PRIMARY SIX
SELF STUDY MATERIALS
ENGLISH LANGUAGE

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. B; the alimentary canal is a part through which food passes. The liver and pancreas are parts of digestive system, but food does not pass through these in a segment.
2. C; it has numerous segments with two pairs of limbs in a segment.
3. B; the population size of the prey is always higher than that of the predators.
4. A; a ligament joint joins bone to bone, while tendons join muscle to bone.
5. B; it has one leaf at the node, with adjacent leaves on opposite sites.
6. B; cane sugar is sucrose, while maltose is found in high concentration in malt. Glucose is not stored in plants but in animals, while starch is found in high concentrations in all plants.
7. D; it has two sutures. Follicle has one suture, schizocarp has many transverse sutures, while capsule many longitudinal sutures.
8. A; because weight of husk is the loss of mass after dry soil is heated to red hot (10g). And the mass of the fresh soil sample is (40g), hence 25%.
9. C; as energy can be produced without oxygen and activation of enzymes is done by water.
10. B; it is a canine due to its wedge-shaped crown used for tearing food. A has a chisel shaped crown.
11. D; As recessive alleles’ the phenotypic effects are suppressed in heterozygous condition.
12. A; it is caused by filament worms that are spread by mosquitoes when they bite. It is a painful swelling.
13. D; ADH increases the rate of re-absorption of water from glomerular filtrate, hence little but concentrated urine is produced.
14. B; the colour of the flowers formed was absent in both parents.
15. C; it is rigid and cannot grow, yet it is the outer surface of insects. Hence it is first shed off before growth can occur.
16. C; puberty is the initial change at the adolescent stage, mostly physical that make an organism able to produce gametes.
17. B; it transports deoxygenated blood from the right ventricle to the lungs.
18. D; ethanol is produced in anaerobic respiration in yeasts and plants, while pyruvate is also called pyruvnic acid.
19. A; physical activity increases demand for energy whose production results also in formation of heat which when allowed to accumulate in the body disrupts body processes.
20. D; it is a reflex action and all reflex actions are involuntary.
21. A; adrenal glands are found above the kidneys.
22. C; the other alternatives transfer tapeworms from one host to another. Tapeworms enter into the human body through eating half-cooked or raw meat or pork.
23. B/C; growth is increase in dry mass that is permanent and every time size increases irrevocably, it is because permanent dry mass has been added.
24. D; note that lichens are not plants. During succession, the first plants are mosses followed by ferns, grasses, shrubs, before big trees can develop.
25. A; asexual reproduction in anemoes is similar to mitosis, which is termed reproduction by binary fission.
26. B; gynocotom is the female part of a flower and consists of stigma, style and ovary only.
27. B; B is the movement of the whole organism. Chemo means response to chemicals although the chemicals from one direction.
28. C; theoad carries out respiration producing carbon dioxide that turns the lime water milky.
29. D; the movement of solute materials from a region of high

34. (a) (i) They decompose the organic materials of the compost. (ii) They fix nitrogen.
   (iii) As they move in the soil, they create pores, increasing the soil aeration, drainage and capillarity. They increase the amount of nutrients in the soil by causing decomposition.
(b) - Decomposition of organic wastes involves releasing nitrogen from the protein components.
   - Decomposition of dead organisms.
   - Nitrogen fixation by bacteria in root nodules.
   - Nitrogen fixation by bacteria directly into soil.
(c) - Polythene bags prevent passage of water into the soil, reducing soil aeration, causing death of soil organisms.
   - It prevents water passage into the soil, increasing soil water retention capacity, but low drainage capacity.
   - They are non-degradable and this reduce soil capillarity.
35. (a) A population is a group of organisms of the same species in an area at a specific time, while a community is a group of organisms of different species in an area at a specific time.
   (b) - Availability of food/competition for food.
   - Availability of space/shelter.
   - Predators – reduce the size of a population for food.
   - Competition for resources, which reduces population growth.
   - Migration, leads to increase in population size.
(c) - Capture rabbits from the bush.
   - Count and record the number of captured rabbits (R1).
   - Mark the captured rabbits and release them back into the field.
   - Capture rabbits again from the area after one month.
   - Count and record the number of rabbits captured. (R2)
   - Count and record the number of rabbits in the second capture with the earlier mark (R3)
   - Estimate the number of rabbits in the bush by calculating: Population size = R1 x R2/R3
36. (a) (i) The external intercostal muscles contract, the internal intercostal muscles relax, causing the ribcage to move upwards and outwards and the diaphragm muscles contract, causing the diaphragm to flatten. All these increase the volume in the thoracic cavity and lungs, while decreasing pressure in them below the atmospheric pressure, air then moves into the lungs.
   (ii) Carbon dioxide in blood diffuses from blood to the air into across the alveoli wall, while oxygen in inhaled air diffuses into blood across the alveoli wall.
   (b) - Exhaled air contains more carbon dioxide than inhaled air.
   - Exhaled air has less oxygen than inhaled air.
(c) Insects use spiracles for breathing that are located on the abdomen and the thorax, therefore, they continue to breathe even with the head in water.
37. (a) 
<table>
<thead>
<tr>
<th>Stimuli</th>
<th>Receptor</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>Eye</td>
<td>Pupil constriction</td>
</tr>
<tr>
<td>Sound</td>
<td>Ear</td>
<td>Pupil constriction</td>
</tr>
<tr>
<td>Taste</td>
<td>Tongue</td>
<td>Pupil constriction</td>
</tr>
<tr>
<td>Smell</td>
<td>Olfactory</td>
<td>Pupil constriction</td>
</tr>
<tr>
<td>Temperature</td>
<td>Thermoreceptors</td>
<td>Pupil constriction</td>
</tr>
<tr>
<td>Insulin</td>
<td>Liver</td>
<td></td>
</tr>
</tbody>
</table>

(b) (i) The ciliary muscles in the ciliary body contract, causing suspensory ligaments to slacken. This makes the lens to become short and thick, increasing the ability of the lens to refract light, reducing the focal length of the lens for the nearby object, hence the image formed on the retina.
(ii) The ciliary muscles in the ciliary body relax causing tension in the suspensory ligaments. The suspensory ligaments pull the lens apart making the lens thin and long. This makes the lens to refract less and increase the focal length of the lens, hence image of distant object are formed on the retina.
1. Individuals of blood group O are universal blood donors because they have; 
A. no antibodies  B. antibodies a and b  C. no antigens  D. antigens A and B
2. Figure 1 shows an ecological pyramid of numbers in an ecosystem. Which levels have the least and the highest number of organisms respectively?
3. Which of the following correctly shows the position and type of growth caused by the meristems?
A. Apical  Cambium  Increase in length of the plant.
B. Lateral  Cambium  Increase in girth of the plant.
C. Lateral  Tip of root  Increase in girth of the plant.
D. Apical  Tip of shoot  Increase in length of root of the plant.
4. In which type of variation do extremes of a character have clear cut difference between them?
A. Genetic variation  B. Continuous variation.
C. Environmental variation.  D. Discontinuous variation.
5. Figure 2 shows a plant during an early stage of succession on a rock. To which division of kingdom plantae does the plant belong?
A. Bryophyte.  B. Gymnospermae.
C. Angiosperme.  D. Pteridophyta.
6. Through which blood vessels does deoxygenated blood leave the heart?
A. Pulmonary vein.  B. Vena cava.
C. Aorta.  D. Pulmonary artery.
7. Which sequence below shows the order of types of soil in terms of increasing water retention capacity?
A. Clay, loam and sand soil.  B. Loam, sand and clay soil.
8. Which of the following is the role of earlobes in hearing?
A. Involves cell division by meiosis.  B. Aves and Mammalia.
C. Eye ball moves inwards.  D. Myelin sheath.
9. Which stage of mitotic cell division is shown in figure 5 below?
A. Interphase II  B. Telophase I  C. Anaphase II  D. Metaphase I
10. The following are different activities of carbon cycle below?
A. Starch, amino acids, glucose and glycerol.
B. Amino acids, glucose, fatty acids and glycerol.
C. Glucose, proteins, fatty acids and glycerol.
D. Fatty acids, fats, glucose and amino acids.
11. Which of the following is consistent with gaseous exchange in fish? Water;
A. enters the opened mouth when the flow of buccal cavity raises
B. leaves the mouth when the flow of buccal cavity lowers
C. enters gill chambers when pressure in the chambers is lower than pressure in the buccal cavity
D. moves out of gill chambers when pressure in the chambers is lower than pressure in the water body
12. Fraternal twins result from;
A. two eggs fertilised by the same sperm cell.
B. an egg fertilised by two sperm cells.
C. a fertilised egg splitting into two.
D. Two eggs fertilised by different sperm cells.
13. Figure 4 below shows different activities of carbon cycle. Which stage represents photosynthesis?
A. K  B. L  C. M  D. N
14. Which of the following is the importance of a caudal fin in a bony fish?
A. Detects vibration in water.
B. Propels the fish forward.
C. Prevents instabilities.
D. Regulates the depth of a fish.
15. Which part of the neuron transports impulse towards the cell body?
A. Node of Ranvier.  B. Axon.
C. Dendron.  D Myelin sheath.
16. Which of the following are used as building units of complex food nutrient?
A. Starch, amino acids, glucose and glycerol.
B. Amino acids, glucose, fatty acids and glycerol.
C. Glucose, proteins, fatty acids and glycerol.
D. Fatty acids, fats, glucose and amino acids.
17. When bright light is flashed into the human eyes, A. Pupil decreases in size
B. The eye lens contracts.
C. Eye ball moves inwards.
D. Dilatory muscles contract.
18. Which of the following classes of chordata carry out internal fertilisation?
A. Mammalia and Pisces.
B. Aves and Mammalia.
C. Reptilia and Aves.
D. Amphibia and Pisces.
19. Which stage of meiotic cell division is shown in figure 5 below?
A. Interphase II  B. Telophase I  C. Anaphase II  D. Metaphase I
20. The following are different activities of homeostatic control of blood glucose level;
A. Detection of deviation from the norm.
B. Increase of breakdown of glucose.
C. Formation of glycogen from glucose.
D. Secretion of insulatory system.
E. Conversion of non-carbohydrates to glucose.
Which of the following activities is performed by the pancreas?
A. I and II.  B. I and IV.
C. II and V.  D. IV and V.
21. Which of the following is not true of asexual reproduction in organisms?
A. Involves cell division by meiosis.
B. Offspring are identical.
C. Requires only one parent.
D. A fast means of multiplication.
22. Figure 6 shows a vertebra. Which region of the vertebral column is it found? A. Thoracic region.  B. Neck region.
C. Abdominal region.  D. Sacral region.
23. In unicellular organisms, external digestion occurs; A. outside the body  B. outside the cytoplasm
C. inside the body  D. inside the cytoplasm
24. Which of the following patterns of distribution of organisms is caused by accumulation of resources at specific sites of the ecosystem?
A. R and U.  B. Rand S.
C. Aorta.  D. Pulmonary artery.

SECTION B
25. During an experiment, a pair of potato cubes from two different sets of A (1cmX1cmX1cm) and B (5cmX5cmX5cm) were placed in a beaker of potassium permanganate incubated at 25°C for 30 minutes. After which a cross section of the cubes were obtained and the length of penetration of potassium permanganate was measured. The experiment was repeated at different temperature using different pairs of potato cubes from sets A and B. The results obtained are presented in the table below:

<table>
<thead>
<tr>
<th>Temperature/°C</th>
<th>Length of penetration in A/mm</th>
<th>Length of penetration in B/mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>35</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>45</td>
<td>3.0</td>
<td>2.5</td>
</tr>
<tr>
<td>55</td>
<td>4.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

- a) Plot a graph to represent the results obtained in the experiment.
- b) Suggest conclusions made from the experiment.
- c) Explain the difference in results;
   i) between cubes from set A and B.
   ii) at different temperature.
- d) State;
   i) Which one would need a transport system if cubes from A and B were living things.
   ii) the importance of incubation in the experiment.
- e) Suggest any possible sources of errors during the experiment.

26. (a) Differentiate between; i) commensalism and parasitism.
   ii) A parasite and a host in a parasitic relationship.
   (b) (i) State the cause of malaria.
   (ii) Describe the mode of transmission of malaria.
   (iii) Outline control measures for malaria.

SECTION C
27. (a) Explain the following observations in organisms.
   i) Plants do not have an excretory system.
   ii) Human beings pass out a lot of urine on cold days.
   iii) Desert animals have long loop of Henle.
   (b) (i) State the advantages of endotherms over ectotherms.
   (ii) Describe the behavioral response of organisms to decrease in temperature.
   (iii) Outline the reasons for each of the following during experiments on photosynthesis.
   (iv) Destarching.  ii) Use of a potted plant.
   (b) Describe an experiment to investigate the need for chlorophyll in photosynthesis.

...
ENGLISH LANGUAGE SOLUTIONS (OENG004)

PAPER TWO

2A Passage

2.1 Truck drivers are regarded as unsung heroes because they are the messengers of regional trade, but this important duty requires little or no recognition at all.

2.2 They are caught between a rock and hard place because they are confused on how to balance the freedom and rights of the integration pillars and lockdown standard operating procedures without compromising health and trade.

2.5 (i) Experts think that regional heads of state need to agree on standard operating procedure for testing in the EAC.

(i) They think regional heads of state should assign joint testing teams in each territory.

2.4 (i) President Yoweri Museveni asserts that an hour’s difference in travel involving interaction before entry through a border is enough transit time for new infections.

(ii) They cannot stay put in their trucks with controlled interaction because one cannot stop them from disembarking to refuse or answer nature’s call. That’s human.

2.5 (i) mitigate – reduce/ lessen/ decrease

(ii) skyrocketed – increased suddenly or extremely/ shot up/ surged

3A

3.1 She was too grief-stricken to be understood by anybody.

3.2 He met neither of the women.

3.3 Kanda asked Yoweri why he hadn’t ironed his school uniform because/as/ since he did not look smart.

3.4 I would rather you didn’t come to such a place.

3.5 So real was the play made that most of us forgot we were in the theatre.

3.6 I had the opportunity, I would have attended the seminar.

3.7 Not even thorough washing removed the stains.

3.8 I succeeded in controlling my tempers.

3.9 The patient was made to take medicine by the Nsamba nurse.

3.10 Rarely did I find any problem with him.

3B

3.11 C

3.12 A

3.13 B

3.14 A

3.15 B

3.16 A

3.17 D

3.18 A

3.19 D

3.20 D

ENGLISH LANGUAGE QUESTIONS (OENG005)

PAPER ONE

SECTION A

1. Read the following passage and answer the questions that follow.

With the invention of television, many forms of entertainment have been replaced. Ideally programmes like television serials and world news have removed from us the need to read books or papers, to listen to radios or even to watch movies. In fact, during the 1970s, when televisions were first introduced, cinema theatres suffered great losses as many people chose to stay in the comfort of their homes to watch their favorite programmes. Indeed, the television brings the world into our house. Hence, by staying at home and pressing some buttons world happenings are immediately presented before us. Children nowadays develop faster in language, owing to the early exposure to television programmes. At such a tender age, it would be difficult for them to read books or papers. Thus, television programmes are a good source of learning for them. Furthermore, they are usually too busy or too篇long for entertainment. Surrounded by the comfort of their home, the family can have a chance to get together and watch their favorite television programmes. Of course, we should not be too carried away by the advantages of the television and overlook its negative points. Watching television programmes takes away our need to read. Why bother to read the papers when we can hear them from the television news reports? Why read books when exciting movies are screened? The lack of reading is unhealthy, especially to younger children as they will grow up only with the ability to speak but not write. I have a neighbor whose six-year-old child can say complete sentences like “I like cats”, but when told to write out the sentence, is unable to do so. Not only are the writing skills of children affected, their thinking capacities are also handicapped. Television programmes remove the need to think. The stories, ideas and facts are woven in the way television planners wanted. Exposure to such opinions and ideas will hinder the children’s analysing ability. Despite the disadvantages of watching television programmes, personally, I think that choosing the ‘middle path’, which is to do selective television viewing and not over indulging in the habit should be the best solution to reconcile both the merits and demerits of owning a television.

QUESTION

In not more than 120 words, summarise the advantages and disadvantages of owning a television.
PHYSICS: PAPER TWO SOLUTIONS (OPHY004)

### Question 2.1
1. Why does man alter the face of the earth?
2. What harm has man done by destroying the habitat of wildlife?
3. What is the only preservation made by man?
4. How does every form of human activity affect the habitat of wildlife?
5. Explain the possible meanings of the following expressions and terms as used in the passage.
   - i) predators
   - ii) prey
   - iii) till
   - iv) equilibrium
   - v) checks and balances

### Question 3.20
- A. will he
- B. does he
- C. doesn't he
- D. can he

### Question 3.4
- A. lodest
- B. most loud
- C. more loud
- D. louder

### Question 3.11
- A. more
- B. most
- C. among
- D. twice

### Question 3.14
- A. between B. before C. both D. twice

### Question 3.15
- A. of, in, from B. in, of, from C. from, of, in D. from, in, of

### Question 3.16
- A. beside B. before C. both D. besides

### Question 3.17
- A. to, too B. two, to C. too, to D. too, too

### Question 3.18
- A. will he
- B. does he
- C. doesn’t he
- D. can he

### Question 3.19
- A. than B. to C. before D. too

### Question 3.20
- A. will he
- B. does he
- C. doesn’t he
- D. can he

### Experiment to determine the Specific Latent Heat of Fusion of Ice by the method of mixtures

1. **Apparatus:**
   - Calorimeter
   - Stirrer
   - Thermometer
   - Pure melting ice
   - Warm water

2. **Procedure:**
   1. Weigh a calorimeter with its stirrer, let the mass be $m_1$.
   2. Pour water in the calorimeter and weigh it again with its contents.
   3. Find the mass, $m_2$, of the water added from; $m_2 = m - m_1$.
   4. Warm the calorimeter with its contents to a few degrees, say $10^\circ \text{C}$, above room temperature and then fit it in its jacket.
   5. Record the initial temperature, $\theta_1$ of the water in the calorimeter.
   6. Add small pieces of pure dry ice at $0^\circ \text{C}$ and stir the mixture gently until all the ice melts.
   7. When the temperature is as far below room temperature as it was above, (such procedure compensates for any heat transfer that would affect the accuracy of the result).
   8. Read and record the final temperature, $\theta_2$ of the mixture in the calorimeter.
   9. The calorimeter is weighed once again to find the mass, $m$, of the ice that was added.

### Archimedes' Principle
- The working of a rocket engine
- Why you feel pain when you punch a wall
- Inertia and its effects
- The other laws of motion etc.

### Archimedes' Principle States
- When a body is wholly or partially immersed in a fluid, it experiences an upthrust equal to the weight of the fluid displaced.

### Specific Latent Heat of Fusion of Ice
- The calorimeter is weighed once again to find the mass, $m$, of the ice that was added.
Critical angle is the angle of incidence in an optically dense medium for which the angle of refraction is 90°.

**Read about** determination of the Specific Latent Heat of Fusion of Ice by the electrical method.

(c). Heat lost by steam = heat gained by calorimeter + heat gained by water

Note: Steam loses heat in two steps and these are;
(i). Cooling from steam to water at 100°C,
(ii). Cooling from 100°C to 60°C

\[
\begin{align*}
m_i' & = m_i + m_w = (100 - 60) m_i + 60 m_w
\end{align*}
\]

\[
\begin{align*}
l_i' & = (m_i + m_w)(0 - 0) - m_i(0 - 0)
\end{align*}
\]

(d). It is because of the drop in atmospheric pressure. A liquid is said to be boiling when its saturated vapour pressure (SVP) is equal to the atmospheric pressure (external pressure) and boiling point is the temperature at which the SVP of a liquid is equal to the atmospheric pressure. Such low pressure is very easy to acquire making it possible to have water boil even below 100°C. This shows that boiling point of a liquid (such as water) depends on altitude i.e. drops as you climb higher on a mountain and raises as you move towards sea level.

**Read about:** applications of critical angle and total internal reflection

(c). Note:
(i). To use the graphical method, you must use a proper convenient scale. A good scale can be chosen using the figures (1.2, 2.5, 4.5 and their multiples).
(ii). Make conversion of the given lengths to suit your graph paper.
(iii). In ray diagram construction, the following rules are considered:
- A ray that is originally parallel and close to principal axis (paraxial ray) is refracted through F.
- A ray that passes through F is refracted parallel to the principal axis.
- A ray that passes through the pole of the lens passes un-deviated.

Let 1cm on the graph represent 5cm

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Actual length(cm)</th>
<th>Scale length(cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object height</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Object distance</td>
<td>45</td>
<td>9</td>
</tr>
<tr>
<td>Focal length</td>
<td>15</td>
<td>3</td>
</tr>
</tbody>
</table>

(ii) The image formed is at 22.5cm from the lens. Note: this is obtained by counting the number of small squares and multiplying this number by the scale we used.

(iii) The height of the image is 2.5cm

\[
\begin{align*}
magnification & = \frac{\text{image distance}}{\text{object distance}} = \frac{22.5}{45} = 0.5
\end{align*}
\]

OR

\[
\begin{align*}
magnification & = \frac{\text{image height}}{\text{object height}} = \frac{2.5}{5} = 0.5
\end{align*}
\]

4. (a)(i). Wave front is the line or surface perpendicular to the direction of the wave where all points are in phase.

(ii). Wave length is the distance a wave covers in a complete cycle. Or: Wave length is the distance between two successive points in phase.

**Also read about:**

- Amplitude, frequency, period, crest, trough, rear fraction, nodes, antinodes, standing/stationary waves, progressive waves, longitudinal waves, transverse waves, mechanical waves, electromagnetic waves etc.

(b). (i). Critical angle is the angle of incidence in an optically dense medium for which the angle of refraction in a rare medium is 90°.
The cathode is heated to emit electrons by thermionic emission using a low voltage supply. A high p.d applied across the anode accelerates the emitted electrons from the cathode towards the anode. When the electrons strike the metal target embedded in the anode, about 99% of their kinetic energy is converted to heat energy and the rest (like 1%) is converted to X-rays.

Introducing logarithms to base 10 on both sides gives:

\[
\log_{10} 0.0625 = n \log_{10} 0.5
\]

\[
n = \frac{\log_{10} 0.0625}{\log_{10} 0.5} = \frac{2}{3}
\]

So, the half-life \( t \) of the sample is given by:

\[
t = \frac{80}{2} = 40 \text{ days}
\]

The sample of mass \( M_n \) decays with a half-life of \( t_n \) is given by:

\[
M_n = M_0 \left(\frac{1}{2}\right)^n
\]

where \( n = \frac{t}{t_n} \)

(c) Radioactivity uses can be categorised as:

(i) Industrial uses:
- tracing leakages in pipe lines such as oil pipe lines.
- detecting faults in thickness of metal sheets in welded joints.
- food preservations.
- detecting smoke.

(ii) Medical uses:
- used to treat cancerous cells (radiotherapy).
- Used to sterilise medical surgical equipments.
- Used to locate broken bones.

(iii) Archeological uses
- Used carbon dating.

(iv) Biological uses
- Used to study the uptake of fertilisers by plants.
- Used to sterilise insects, hence eliminating pests that destroy crops.

(b) Identify an object and show where the forces act on it.

Method 1:

Mass remaining = 96g - 90g = 6g

(i) The half-life of the sample

\[
t = \frac{80}{2} = 40 \text{ days}
\]

Method 2:

\[
\begin{array}{|c|c|}
\hline
\text{Mass remaining (g)} & \text{Time taken (days)} \\
\hline
96 & 4t_n = 80 \text{ days} \\
48 & t_n = 80 \div 4 \text{ days} \\
24 & t_n = 80 \div 4 \\
12 & t_n = 80 \div 4 \\
6 & t_n = 80 \div 4 \\
\hline
\end{array}
\]

(c) Ohm’s law states that the current flowing through a conductor is directly proportional to the potential difference across its ends provided temperature and other physical conditions kept constant. i.e \( V \propto I \)

Note: Conductors that obey Ohm’s law are known as ohmic conductors while those that don’t obey the law are called non-ohmic conductors.

7. (a) Centre of gravity is the point on a body where its whole weight seems to act. OR: It is a point at which the whole mass or weight of the body may be considered to be concentrated or to act if the body is situated in a uniform gravitational field.

(ii) A body is said to be in unstable equilibrium when its centre of gravity is in the highest position. If the body is slightly displaced or tilted, its centre of gravity lowers and does not return to its original position after the displacement.

(c) A uniform beam is pivoted at its centre as shown below.
From Archimedes principle, weight of liquid displaced = 0.008 kg.

Weight of Q in air = weight of liquid displaced + weight of Q in liquid

Taking moments about the pivot,

Let m = mass of Q while in the liquid.

\[
\begin{align*}
180 & \times 30 = m \times 40 \\
1000 & \quad 100 \\
0.18 \times 0.3 & = 0.4 \\
m & = 0.135kg
\end{align*}
\]

Weight of Q in liquid = mg = 0.135 \times 10 = 1.35 N

Similarly, weight of liquid displaced = 0.008 \times 10 = 0.08 N

\[
\begin{align*}
\therefore \text{Weight of Q in air} & = 0.08 + 1.35 = 1.43 N
\end{align*}
\]

8. (a) Parallax’s law of electromagnetic induction states that the magnitude of the induced emf is directly proportional to the rate of change in the magnetic flux linking the circuit.

Read about the Lenz’s law.

(ii) A generator is a machine that converts mechanical energy to electrical energy. AC and DC generators work on a principle that current is induced in a coil when it rotates in a magnetic field.

**DC generator**

Structure: The generator consists of a coil placed in a magnetic field and the ends of the coil are connected to the commutators, which are in contact with carbon brushes.

How DC generator works:

- A mechanical upward force is applied on side AB of the coil. This makes the coil to rotate in a direction as shown in the figure above, i.e. CD moves downwards while AB moves upwards.
- As a result of rotation, the magnetic flux linking the coil changes and an emf is induced in it.
- The induced emf causes a current to flow in it and according to Fleming’s right hand rule, the induced current will flow in the direction ABCD.
- When the coil is vertical, the brushes will be touching the gaps implying that no current will be flowing in the coil.
- When the coil passes over the vertical position, after half the rotation, the commutators change contacts. C replaces the position of C, and vice versa.
- The forces on the sides of the coil change, thus the current in the coil is reversed. The current flowing through the load thus continues to flow in the same direction.
- Hence the direction of the induced emf doesn’t change in the external circuit during one complete revolution of the amateur coil. The output of the generator is unidirectional.

Graph of induced emf against time in a D.C. generator

**Note:**
- The induced emf and hence current are maximum when the plane of the coil is horizontal. This is because cutting between the coil sides and the magnetic field lines are greatest.
- The induced emf and hence current are minimum (zero) when the plane of the coil is vertical. This is because there is no cutting between the coil sides and the magnetic field lines.

Read about operation of AC generator.

(iii)

- Increasing the strength of a magnet
- The number of turns in the coil
- The speed which the magnet moves
- (b) Laminated core step down transformers.

(c) (i) Current flowing through the motor

- (i) Power = 1V
- (ii) Number of turns in the secondary (N2)

\[
\begin{align*}
I & = 200 = 2.5A \\
N2 & = V x N1 = 80 \times 200 \\
N2 & = 640
\end{align*}
\]

Read about the operation of transformers.

(d) (i) A kilowatt hour (KWh) is the amount of electrical energy consumed when an appliance rated 1 Kilowatt is used for 1 hour.

Total power consumed by 4 bulbs

\[
\begin{align*}
= 200 \times 4 = 0.2 \times 4 = 0.8kW
\end{align*}
\]

Number of electrical units consumed

\[
\begin{align*}
= kWh = kW \times h = 0.8 \times 10 = 8 \text{ units}
\end{align*}
\]

Electrical cost = number of units used \times unit cost

\[
\begin{align*}
= 8 \times 540 = sh 4320
\end{align*}
\]

**PHYSICS PAPER ONE QUESTIONS (OPHY005)**

**SECTION A**

1. Which of the following is/are correct about black surfaces?
   (i) They are good radiators of heat
   (ii) They are poor radiators of heat.
   (iii) They are good absorbers of heat.
   (iv) They are poor absorbers of heat.
   A. (i) and (iii) B. (i) and (iv) C. (ii) D. (ii) and (iv)

2. How does addition of salt to water affect it?
   (i) It lowers the melting point
   (ii) It raises the melting point.
   (iii) It lowers the boiling point.
   (iv) It raises the boiling point.
   A. (i) and (iii) B. (i) and (iv) C. (ii) D. (ii) and (iv)

3. A car of mass 3000kg starts from rest and accelerates to a speed of 60ms⁻¹ in 5s. What is the force applied on the car?
   A. 45000N B. 3000N C. 60N D. 36000N

4. A displacement node on a standing wave is a point of:
   A. maximum displacement
   B. minimum displacement
   C. varying displacement
   D. average displacement.

5. The temperature at which all heat energy is removed from a substance is called:
   A. Kelvin temperature
   B. Celsius temperature
   C. absolute zero temperature
   D. freezing temperature

6. A car is uniformly accelerated from rest and after 10s it acquires a speed of 30ms⁻¹, the distance covered during this time is:
   A. 100m
   B. 150m
   C. 200m
   D. 250m

7. A floating body:
   A. displaces its own volume of fluid
   B. displaces more than the weight of fluid
   C. has weight less than that of the fluid displaced.
   D. has weight greater than that of the fluid in which it floats.

8. White light is separated into component colours by a prism due to:
   A. interference
   B. refraction
   C. reflection
   D. diffraction.

9. A block is pulled with a force of 30N at a constant velocity of 6ms⁻¹ for a time of 2s, the power developed is:
   A. 600W
   B. 300W
   C. 200W
   D. 15W

10. A current of 3A flows through a resistor of 6Ω when a battery of e.m.f 21V is connected across it. What is the internal resistance of the battery?
    A. 0.67Ω
    B. 1.00Ω
    C. 2.00Ω
    D. 3.50Ω

11. Electron beam

   Figure 1 shows a beam of electrons incident midway between two charged metal plates. Which of the following is correct? The beam:
   A. passes through the plate undeflected
   B. moves perpendicular to the plate.
   C. is deflected towards the negative plate.
   D. is deflected towards the positive plate.

12. The transformer cores are laminated in order to:
    A. reduce eddy current
    B. decrease electric resistance
    C. strengthen the magnetic flux.
    D. improve the magnetic flux linkage.

13. 10kg of water falls from a height of 40m every second onto a turbine to produce electricity. The maximum power that can be generated is:
    A. 2.5x10⁻⁴W
    B. 4.0x10⁻⁴W
    C. 4.0x10⁻⁴W
    D. 2.5 x 10⁻⁴W

14. Forces of 50N, 7N, 30N and 7N act on a body as shown in figure 2. In which direction does the body move?
    A. Upwards
    B. Downwards
    C. To the right
    D. To the left

15. The rate at which electric charge flows in circuit is measured in:
    A. watts
    B. volts
    C. amperes
    D. coulombs.

16. Cathode rays are:
    A. Electromagnetic waves
    B. Streams of X-rays
    C. Protons emitted by a hot cathode
    D. Streams of electrons moving at high speed.

17. The wavelength of a progressive transverse wave is defined as the:
    A. Height of a crest
    B. Distance between a trough and a crest
    C. Distance between two successive crests.
    D. Distance between any two crests.
18. A current of 6A flows for 2 hours in a circuit. Calculate the quantity of electricity that flows in this time.
   A. 3C
   B. 12C
   C. 720C
   D. 432000C

19. The following are SI units of fundamental quantities except:
   A. Kilogram
   B. Metre
   C. Weight, displacement, acceleration.
   D. Specific heat capacity, power, time.

20. Which one of the following sets includes only vector quantities:
   A. Mass, velocity, speed.
   B. Energy, electric field, momentum.
   C. Weight, displacement, acceleration.
   D. Specific heat capacity, power, time.

21. 

![Diagram](image)

Forces of 40N, 20N and 50N are applied on a metre rule supported on a knife edge as shown in figure 3. The metre rule will

A. Turn in anti-clock wise direction
B. Turn in a clock wise direction
C. Oscillate
D. Balance.

22. The refractive index of glass is 1.5. The angle of refraction in glass for a ray of light incident at 30° is:
   A. 19.5°
   B. 42.0°
   C. 45.0°
   D. 48.0°

23. Which of the following does not affect the rate at which a gas diffuses through a partition?
   A. Temperature of the gas
   B. Size of gas molecules
   C. Volume of the gas
   D. Size of the partition

24. 

![Diagram](image)

Figure 4 shows magnetic field lines between two magnetic poles. The poles A, B, C and D respectively are:

A. South, north, north and south
B. North, south, south and north
C. North, north, south and north
D. South, south, north and south.

25. The image formed by the optical system of the human eye is:
   A. the same size as the object
   B. erect and real
   C. inverted and real
   D. erect and virtual.

26. The X and Y-plates in a cathode ray oscilloscope make up the

A. Electron gun
B. Deflection system
C. Focusing system
D. Accelerating system

27. Which of the following destroys a magnet?
   (i) Heating it
   (ii) Alternating current
   (iii) Dropping it
   (iv) Greasing it
   A. (i) and (iii) only
   B. (ii) and (iv) only
   C. (ii) and (iii) only
   D. (i), (ii) and (iii) only

28. Which one of the following statements are correct about electrostatic field lines?
   (i) run from north to south
   (ii) are closed loops
   (iii) run from positive to negative
   (iv) run from negative to positive
   A. (i) and (ii)
   B. (i) and (iii)
   C. (ii) and (iv)
   D. (iii) and (iv)

29. A car moving at 4ms⁻¹ hits a stationary car of the same mass and the two cars move together, what is their common velocity?
   A. 1ms⁻¹
   B. 2ms⁻¹
   C. 3ms⁻¹
   D. 4ms⁻¹

30. Which of the following light combinations will give white light?
   A. Cyan + blue and magenta + red
   B. Yellow + red and magenta + blue
   C. Cyan + green and yellow + blue
   D. Cyan + green and yellow + red

31. An electric kettle is rated 240V, 2640W. The best fuse to use in its plug is
   A. 9A
   B. 11A
   C. 13A
   D. 15A

32. Surface tension is a demonstration of;
   A. adhesive forces
   B. cohesive forces
   C. collision among molecules
   D. random motion of molecules

33. The mass of a radioactive element is 96g, after 4 minutes the mass is 3g. What is the half-life of the element?
   A. 19.50
   B. 20.50
   C. 19.50
   D. 20.50

34. Resistors of Ω and 2Ω are connected in parallel across a voltage source. If the current in the 2Ω resistor is 0.8A, what will current in the 1Ω resistor be?
   A. 0.2A
   B. 0.2A
   C. 0.7A
   D. 3.2A

35. Which of the following statements is correct?
   (i) White surfaces reflect all colours
   (ii) Red surfaces absorb all colours and reflect red
   (iii) Black surfaces appear black because they reflect all colours
   (iv) Yellow surfaces absorb red
   A. (i) and (ii)
   B. (ii), (iii) and (iv)
   C. (i), (ii), (iii) and (iv)
   D. (iii) and (iv)

36. When a stone is projected up, it has:
   A. Zero potential energy when it is moving
   B. Maximum kinetic energy when at the highest position
   C. Maximum potential energy when at rest on the ground.
   D. Maximum potential energy at the highest point of its flight.

37. A little crystal of copper sulphate was carefully put at the bottom of a beaker containing water. In a few days, all the water had a uniform bluish colour. The process by which this occurs is:
   A. Convexion
   B. Osmosis
   C. Diffusion
   D. Dispersion

38. The half-life of a radioactive element is 2 minutes. What fraction of initial mass is left after 8minutes?
   A. ½
   B. ¼
   C. ¼
   D. ⅛

39. The results of rubbing a glass rod with silk and separating them is;
   A. a negative charge on the rod and an equal positive charge on the silk.
   B. equal amounts of positive charges on both.
   C. a positive charge on the rod and an equal negative charge on the silk.
   D. no charge on both the rod and the silk.

40. A mass of 0.2kg produces an extension of 8cm in a spring. The force required to produce an extension of 6cm is;
   A. 24.0N
   B. 27.0N
   C. 1.5N
   D. 0.8N

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**BIOLOGY, PHYSICS AND GENERAL PAPER TOMORROW**