314 \times 2.73 - 121.589}{1.0 \times 1 \times 1 \times 10^{-3}}
\]

n(C₂H₆O) = 121.589

12x8xn + 1x8xn + 1x16n = 121.589

\[
12n = 121.589/120 = 1
\]

\[
12 \times 8 \times n + 1 \times 8 \times n + 1 \times 16 \times n = 121.589
\]

\[
\text{Mass of C in CO}_2 = \frac{5.357 \times 8.314 \times 273}{1.0 \times 10^{10}}
\]

\[
\text{Mass of H in H}_2\text{O} = \frac{5.357}{1.0 \times 10^{10}}
\]

\[
\text{Mass of O in Q} = \frac{7.5}{1.0 \times 10^{10}}
\]

\[
\text{Mass of Q} = 5.357 \text{g}
\]

\[
\text{Volume of HCl added (cm}^3) = \frac{x = 0.2025(1 + x)}{x}
\]

\[
\text{Equilibrium constant} = \frac{[\text{CO}]^4}{[\text{Ni(CO)}]_x^2}
\]

\[
K_p = \frac{p^2}{P_{\text{Ni(CO)}_4}} \text{atmospheres}^2 \text{or} (\text{Nm}^2)^2 \text{or} \text{N}^2 \text{m}^6
\]

\[
\text{Temperature:}
\]

For an endothermic reaction, as temperature increases, the equilibrium constant increases and equilibrium position shifts from the left to the right and vice versa. For an exothermic reaction, as temperature increases, the equilibrium position shifts from the right to the left and vice versa.

\[
\text{Pressure:}
\]

As pressure increases, the equilibrium constant remains unchanged but the position of equilibrium shifts from the left to the right if the forward reaction occurs by a decrease in volume and vice versa.

\[
\text{Concentration:}
\]

As concentration of one of the products increases, the equilibrium constant remains unchanged but the position of equilibrium shifts from the left to the right and vice versa.

\[
\text{Note that the explanation was not required and two factors were required for description.}
\]

b) i) \( \text{K}_c = \frac{[\text{CO}]^4}{[\text{Ni(CO)}]_x^2} \) mol\(^3\) dm\(^{-9}\)

\[
K_p = \frac{p^2}{P_{\text{Ni(CO)}_4}} \text{ (atmosphere)}^2 \text{ or } (\text{Nm}^2)^2 \text{ or } \text{N}^2 \text{m}^6
\]

ii) The position of equilibrium remains unchanged on adding a catalyst.

c) i) \( \text{COCl}_2\) (aq) \( \rightarrow \) CO(aq) + Cl₂(g)

\[
\text{Initial moles} = \text{a moles}
\]

\[
\text{Moles reacted} = \text{x moles}
\]

\[
\text{Total moles} = \text{a-x + x} = \text{a+x}
\]

\[
\text{% of Cl}_2 = \frac{x}{a+x} \times 100 - 20.25 \Rightarrow \frac{x}{a+x} = \frac{20.25}{100} - 0.2025
\]

\[
\text{But a = 1 from the question}
\]

\[
\frac{x}{1} = 0.2025
\]

\[
0.2025(1/x) = x
\]

\[
0.2025 + 0.2025x = x
\]

\[
0.2025 - 0.7975x = 0.2025
\]

\[
x = 0.2025
\]

\[
0.7975 = 0.2539
\]

\[
\text{moles of COCl}_2 = 1 - 0.2539 = 0.7461
\]

\[
\text{moles of CO} = 0.2539 \text{ moles}
\]

\[
\text{moles of Cl}_2 = 0.2539 \text{ moles}
\]

\[
K_c = \frac{[\text{CO}]^4}{[\text{COCl}_2]^2}
\]

\[
= \frac{(0.2539)^2}{0.7461} = 0.0432 \text{ mol dm}^{-3}
\]

Turn to next page
c(ii)
Initial moles a COCl₂
Moles reacted x x x
Eqn molles a-x a-0Ca 0Ca 0Ca
\[ \alpha = \frac{x}{a} \Rightarrow x = \alpha a \]
\[ \alpha = 15/100 = 0.15 \]
Moles of COCl₂ = 2 x (0.15 x 2) = 1.7 moles
Moles of CO = 2 x 0.15 = 0.30 moles
Moles of Cl₂ = 2 x 0.15 = 0.30 moles
\[ Kc = \frac{a}{x} \]

(b) (i) Heated iron metal reacts with chlorine gas forming iron(III)chloride.

(ii) Roasting is a chemical process of concentrating an ore and also separating it from other earthly material by strongly heating it in air to form its oxide that can be reduced to the metal easily while changing the nonmetallic impurities to gases that easily escape to the atmosphere.

(iii) The reaction is exothermic. This is because increase in temperature caused a decrease in the value of equilibrium constant.

Qn 6.

(a(i)) Lattice energy is the energy change that occurs when one mole of an ionic compound broken into or formed from its constituent gaseous ions.
(b) i)

HBr ROOR

\[ \Delta H = \Delta H_{\text{AlF}} = -4690 \pm (3x364) = -578 \text{kJ/mol}. \]

L.E = -5945 kJ/mol

(c) DHAlF₃ = -4690 + (3x364) = -578 kJ/mol. DHAl₂O₃ = -5945 + -578 = -158 kJ/mol

(d) The factors that affect lattice energy are:

i) Ionic charge; the higher the ionic charge, the bigger is the lattice energy value and vice-versa. This is because the force of attraction between oppositely charged ions increases hence amount of energy given out or absorbed when forming or breaking the crystal lattice increases and vise-versa.

ii) Ionic radius; the higher the ionic radius, the smaller is the lattice energy value and vice-versa. This is because charge density decreases thus the force of attraction between oppositely charged ions decreases hence amount of energy given out or absorbed when forming or breaking the crystal lattice respectively decreases and vise vasa.

Qn. 7.

(a) Industrial preparation of chlorine

Chlorine is prepared by electrolysis of brine. Brine is electrolysed using steel cathode and titanium anode. Sodium ions are discharged at the cathode and form sodium metal while chlorine ions are discharged at the anode to liberate chlorine gas.

Na+(aq) + e⁻ → Na(s)

2Cl⁻(aq) + 2 e⁻ → Cl₂(g)

The liberated chlorine is then collected in a tight gas cover. The sodium metal reacts with water to give sodium hydroxide and hydrogen gas as byproducts.

(b) (i) Heated iron metal reacts with chlorine gas forming iron(III)chloride.

\[ 2Fe(s) + 3Cl₂(g) \rightarrow 2FeCl₃(g) \]

(ii) Chlorine reacts with cold dilute potassium hydroxide forming potassium chloride, potassium chlorate(V) and water.

\[ 3Cl₂(g) + 6KOH(aq) \rightarrow 5 KCl(aq) + KClO₃(aq) + 3H₂O(l) \]

(c) Chlorine reacts with hot concentrated potassium hydroxide forming potassium chlorate(V) and water.

\[ 2Fe(s) + 2KClO₃(aq) \rightarrow 2FeCl₃(aq) + KClO₄(aq) + H₂O(l) \]

(3) Fluorine reacts with hot concentrated potassium hydroxide forming potassium fluoride, oxygen difluoride and water.

\[ 2F₂(g) + 3KOH(aq) \rightarrow 2KF(aq) + OF₂(aq) + H₂O(l) \]

(b) Chlorine reacts with cold dilute potassium hydroxide forming potassium chlorate(V) and water.

\[ 2FeCl₃(aq) + 3KClO₃(aq) + 3H₂O(l) \rightarrow 5 KCl(aq) + KClO₄(aq) + 3H₂O(l) \]

7. (b) (i) Heated iron metal reacts with chlorine gas forming iron(III)chloride.

\[ 2FeCl₃(aq) + 3KClO₃(aq) + 3H₂O(l) \rightarrow 5 KCl(aq) + KClO₄(aq) + 3H₂O(l) \]

(ii) Chlorine reacts with cold dilute potassium hydroxide forming potassium chlorate(V) and water.

\[ 2Fe(s) + 3Cl₂(g) \rightarrow 2FeCl₃(g) \]

(iii) Chlorine reacts with cold dilute potassium hydroxide forming potassium chloride, potassium chlorate(V) and water.

\[ Cl₂(g) + 2KOH(aq) \rightarrow KCl(aq) + KClO₃(aq) + H₂O(l) \]

7. (d) Fluorine in hydrogen fluoride is more electronegative than chlorine in hydrogen chloride. So hydrogen fluoride molecule is more polar than hydrogen chloride molecule. Consequently hydrogen fluoride molecules associate via stronger hydrogen bonds than does hydrogen chloride molecules. Hence the heat energy at room temperature is sufficient to break the weaker hydrogen bonds and vapourised hydrogen chloride but not hydrogen fluoride.

Qn. 8.

(a) Roasting is a chemical process of concentrating an ore and also separating it from other earthly material by strongly heating it in air to form its oxide that can be reduced to the metal easily while changing the nonmetallic impurities to gases that easily escape to the atmosphere.

(b) Floatation is a physical method of concentrating an ore and also separating it from other material.