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 ______________ 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.
1. (a) (i) Principal focus is the point on the principal axis to which rays that are close and parallel to the principal axis converge for a concave mirror or appear to diverge from for a convex mirror after reflection by the mirror.

(ii) Derivation of the equation, \( \frac{1}{s} + \frac{1}{s'} = \frac{1}{f} \).

Consider a point object O on the principal axis of a concave mirror.

From triangle OXC, \( \theta = \beta - \alpha \) \( \ldots \ldots \) (i)

From triangle CXI, \( \theta = \gamma - \beta \) \( \ldots \ldots \) (ii)

Equating equations (i) \( = \) (ii)

\[ \beta - \alpha = \gamma - \beta \]

\[ 2\beta = \gamma + \alpha \] \( \ldots \ldots \) (iii)

For small angles in radians; \( \tan \alpha \approx \alpha \), \( \tan \beta \approx \beta \) and

\[ \frac{2h}{\frac{1}{v} + \frac{1}{u}} \]

This gives \( \frac{1}{v} = \frac{1}{f} + \frac{1}{u} \)

Read about the derivation of \( \frac{1}{s} + \frac{1}{s'} = \frac{1}{f} \) for a convex mirror.

(b) A sextant is an instrument used to measure the angle of elevation of heavenly bodies such as the star or the sun.

2. (a) Refractive index of a material is the ratio of the sine of angle of incidence to the sine of angle of refraction for a ray of light traveling from one medium to another of different optical densities.

Or, it can also be defined as the ratio of the speed of light in one medium to the speed of light in another medium.

Note: If medium 1 is a vacuum, then we refer to it as absolute refractive index.

Absolute refractive index of a material is the ratio of the sine of angle of incidence to the sine of angle of refraction for a ray of light traveling from a vacuum to a given medium.

When light travels from a more optically dense medium to a less optically dense medium, some of it is reflected while a bigger part is refracted. The refracted ray is brighter.
When the angle of incidence, $i$, is gradually increased, the angle of refraction, $r$, also increases. At a certain angle of incidence, the angle of refraction becomes 90° and the ray grazes the surface (moves along the boundary). At this moment, the angle of incidence in the less dense medium to which the angle of refraction in the denser medium is 90° is called the critical angle.

When the angle of incidence is further increased beyond the critical angle, the light ray becomes totally internally reflected in the optically dense medium. At this stage, we say that total internal reflection has occurred.

From the diagram above, applying Snell’s law at Q gives:

$$n_a \sin i = n_g \sin r$$

For minimum deviation, $i_1 = i_2 = i$ and $r_1 = r_2 = r$.

$$D = 2i - A \Rightarrow i = \frac{d_{\text{min}} + A}{2}$$

Also $A = r_1 + r_2 = 2r \Rightarrow r = \frac{A}{2}$

From Snell’s law:

$$n_a = \frac{\sin \left( \frac{D + A}{2} \right)}{\sin \left( \frac{A}{2} \right)}$$

But $n_a = 1$

Hence:

$$n_g = n_a \sin i = n_\text{g} \sin r$$

From the diagram above, applying Snell’s law at Q gives:

$$\sin i = \text{constant}$$

Applying Snell’s law at P gives:

$$1.5 \sin c = 1 \times \sin 90° = 1$$

$$\sin c = 0.667$$

$$c = 41.8°$$

But $r = A - c = 60 - 41.8 = 18.2°$

Applying Snell’s law at P gives:

$$1.5 \sin r = 1 \times \sin 90° = 1$$

$$1.5 \sin 18.20 = \sin l$$

$$\sin l = 0.4685$$

$$l = 27.9°$$

SECTION B.

A glass tube with a tap at the bottom is filled with water. A sounding tuning fork is brought to the mouth of the tube. The water is then slowly drained until a loud sound is heard. The loud sound heard is an indication of resonance of sound in air. This is referred to as the first resonance. The experiment can be repeated with other forks to produce other positions of loud sounds. All these indicate resonance of sound in air.

Read about the experiment to determine the speed of sound in air by the resonance method.

(c) (i) Doppler effect is the apparent change in the frequency of wave motion due to relative motion between the source and the observer.

(ii)

From; $V = \sqrt{\frac{T}{\mu}}$ where $\mu = \frac{\text{mass}}{\text{length}} \frac{m}{l} = 0.01 \text{kgm}^{-1}$

Also fundamental frequency, $f_0 = \frac{V}{2l} \Rightarrow f_0 = \frac{\sqrt{\frac{T}{200}}}{2 \times 1.0} = 70.71Hz$

Frequency of the 2nd harmonic = $2f_0 = 2 \times 70.71 = 141.42Hz$

(b) Experiment to determine resonance of sound in air.

A glass tube with a tap at the bottom is filled with water.

A sounding tuning fork is brought to the mouth of tube.

The water is then slowly drained until a loud sound is heard.

The loud sound heard is an indication of resonance of sound in air. This is referred to as the first resonance.

The experiment can be repeated with other forks to produce other positions of loud sounds. All these indicate resonance of sound in air.

Read about the experiment to determine the speed of sound in air by the resonance method.

(c) (i) Doppler effect is the apparent change in the frequency of wave motion due to relative motion between the source and the observer.

(ii)
PHYSICS SOLUTIONS (APHY 004)

(ii) angle of diffraction of the highest order diffraction image.
\[ \sin \theta = \frac{n\lambda}{d} = \frac{2 \times 600 \times 10^{-9}}{1.54 \times 10^{-6}} \]
\[ \theta = 51.2^\circ \]

(d) (i) Production of polarized light by reflection.

When an unpolared light is incident on a boundary of a transparent medium, part of the light is partially reflected and the other partially transmitted into the denser medium.

The reflected light is viewed through a sheet of polarized light while turning the sheet about an axis perpendicular to its plane. The procedure is repeated for other angles of incidence. At one particular angle of incidence (polarizing angle), the reflected ray is completely plane-polarized (light is received only at a particular orientation of the polaroid) while the refracted ray is partially plane-polarized.

At this point, the two rays are perpendicular to each other and vibrations in the reflected ray are parallel to the reflecting surface.

(ii) Uses of polarized light.
- Stress analysis
- Determination of the concentration of sugar in solution
- Liquid crystal displays (LCDs)

Give the differences between the spectra produced by a prism and a diffraction grating.

<table>
<thead>
<tr>
<th>Prism</th>
<th>Diffraction grating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produces single spectrum at a time</td>
<td>Produces many spectrum at a time</td>
</tr>
<tr>
<td>Shorter wave lengths are deviated most</td>
<td>Longer wave lengths are deviated most</td>
</tr>
<tr>
<td>Produces less pure spectrum</td>
<td>Produces more pure spectrum</td>
</tr>
</tbody>
</table>

SECTION C

5. (a) Tesla is the magnetic flux density if a conductor of length 1m carrying current of IA and placed perpendicular to a uniform magnetic field experiences a force of IN.

Magnetic flux density is the force acting on a conductor of length 1m carrying current of IA and placed in a direction perpendicular to the uniform magnetic field.

(b) Derive the expression for the force per metre between the wires.

Consider two parallel conductors A and B above, carrying currents I1 and I2, respectively.

The magnetic flux density, B, at point P1, is due to current I1,

\[ F = \frac{\mu_0 I_1 I_2}{2\pi d} \]

Similarly, the magnetic flux density, B2 at point P2 is due to current I2

\[ B_2 = \frac{\mu_0 I_2}{2\pi d} \]

Force, F1 acting per metre length on wire B is given by;

\[ F_1 = B_1 I_1 \sin 90 = \frac{\mu_0 I_1 I_2}{2\pi d} \]

Force, F2 acting per metre length on wire A is given by;

\[ F_2 = B_2 I_1 \sin 90 = \frac{\mu_0 I_1 I_2}{2\pi d} \]

The expressions for the magnetic flux density, B, at the centre of a circular coil

\[ B = \frac{\mu_0 N I}{2\pi r} \]

Number of turns, N = \( \frac{12}{2\pi r} = \frac{12}{2 \times 0.15} \)

Magnetic flux density at the centre of the coil, B is;

\[ B = \frac{\mu_0 N I}{2\pi r} = \frac{4 \times 10^{-7} \times 4 \times 12}{2 \times 0.15} = 2.13 \times 10^{-4} \text{ T} \]

(d) (i) Structure and mode of operation of a moving coil galvanometer.

N and S are curved pole pieces of a permanent magnet; S1 and S2 are hair springs and I is current.

Action:
- The current I to be measured is fed in and out of the coil through the hair springs.
- The coil experiences a deflecting magnetic torque, \( \tau_w = BINA \)
- The coil then turns in the magnetic field with the pointer until it is stopped by the restoring torque, \( \tau_r = k\theta \) (opposing torque) provided by the hair spring, where K is the torsional constant of the hair spring and \( \theta \) is the deflection of the pointer.

At the point of no deflection, the magnetic torque is equal to the restoring torque, that is;

\[ BINA = k\theta \]

\[ \Rightarrow I = \left( \frac{k}{BAN} \right) \theta \]
A copper rod (or some other metal) which can be freely rotated round the North pole of a permanent magnet is connected as shown above.

1. Since \( \frac{k}{B} \) is a constant hence \( I \alpha \theta \)

2. Therefore the reading is taken on a linear scale.

Read about the current and voltage sensitivity.

(i) Structural modification needed to convert an A.C to a D.C generator.

- The slip rings are replaced by split rings/commutators and the brushes arranged so that the change over of contacts occurs after each half of the cycle.

6. (a) (i) Laws of electromagnetic induction.

- The magnitude of the induced e.m.f in a circuit is directly proportional to the rate of change of the magnetic flux linked with the circuit. This is known as Faraday’s law of electromagnetic induction.

- The direction of the induced e.m.f is such as to oppose the change causing it. This is known as Lenz’s law of electromagnetic induction.

(ii) Experiment to verify Faraday’s law of electromagnetic induction.

Plot a graph of \( S \) against \( t \) for \( N \) revolutions and determine the number of revolutions per second (frequency), \( f \), then

\[
S N = V I
\]

\[
\alpha \quad \text{and} \quad \phi
\]

Also note the deflection, \( \alpha \).

- Since

\[
\frac{d}{dt} N f = \text{induced then } f \alpha \text{ speed of rotation of the rod.}
\]

- Since

\[
\frac{d}{dt} N f = \text{induced } \alpha \text{ rate of change of magnetic flux.}
\]

6. Read the passage below and answer the questions that follow using your own words as much as possible.

When you experience infatuation, your mind is consumed like a thing, you’re probably experiencing lust.

When you experience infatuation, your mind is consumed by the thought of the other person. You are thinking not only about the other person but also how you want to reveal yourself to the other person. You have an idealized vision of what this person is like and your vision may be or may not be accurate.

Instead of feeling secure, you are thinking more about how to impress the other person. Your focus is on how to get the other person to like you, and feel nervous because you don’t know how the person feels. Your relationship is pretty new, and while you’re constantly thinking about the other person, you’re not confident that he or she has what it takes to go the distance. Sex is exciting but you feel tentative afterwards. You worry about whether your partner found you appealing and you worry about what the next step after sex will be.

You think constantly about the way the other person looks at you. You think obsessively about these details, and you try to decide how the person feels about you based on these somewhat trivial qualities. The person you like disagrees with you, and you wonder if the relationship is over. You wonder whether you know the person at all or whether your impressions have been wrong all along. You want to ask the person to date exclusively, but you are nervous about what he or she might say. You are afraid that asking for commitment may frighten the person away. Your feelings aren’t deep enough for love; you’re probably more in the realm of infatuation.

This phenomenon can be exacerbated when security isn’t important to you. You are more interested in the score and in how great it feels to be physical together. After getting what you want, you can take or leave that person. You may just be meeting the person you’re interested in, or you may have known the person for a long time. In either situation, the relationship is more about fulfilling sexual desires than it is about creating a partnership.

You may succeed in having sex with this person and even though it is great, your mind has nightcraw. Your focus is on lowering the person’s guard so that he or she will be open to a sexual encounter. Who cares if you have an argument? You can find someone new without the hassle of bickering and fighting. The sex is great, but it’s not worth the baggage—unless its make-up sex after one of those passionate arguments.

In reality, you could care less about getting exclusive with your partner. You’re satisfied to date other people, and you don’t care if the other person also has multiple partners. Even though you may feel jealous if your lover finds another partner, your lack of commitment suggests infatuation not love!

Friendship should also weigh into your decision to commit. In the years ahead if you don’t like your mate, you’re going to be miserable.

Even if you think you love the other person, if that person doesn’t respond to your feelings, don’t waste too much time hoping that your love interest changes his or her mind. You’ll have other opportunities to find someone who is ready to create a real and lasting partnership.

Questions:

(a) Suggest a suitable title for the passage. (2marks)

(b) According to the passage, how can disagreement best be dealt with in a true love relationship? (4marks)

(c) In not more than 100 words, summarize the manifestations of infatuation. (4marks)

(d) Explain the meaning of the following words and phrases as used in the passage, without changing their meanings.

- fool-proof way to decipher (2 marks)
- doesn’t flatter you (2 marks)
- are affections and post-coital cuddling just as important as sex, although you love to keep the flame alive? (2 marks)
- you have an agreement with your partner, keep working until you are able to find some common ground. (2 marks)
- you appreciate your partner speaking the truth even when it is painful, something funny happens to you at work and you can’t want to tell your partner. (2 marks)
- you encounter a bad experience, and you want to talk to someone who will understand. (2 marks)
- if your partner is the first person that you think about when you want to share your innermost thoughts, then you are certainly in love. (2 marks)
- you’re looking to catch someone as a prize or get someone to go to bed with you: you’re treating the person

Useful words and phrases:

- realm
- infatuation
- nightcraw
- bickering
- jealousy
- compromising
GENERAL PAPER ANSWERS (AGP004)

SECTION A

Land conflicts are disputes among people over ownership or boundaries of land.

Causes:
- Poverty as this makes individuals unable to acquire land
- Succession disputes
- Commercialisation of land (for agriculture, industrialisation, etc.)
- Failure of the police force to investigate and gather evidence over land conflicts in a timely manner.
- Inadequate investigations by courts of law as these mainly depend on police reports.
- Population growth hence leading to pressure on the available land.
- Inefficiency in the country’s land registries for example in terms of the land registration process taking a long time.
- Political interference by politicians who give contradictory directives to courts.
- Another is the issue of delay in compensation for land meant for public projects like roads especially due to corruption.
- The land tenure system (landlords)

Effects of land conflicts:
- Increased poverty among people
- Lack of sufficient land for agricultural production
- Displacement of people to other areas in case of public projects like roads
- Death of individuals involved in land conflicts
- Destruction of property due to violent evictions
- Loss of confidence in government by its nationals who expect protection for their lives and property
- Decline in the productivity of land
- Development of slums in urban centres

2. Environmental degradation is the reduction/deterioration in the value of man’s natural surrounding (endowments) such as plant life, land, water and air.

Or: It is the deterioration in the value of the biosphere, the lithosphere, the hydrosphere.

Human activities
- Settlement on wetland, forests and game reserves for agriculture, housing, industries, etc.
- Industrialisation (and its productions)
- Deforestation due to lumbering, charcoal burning, brick making and burning, building, settlement, farming, etc.
- Mining and quarrying; copper mining at Kilembe, cement works at Tororo and Hima, clay works at Kajjansi (Entebbe), stone and sand quarrying throughout the country.
- Noise pollution (from noise generating machinery)
- Urban practices (concrete burial) cementing and tiling of graves.
- Poor disposal of waste e.g. sewage.
- Poaching in game parks, reserves and protected waters.
- Depletion of water resources like fish and water plants.
- Poor farming methods; over stocking, over-grazing, over cropping, monoculture, land fragmentation, bush burning, etc.
- Transport perils
- Dangerous transfer of flora (like the water hyacinth and fauna like tilapia.

Other factors
- Natural hazards/calamities.
- Pests and diseases.
- Chemical weathering and leaching.
- Cyclic climatic changes.

3. Child abuse is when a parent or caregiver, through action or failure to act causes injury, death, emotional harm to a child. The different forms of abuse are mistreatment like neglect, physical abuse, sexual abuse, exploitation and emotional abuse.

Causes:
- Poor parent-child relationship.
- Alcohol and drug abuse: Parents that take alcohol and abuse drugs are most likely to abuse their children.
- Parent’s history of neglect: Adults who were neglected in their childhood are likely to neglect their own children as they missed the opportunity to be cared for and showed affection.
- Inadequate capacity of statutory protection services and community based structures to identify, support and follow-up child neglect and abuse cases.
- Limited access to compulsory free Education.
- Violation of the existing laws and codes of conduct as abusers get away with such cases.
- Ignorance about children’s rights and freedoms may bar them from taking note of what they have been denied.

Effects:
- It threatens normal child development.
- May cause distrust for adults.
- May result into array of characteristics and behavior as anger, anxiety, aggression, social withdrawal, low self-esteem, sleep difficulties and many others.
- A child may dissociate and develop disorders as amnesia and personality disorder and these may affect their everyday life in school, at work, and in relationships.
- Death may occur especially for very young children. (ages four and below.

4. African traditional values and customs refer to a collection/variety/forms of attitudes/beliefs/norms/and practices that are held/cherished by people in different societies of Africa.

Values
- They enhance/ aid/ facilitate/ promote learning/ study purposes for generations to come later.
- Helps promote discipline on proper conduct and morals in child upbringing
- Building unity and strengthening bonds among people in different African societies.
- Offer useful reference (archives) for future generation e.g. sex education.
- Helps in preservation of culture – the traditions, customs and beliefs, etc. the Ekisakatwe organised annually by the Nabajjara of Buganda is a case in point.
- Promotion of art and aesthetics especially orature; i.e., oral aspect like songs, poems, rhymes, riddles, etc.
- They define/ identify a people of a specific community and accord them their distinction different from others. E.g. male circumcision among the Bamasaba among the Sabiny people of Kapchorwa/ Bukwok.
- They instil pride/ love amongst people for their cultures.
- Entertainment and enjoyment of people

SECTION B

5.

<table>
<thead>
<tr>
<th>Truckers’ name</th>
<th>Age</th>
<th>No of yrs in Co</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wasemwa</td>
<td>49(47+2)</td>
<td>1yr 6 months</td>
</tr>
<tr>
<td>Buladde</td>
<td>47(45+2)</td>
<td>10</td>
</tr>
<tr>
<td>Otieno</td>
<td>47(45+2)</td>
<td>10</td>
</tr>
<tr>
<td>Mulongo</td>
<td>47(45+2)</td>
<td>10</td>
</tr>
<tr>
<td>Nakawanza</td>
<td>58(45+13)</td>
<td>9</td>
</tr>
<tr>
<td>Kikungu</td>
<td>53(51+2)</td>
<td>8</td>
</tr>
</tbody>
</table>

b) i) Buladde

ii) Otieno

c) Mulongo (April)

Wasemwa (June)

Otieno (July)
d) i) Challenges

- Long delays at the border points waiting for covid-19 results
- Traffic congestion at the border
- Hostile communities along the way when they stop for food/rest
- Unable to visit their families at the end of a journey
- Very poor facilities at the official designated stop-over points
- Its tiring to drive alone in a big truck since co-drivers were prohibited
- Fear of contracting covid-19 as they carry out their jobs

ii) Possible Solutions

- Using quick testing kits which produce results quickly
- Assigning many officials to clear trucks at the borders quickly
- Improving facilities at designated official stopover points and food stops
- Allowing the truckers to have a co-driver
- Encouraging truckers to use sanitisers, keep distance, use masks, etc.

6. (a) Title - Benefits of educating a woman

- The need for educating a woman

(b) Meanings

i. It means a woman is naturally endowed with goodness but if not nurtured or well-raised, her goodness may never yield or may go to waste.
ii. It means that a woman who is raised well and educated becomes exceptional or excellent.

c) THE REASONS THE WRITER FORWARDS FOR THE NEED FOR EDUCATING A WOMAN

- Education carries on the distinction and makes someone less brutish than others.
- God gave man equal capacities so none should be denied additions.
- He blames the error of in-human customs that binders women from being wise.
- Women naturally have greater and their senses are quicker than those of men so should not be denied education.
- He states that men have a fear of women vying with them in their improvements.
- Being quick and sharp if given education would prove very sensible.
- He states that education makes a woman an exceptional creature.

(d) Meanings of words used in the passage

ii. Barbarous customs — Uncivilised/archaic behaviour

iii. Convulsive — Free and pleasant/social

iv. Manifest — Evidence/proof

v. Forfeit the privilege — To be denied the benefit

vi. Vie — To compete or fight for something.

vii. Retentive — Having the power to absorb information

viii. Emblem of sublime employments — A symbol or representation of memory

ix. Degenerate — Decline or deteriorate x. Cloistered — To isolate or keep away for the sake of maintaining innocence

Turn to next page
1. (a) The first foliage leaves of annual plants usually wither and fall off within few days of growth. This would not provide adequate study time from which much measurement could be obtained—hence making it difficult to draw realistic conclusion.

(b) The least average surface areas for the two categories of plants were recorded at 10 days from the first day of leaf appearance while their highest averages of leaf surface areas were recorded at 65 days from the first day of leaf appearance.

(c) Annual plants grown in atmosphere containing higher volume parts per million carbon dioxide grow and develop leaves with larger surface areas than those grown in atmosphere containing lower volume parts per million carbon dioxide.

(d) At low amount of carbon dioxide rate at which it is fixed in the Calvin cycle during photosynthesis is equally low. Rate of photosynthesis remains low with the result that small amount of food for growth is produced. Rate of growth of plant tissues such as leaves also become low making the leaves to have smaller surface areas. At higher amount of carbon dioxide rate at which it is fixed in the Calvin cycle during photosynthesis is higher. Rate of photosynthesis becomes higher and large amount of food for growth is produced. Rate of growth of leaves also become high making the leaves to have larger surface areas.

2. (a) Heart

(b) (i) Nucleus
(ii) Intercalary disc
(iii) Striations
(iv) Myoфиbril

Note: Remember when labelling line touches only one feature of a diagram you must use singular expression of the part being labelled while plural when two or more features of the same kind are having label lines emerging from them to a common label.

(c) The initial heartbeat originates from a group of specialised cardiac muscle cells, “pacemaker” called sino-atrial node (SA node) located near the wall of right atrium where vena cava enters it. Wave of excitation from SAN spreads outward causing atria to contract, generating pressure that pushes blood from atria into the ventricles. This wave of excitation is picked by similar cardiac muscle cells in the right atrium near the septum separating right atrium with left atrium, called atrioventricular node (AV node).

The wave continues to be conducted by Purkinje fibres relatively slowly to the apex of the ventricles. Conduction of impulse to the apex is to ensure that the ventricles begin contracting from apex upwards in order to force blood into the aorta and pulmonary artery. The reduced speed of conduction is to enable delay in contraction between atria and ventricles to maintain pressure difference for blood to flow smoothly in one direction.

3. (a) (i) Jean Lamarck based his theory on logic. He argued that evolutionary change is a function of direct effect of interaction between an individual organism and the environment. The theory is based on two mechanisms:

   - Extensive use of body part leads to its increase in size and efficiency up to a limit which life itself determines. This characteristic will then be transmitted to the next generation.
   - Under use or no use of body part will result in its decrease in size and efficiency or may disappear altogether. Such characteristic fails to be transmitted to the next generation.

(b) (i) Ornithine /Urea Cycle
(ii) Liver
(iii) Body is unable to store excess amino acids taken up in the diet. Excess amino acids from digestion are deaminated in the liver. The amino group is removed resulting in the formation of ammonia and an acid.

\[2\text{NH}_3 + \text{CO}_2 \rightarrow \text{COOH} + 2\text{NH}_3\]

Urea formation

The ammonia from deamination is carbonylated by addition of carbon dioxide so that it is converted into a less toxic and less soluble compound called urea and excretion.

\[2\text{NH}_3 + \text{CO}_2 \rightarrow \text{NH}_2 \cdot \text{C} = \text{O} + \text{H}_2\text{O}\]

This process occurs by a cyclic reaction called the ornithine/urea cycle, through a system of carriers.

4. (a) (i) Negative feedback is a mechanism in which the effect of deviation from the normal condition triggers a sequence of events which counteract the deviation and restores the system to its original set point (norm) while positive feedback is the mechanism in which the effect of deviation from the normal condition intensifies the original response such that the change tends to proceed in the same higher or lower magnitude away from the set point.

(b) (i) Ornithine /Urea Cycle
(ii) Liver
(iii) Body is unable to store excess amino acids taken up in the diet. Excess amino acids from digestion are deaminated in the liver. The amino group is removed resulting in the formation of ammonia and an acid.

5. (a) Antherozooids (spores) have very delicate membranes that can make them to easily dry up. Their flagella require film of moisture to swim from antheridia to the egg within the archegonium.

(b) (i) Spore mother cells
(ii) Sporangium
(iii) Sorus (pleural, sori)

(c) Spores of ferns have single nucleus each while those of gymnosperm have three nuclei (tube nucleus and generative nucleus).

Gymnosperm spores have wing – like structures while spores of ferns do not have the wing – like structures.

Destruction of proteins in the stomach is continuous to ensure that much amino acids can be obtained in order to synthesise the different proteins required in the body.
**BIOLOGY PAPER 1 ANSWERS (ABIO 005)**

- Spores of ferns are of the same kind but spores of gymnosperm are of different kinds.
- (d) It is a means of surviving during harsh environmental conditions such as little available water and high temperature until such conditions are favourable again. They produce large quantity of spores at the onset of unfavourable conditions such that during the period of dormancy the spores are more effectively dispersed.

6. (a) Some possess penetrative and attachment devices for firm support onto hosts.
   - They usually have thin integument (coat) for easy absorption of food.
   - Some have their bodies flattened to increase the surface area for absorption of food. The whole body surface being absorptive in such cases.
   - Some have ability to produce mucus or other resistant substances to prevent them from being digested by digestive enzymes or any other host reactions.
   - Some respond to host’s reactions by developing thick protective cuticle.
   - Some have some body parts like eyes, alimentary canal lacking or degenerated so as to create space for them to fit in or on the host.
   - Some hermaphrodite with possibility of self-fertilisation to enhance high reproductive chances.
   - Those that are confined in environment without usable oxygen tend to respire anaerobically.
   - To increase chances of dissemination; they produce large numbers of eggs, cysts, spores or even reproduce in phases (during their life cycles) where they inhabit more than one hosts.
   - Some have a wide range of hosts. This means they have high chances of feeding and survival.
   - Some are able to release sexually mature, free-living organisms which are fit for adult life and be able to survive before securing a host.
   - Some can remain dormant to overcome periods spent away from hosts.

   (b) Similarities
   - Both are heterotrophic.
   - They can produce both sexually and asexually which are often associated with resistant stages.
   - They usually produce offspring in large numbers.
   - They absorb already simple and soluble food substances.
   - Those that have digestive they are very simple in nature.

   Differences
   - Parasites derive their foods from living organisms while saprophytes derive their foods from dead organisms.
   - Parasites usually have specific hosts while saprophytes obtain food from a variety of dead organisms.
   - Some parasites have many stages in their life cycle while saprophytes usually have single adult stage and spores.
   - Parasites are plants and animal forms while saprophytes are largely fungi and bacteria.
   - Parasites only strive in habitats of their respective host while saprophytes can survive in diverse habitats.
   - Digestion is exhibited in only very few parasites while all saprophytes have to digest their food.

(c) Some are consumed as food, for example mushrooms. Some are used in industrial processes such as in tanning of leather and production of Vitamin C.
- Some are used in processing and producing yoghurt and cheese.
- Some are manipulated to decompose waste in sewage as a means of purifying water and in production of compost manure.
- Some are used in the manufacture of antibiotics such as penicillin.
- Yeast is used in brewing to obtain alcohol as well as in baking to produce bread.
- By decaying remains of plants and animals they recycle nutrients that enable humans to be able to grow a variety of crops.

**BIOLOGY PAPER 2 QUESTIONS (ABIO 006)**

1. Different plants have been found to respond by flowering differently to varying wavelengths of light. In that regard two plant species were discovered to have a pigment that exists in two isomeric forms depending on how long the plants are consistently subjected to different light conditions. Their patterns of flowering in relation to absorbance of the two pigments were determined as follows:

<table>
<thead>
<tr>
<th>Wavelength of light in nm</th>
<th>400</th>
<th>450</th>
<th>500</th>
<th>600</th>
<th>660</th>
<th>700</th>
<th>730</th>
<th>800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigment P1</td>
<td>2.0</td>
<td>1.5</td>
<td>1.2</td>
<td>4.5</td>
<td>7.2</td>
<td>10.4</td>
<td>28.6</td>
<td>1.0</td>
</tr>
<tr>
<td>Pigment P2</td>
<td>2.0</td>
<td>3.1</td>
<td>2.3</td>
<td>24.1</td>
<td>36.6</td>
<td>6.4</td>
<td>1.8</td>
<td>0.2</td>
</tr>
</tbody>
</table>

   Average numbers of flowers per plant
   - Plant A: 0, 0, 0, 0, 0
   - Plant B: 0, 0, 23, 275, 18

   Graph shown below indicates flowering responses to day length of the two flowering plants A and B above when subjected to specified daylight duration per day.

   Study the information provided in the table and the graph to answer the questions that follow.

   a) i) Compare the:
      - light absorbance of the two plant pigments.
      - average numbers of flowers produced by the plants per day.
   b) i) What do pigments P1 and P2 represent in typical plants?
      - ii) Predict the light critical periods required for the two plant species to flower.
   c) What evidence did you base on to determine the critical periods in (b) (i) above?
   d) Which of the two plants is:
      - i) Long day plant?
      - ii) Long night plant?
   e) Use the information from the data provided and explain the isomeric nature of the pigments P1 and P2 in causing flowering.
   f) What is the hormone in (d) (i) secreted from in a plant?

2. (a) Briefly describe the four main ways by which organisms may be distributed.

   b) Suggest the main factors that usually determine distribution of organisms.

   c) What are the roles of the components of eukaryotic plasma membranes?

   d) Give four ways by which plant vacuoles may be important.

3. (a) Show how the existence of mitochondria and chloroplasts in cells explain their continuous survival as organelles in eukaryotic cells as suggested by endosymbiotic theory of cell origin.

   b) Give three evidences from the two organelles to confirm the theory in (a) above.

   c) What is the role of the components of eukaryotic plasma membranes?

   d) Outline the processes that result in formation of amino acids in plants.

5. (a) Explain the relationship between:
   - i) size and surface area to volume ratio.
   - ii) gaseous exchange and respiration.

   b) Discuss the differences in efficiency of gaseous exchange between bony fish and cartilaginous fish.

   c) Explain the differences in ability of gaseous exchange between carbon dioxide and oxygen concentration in inhaled and exhaled air in mammals.

6. (a) Describe the following processes in flowering plants.
   - i) Polination.
   - ii) Double fertilisation.

   b) Compare alternation of generation in bryophytes with sexual reproduction in flowering plants.

   c) State the reasons why flowering plants are more successful...