

# HOME SCHOOLING MATERIAL

**PASS O' LEVEL**

**BIOLOGY, PHYSICS &  
ENGLISH LANGUAGE**



## YOUR GUIDE AWAY FROM SCHOOL

### BIOLOGY PAPER ONE SOLUTIONS (0B10004)



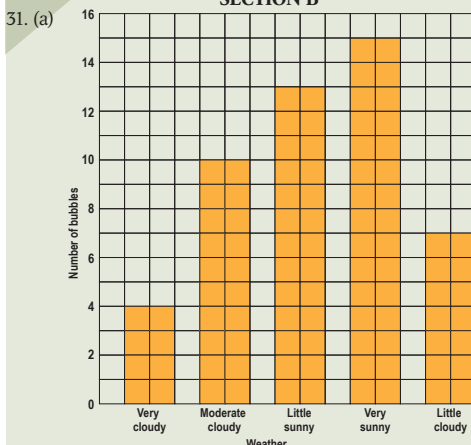
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- B;** the alimentary canal is a part through which food passes. The liver and pancreas are parts of digestive system, but food does not pass through them.
- C;** it has numerous segments with two pairs of limbs in a segment.
- B;** the population size of the prey is always higher than that of predators.
- A;** a ligament joins bone to bone, while tendons join muscle to bone.
- B;** it has one leaf at the node, with adjacent leaves on opposite sites.
- B;** cane sugar is sucrose, while maltose is found in high concentration in malt. Glycogen is not stored in plants but in animals, while starch is found in high concentrations in all plants.
- D;** it has two sutures. Follicle has one suture, schizocarp has many transverse sutures, while capsule many longitudinal sutures.
- A;** because weight of humus 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%.
- C;** as energy can be produced without oxygen and activation of enzymes is done by water.
- B;** it is a canine due to its wedge-shaped crown used for tearing food. A has a chisel shaped crown.
- D;** As recessive alleles' the phenotypic effects are suppressed in heterozygous condition.
- A;** it is caused by filarial worms that are spread by mosquitoes when they bite. It is a painful swelling.
- D;** ADH increases the rate of re-absorption of water from glomerular filtrate, hence little but concentrated urine is produced.
- B;** the colour of the flowers formed was absent in both parents.
- 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.
- C;** puberty is the initial change at the adolescent stage, mostly physical that make an organism able to produce gametes.
- B;** it transports deoxygenated blood from the right ventricle to the lungs.
- D;** ethanol is produced in anaerobic respiration in yeasts and plants, while pyruvate is also called pyruvic acid.
- 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.
- D;** it is a reflex action and all reflex actions are involuntary.
- A;** adrenal glands are found above the kidneys.
- 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.
- A/C;** growth is increase in dry mass that is permanent and every time size increases irreversibly, it is because permanent dry mass has been added.
- D;** note that lichens are not plants. During succession, the first plants are mosses followed by ferns, grasses, shrubs, before big trees can develop.
- A;** asexual reproduction in amoeba is similar to mitosis, which is termed in reproduction as binary fission.
- B;** gynoecium is the female part of a flower and consists of stigma, style and ovary only.
- B;** taxis is the movement of the whole organism. Chemo means response to chemicals although the chemicals from one direction.
- C;** alternative A is an adaptation, not a response, while B is a response to decrease in temperature.
- C;** the toad carries out respiration producing carbon dioxide that turns the lime water milky.
- D;** the movement of solute materials from a region of high

#### SECTION B



- (b) Oxygen gas formed after the plant carrying out photosynthesis.
- (c) (i) Very sunny.  
(ii) Very cloudy.
- (d) (i) The more sunny, the more sunlight available, providing large amounts of energy that cause much reactions of water and carbon dioxide. Often, the temperature is high during sunny conditions, providing optimum temperature for enzyme controlled reactions of photosynthesis.  
(ii) The cloudier, the lower the light intensity, hence little energy is available, causing low rates of reactions of water and carbon dioxide to form glucose and oxygen. In cloudy conditions, temperatures are low, reducing the rate of activity of enzymes involved in photosynthesis.
- (e) (i) - Presence of large lamina, increasing surface area.  
- A lot of chlorophyll that absorbs large amounts of sunlight energy.  
- Transparent cuticle to allow direct light penetration to mesophyll cells.  
- Thin lamina, shortening penetration distance of sunlight energy.  
(ii) - Numerous stomata on the leaf allows more of carbon dioxide to be absorbed.  
- Large and numerous intercellular air spaces in spongy mesophyll layer.
32. (a)(i) The thicker the medulla, the more concentrated the urine is.  
(ii) The thicker the medulla, the drier the habitat.  
(b) (i) Thick medulla implies longer loop of Henle. This increases surface area for re-absorption of water from glomerular filtrate into blood, hence more water is re-absorbed. This results in formation of little but very concentrated urine.  
(ii) Thicker medulla to ensure much conservation of water by re-absorption from glomerular filtrate due longer loop of Henle.  
(c) (i) Dehydration due to retention of little water during urine formation.  
(ii) Retention of much water in the body due to high reabsorption rate.
33. (a)
- |   | Gonadotrophin releasing hormone (GnRH) | Low levels of progesterone in blood                   |
|---|--|---|
| A |  |   |
| B | Follicle stimulating hormone (FSH)     | Gonadotrophin releasing hormone from the hypothalamus |
| C | Luteinising hormone                    | High levels of oestrogen in blood                     |
- (b) B  
(c) (i) Inhibits secretion to prevent growth of a follicle during pregnancy.  
(ii) Inhibits secretion to prevent any ovulation from taking place.  
(d) Ovary and also secretes progesterone.

#### SECTION C

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 or shelter.  
- Predators – reduce the size of a population for food.  
- Availability of space/overcoming effects feeding patterns and behaviour  
- Diseases and epidemics.  
- 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 bush.  
- 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;  
$$\text{Population size} = \frac{R1 \times R2}{R3} \text{ Rabbits}$$
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 lungs 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 breath even with the head in water.

37. (a)

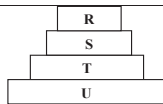
| Stimuli              | Receptor        |
|----------------------|-----------------|
| Light                | Eye             |
| Sound                | Ear             |
| Taste                | Tongue          |
| Smell                | Olfactory       |
| Temperature          | Thermoreceptors |
| Insulin and glucagon | Liver           |

- (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.

## BIOLOGY PAPER ONE QUESTIONS (0B10005)

### SECTION A

- Individuals of blood group O are universal blood donors because they have;
  - no antibodies
  - antibodies a and b
  - no antigens
  - antigens A and B
- Figure 1** shows an ecological pyramid of numbers in an ecosystem.



Which levels have the least and the highest number of organisms respectively?

- R and U.
  - R and S.
  - S and T.
  - T and U.
- Which of the following correctly shows the position and the type of growth caused by the meristem?

| Meristem | Location | Type of growth |
|----------|----------|----------------|
| A        | Apical   | Cambium        |
| B        | Lateral  | Cambium        |
| C        | Lateral  | Tip of root    |
| D        | Apical   | Tip of shoot   |

- In which type of variation do extremes of a character have clear cut difference between them?
  - Genetic variation
  - Continuous variation.
  - Environmental variation.
  - Discontinuous variation.

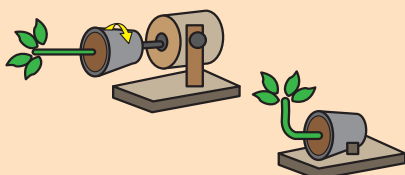
- Figure 2** shows a plant during an early stage of succession on a rock.



To which division of kingdom plantae does the plant belong?

- Bryophyte.
  - Gymnospermeae.
  - Angiospermeae.
  - Pteridophyta.
- Through which blood vessel does deoxygenated blood leave the heart?
    - Pulmonary vein.
    - Vena cava.
    - Aorta.
    - Pulmonary artery.
  - Which sequence below shows the order of types of soil in terms of increasing water retention capacity?
    - Clay, loam and sand soil.
    - Loam, sand and clay soil.
    - Sand, clay and loam soil.
    - Sand, loam and clay soil.
  - Which of the following is the role of earlobes in hearing?
    - Amplify sound vibrations.
    - Transmit sound vibrations to the inner ear.
    - Direct sound waves into auditory canal.
    - Initiate sound vibrations.
  - Which stage of the life cycle of the butterfly is most active and destructive?
    - Larva
    - Pupa
    - Adult
    - Nymph.
  - What is the percentage of offspring of blood group AB from homozygous parents of blood group A and B?
    - 100%
    - 50%
    - 25%
    - 12.5%

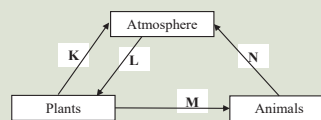
- Figure 3** below shows an experimental setup to investigate the effect of gravity on the plant shoot after 10 days of being set.



What conclusion was made after the experiment? The shoot

- is negatively geotropic
- responds to gravity
- is negatively geotropic
- is positively geotropic

- Which of the following is consistent with gaseous exchange in fish? Water;
  - enters the opened mouth when the flow of buccal cavity raises
  - leaves the mouth when the flow of buccal cavity lowers
  - enters gill chambers when pressure in the chambers is lower than pressure in the buccal cavity
  - moves out of the gill chambers when pressure in the chambers is lower than pressure in the water body
- Fraternal twins result from;
  - two eggs fertilised by the same sperm cell.
  - an egg fertilised by two sperm cells.
  - a fertilised egg splitting into two.
  - Two eggs fertilised by different sperm cells.
- Figure 4** below shows different activities of carbon cycle.



Which stage represents photosynthesis?

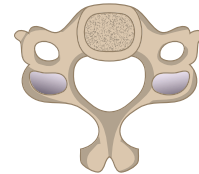
- K
  - L
  - M
  - N
- Which of the following is the importance of caudal fin in a bony fish?
    - Detects vibration in water.
    - Propels the fish forward.
    - Prevents instabilities.
    - Regulates the depth of a fish.
  - Which part of the neuron transports impulse towards the cell body?
    - Node of Ranvier.
    - Axon.
    - Dendron.
    - Myelin sheath.
  - Which of the following are used as building units of complex food nutrients?
    - Starch, amino acids, glucose and glycerol.
    - Amino acids, glucose, fatty acids and glycerol.
    - Glucose, proteins, fatty acids and glycerol.
    - Fatty acids, fats, glucose and amino acids.
  - When bright light is flashed into the human eyes,
    - Pupil decreases in size
    - The eye lens contracts.
    - Eye ball moves inwards.
    - Ciliary muscles contract.
  - Which of the following classes of chordata carry out internal fertilisation?
    - Mammalia and Pisces.
    - Aves and Mammalia
    - Reptilia and Aves.
    - Amphibia and Pisces.
  - Which stage of meiotic cell division is shown in **figure 5** below?



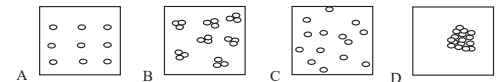
- Interphase II
  - Telophase I
  - Anaphase II
  - Metaphase I
- The following are different activities of homeostatic control of blood glucose level.
    - Detection of deviation from the norm.
    - Increase of breakdown of glucose.
    - Formation of glycogen from glucose.
    - Secretion of insulin and glucagon.
    - Conversion of non-carbohydrates to glucose.
 Which of the following activities is performed by the pancreas?
    - I and II.
    - I and IV.
    - II and V.
    - IV and V.
  - Which of the following is not true of asexual reproduction in organisms.
    - Involves cell division by meiosis.
    - Offspring are identical.

- Requires only one parent.
- A fast means of multiplication.

- Figure 6** shows a vertebra. Which region of the vertebral column is it found?



- Thoracic region.
  - Neck region.
  - Abdominal region.
  - Sacral region.
- In unicellular organisms, external digestion occurs;
    - outside the body
    - outside the cytoplasm
    - inside the body
    - inside the cytoplasm
  - Which of the following pattern of distribution of organisms is caused by accumulation of resources at specific sites of the ecosystem?



### SECTION B

- 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.

| Temperature/°C | Length of penetration in A/mm | Length of penetration in B/mm |
|----------------|-------------------------------|-------------------------------|
| 25             | 0.5                           | 0.2                           |
| 35             | 1.0                           | 0.5                           |
| 55             | 1.5                           | 1.0                           |
| 65             | 2.0                           | 1.5                           |
| 75             | 3.0                           | 2.2                           |
| 85             | 4.0                           | 3.0                           |

- Plot a graph to represent the results obtained in the experiment.
  - Suggest conclusions made from the experiment.
  - Explain the difference in results;
    - between cubes from set A and B.
    - at different temperature.
  - State;
    - Which one would need a transport system if cubes from A and B were living things.
    - the importance of incubation in the experiment.
  - Suggest any possible sources of errors during the experiment.
- (a) Differentiate between;
    - commensalism and parasitism.
    - a parasite and a host in a parasitic relationship.
 (b) (i) State the cause of malaria.
    - Describe the mode of transmission of malaria.
 (c) Outline control measures for malaria.

### SECTION C

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



## ENGLISH LANGUAGE SOLUTIONS (OENG004)



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### PAPER ONE

#### WRITING A DIALOGUE

A dialogue is a conversation between two or more people. As you write down a dialogue, take note of the following:

- It should have a heading, clearly showing characters and the gist of the matter.
- Much as it is a conversation, it should follow the basic rules of grammar. For examination purposes, limit informal language. Slang and colloquial language should be minimal or even not be used at all.
- If you are part of the dialogue, you can address yourself as me or use your name.
- Descriptive language is highly recommended to paint a mental picture of what you are describing.

#### SAMPLE DIALOGUE

**QUESTION:** Imagine you are a parent and your child has been expelled from school due to indiscipline. Write a dialogue that would take place between the two of you.

A DIALOGUE BETWEEN ME AND MY CHILD AFTER  
EXPULSION FROM SCHOOL

Precious: (*Hiding her face from me*) Good evening dad.

Me: (*Taking sometime before answering*) Good evening. You are the last person I expect to see. What are you doing here?

Precious: Er...er...it's just that...

Me: Will you speak up! (*I give her an angry fierce stare*) I hope it is not what I am thinking. Come here! (*I pull her by the ear like a little kitten*)

Precious: (*Screaming frantically*) Dad! Forgive me.

Me: (*I let go of her and she lands squarely on her knees*) Now tell me. Tell me before I kill you with my bare hands!

Precious: (*With a tremour in her voice*) They have expelled me for disrespecting teachers.

Me: I knew it! I knew it! I could tell from those eyes that you use only to doze in class and disrespect teachers instead of reading books!

Precious: I am sorry dad. I promise it won't happen again.

Me: Again? Again, did you say? This is the third time you are being expelled from schools. Your expulsions have become my breakfast, my lunch, my supper. Can you imagine I have just cleared your school fees?

Precious: Pardon me dad, please.

Me: (*After a quiet thoughtful moment, head in my arms*) Precious.

Precious: Yes dad.

Me: Precious.

Precious: Yes dad?

Me: How many times have I called you?

Precious: Two times dad.

Me: I think we shall not need the services of the househelp anymore. You will make a perfect replacement.

Precious: Dad, give me one more...

Me: Hey-hey-hey... (*I say signaling her to keep quiet*) Now get out of my sight because when I start beating you, they will get you out of my hands when you are a corpse.

Precious: (*She hastens to her room and cries herself to sleep*.)

### PAPER TWO

#### SUMMARY WRITING ROUGH COPY

THE IMPACT OF COMMERCIAL SUGARCANE GROWING ON HOUSEHOLDS IN BUSOGA REGION

~~It do increases does not increase household food adequacy among households.~~ Commercial sugarcane growing has left ~~There are~~ few varieties of food crops cultivated by sugarcane growing households. They are also short of money to supplement what they grow. ~~Sugarcane growing has resulted in the~~ There has been conversion of different land-use types to monoculture sugarcane plantations. They Households rent out land to rich outgrowers and the income is used to marry more women. ~~Food insecurity~~ Compromise of agro-diversity might expose them to food insecurity and malnutrition. They offer labour in exchange for food, borrow food and ration food and at times steal from their neighbours. Male-headed households ~~were the most insecure as they~~ disregarded food in favour of assets like houses, bicycles and clothes. Land owners were ~~for~~ the most food insecure since they rented it out for four harvest seasons in a bid to make quick money.

#### FAIR COPY

THE IMPACT OF COMMERCIAL SUGARCANE GROWING ON HOUSEHOLDS IN BUSOGA REGION

Commercial sugarcane growing has left few varieties of food crops cultivated by sugarcane growing households. They are also short of money to supplement what they grow. There has been conversion of different land-use types to monoculture sugarcane plantations. Households rent out land to rich outgrowers and the income is used to marry more women. Compromise of agro-diversity might expose them to food insecurity and malnutrition. They offer labour in exchange for food, ration or at times steal food from their neighbours. Male-headed households disregarded food in favour of assets like houses, bicycles and clothes. Land owners were the most insecure since they rented land out for four harvest seasons in a bid to make quick money.

(118 words)

#### 2A Passage

2.1 Truck drivers are regarded unsung heroes because they are the messengers of regional trade, but this important duty receives 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.

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

(ii) 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) Truck drivers cannot stay put in their trucks with controlled interaction because one cannot stop them from disembarking to refuel or answer nature's call. That's human.

2.5 (i) mitigate – reduce/lessen/decrease

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

(iii) stay put – remain in one place/ keep in one place

#### 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 Had I 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 Nsambya 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

*This question is compulsory. Use 180-200 words*

1. Assuming you are sick and your teacher is coming to check on you at your home. Give him or her directions to your home.

#### SECTION B

*Choose only ONE question and write a composition of 500-600 words*

2. Write a story ending: "...after what seemed like eternity, I was finally free to go back home.

3. "Lockdown to students should end now." Discuss.

4. Narrate an incident when you annoyed your parents so much and what happened as a result.

5. Why do you think cases of domestic violence have increased during the COVID-19 lockdown?

6. Write a story based on the proverb "He who kills by the sword dies by the sword".

7. "Pompous weddings should be abolished." Do you agree?

### PAPER TWO

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

With the invention of televisions, many forms of entertainment have been replaced. Lively 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 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, pronunciations by the newscasters, actors or actresses are usually standardised, hence young children watching these programmes will learn the 'right' pronunciations too. Owning a television is also extremely beneficial to working parents who are usually too busy or tired to take their kids out 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 the lack of thinking opportunities 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.

## From page III

### 2A. Read the following passage and answer the questions that follow:

Man is forever changing the face of nature. He has been doing so since he first appeared on the earth. Yet, all that man has done is not always to the ultimate advantage of the earth or him. Man has, in fact, destroyed more than necessary.

In his struggle to live and extract the most out of life, man has destroyed many species of wildlife; directly by sheer physical destruction and indirectly by the destruction or alteration of habitats. Some species may be able to withstand disruptions to their habitat, while others may not be able to cope.

Take the simple act of farming. When a farmer tills a rough ground, he makes it unsuitable for the survival of certain species. Every change in land use brings about a change in the types of plant and animals found on that land.

When man builds a new town, this means the total destruction of vast areas of farmland or woodland. Here, you have the complete destruction of entire habitats and it is inevitable.

It follows, therefore, that every form of human activity unavoidably upsets or changes the wildlife complex of the area. Man has destroyed many forms of wildlife for no reasonable purpose. They have also made many great blunders in land use, habitat destruction and the extermination of many forms of wildlife.

Man's attitude towards animals depends on the degree to which his own survival is affected. He sets aside protection for animals that he hunts for sport and wages a war on any other creature that may pose a danger or inconvenience to him. This creates many problems and man has made irreversible, serious errors in his destruction of predators. He has destroyed animals and birds which are useful to farmers as pest controllers. The tragedy that emerges is that all the killing of predators did not in any way increase the number of game birds.

Broadly speaking, man wages war against the creatures which he considers harmful, even when his warfare makes little or no difference to the numbers of those he encourages. There is a delicate predator and prey equilibrium involving also the vegetation of any area, which man can upset by thoughtless intervention. Therefore, there is a need for the implementation of checks and balances. The continued existence of these animals depends entirely on man and his attitude towards his own future.

#### Questions:

- Why does man alter the face of the earth?
- What harm has man done by destroying the habitat of wildlife?
- What is the only preservation made by man?
- How does every form of human activity affect the habitat of the wildlife?
- Explain the possible meanings of the following expressions and terms as used in the passage.
  - predators
  - preys
  - till
  - equilibrium
  - checks and balances

### 3A. For items 3.1 to 3.10 rewrite each sentence as instructed without changing the original meaning.

- The students of form four applauded the teacher of English for setting a rather easy English mock examination. (Rewrite beginning: The teacher.)
- Parents and teacher are not in any way accountable for the deteriorating of somewhat indolent students. (Rewrite beginning: In)
- The Kanaaba awkward corner has always been the scene of queer accidents. (Rewrite ending... corner.)
- It is strange she cannot take note of guidance given to her. (Rewrite ending---- strange.)
- Listening with understanding is believing with an understanding heart. (Rewrite using: to.)
- As soon as the bride and the bridegroom entered the hall, they dance started. (Rewrite using: using No sooner.)
- Ambition is one of those passions that is never satisfied. (Rewrite ending: ambition)
- The stranger said to the girl, "I know you and your mother." (Rewrite using the indirect speech.)
- Do not forget the enthusiasm of him who brought this movement so far. (Rewrite using: remember)
- Your son is capable of performing a lot better in the forthcoming national examinations. (Rewrite replacing: capable with able)

### 3B. For items (3.11 to 3.20) put a ring around the correct answer.

- She is a woman.....deep learning.....totally ignorant.....life.....manners.
  - but, of, and, of
  - of, of, and, but
  - and, but, of, of
  - of, but, of, and
- John is inferior.....Junior in intelligence.
  - too
  - to
  - than
  - more than
- The more they get.....they want.
  - more
  - most
  - the more
  - the most
- Polyandry still exists.....certain African tribes.
  - between
  - before
  - among
  - twice
- Man is entirely different.....other animals.....the utter helplessness.....his babyhood.
  - of, in, from
  - in, of, from
  - from, of, in
  - from, in, of
- .....his own children, there were present his nephews and nieces.
  - beside
  - before
  - both
  - besides
- He is.....much exhausted.....speak clearly.
  - to, too
  - two, to
  - too, to
  - too, too
- Her voice is.....than that of any other girl in the class.
  - loudest
  - most loud
  - more loud
  - louder
- The death of Id Amin Dada was prior.....Nelson Mandela's.
  - than
  - to
  - before
  - too
- He hardly ever speaks, .....?
  - will he
  - does he
  - doesn't he
  - can he

# PHYSICS PAPER TWO SOLUTIONS (OPHY004)

- (a)(i) **Velocity ratio** of a machine is the ratio of distance moved by effort to distance moved by load in the same time.  
(ii) **Pitch of a screw** is the distance covered by the screw in one complete turn.

#### OR

Is the length of the gap between any two successive treads of the screw.

- (b). (i)  $V.R = \frac{2\pi l}{pitch}$  ;  $l$  = length of the lever arm used to turn the screw  
 $\Rightarrow VR = \frac{2\pi \times 40}{2.0} = 40\pi$  as the velocity ratio.

**Note:** Velocity ratio has no units just like mechanical advantage.

(ii). They are used in;

- lifting heavy loads, such as building and construction material.
- lifts

- (c) (i). In a system of colliding bodies, the total momentum before collision is equal to the total momentum after collision provided no external force acts on them.  
(ii) Let the mass of the dog and that of the rider plus the bicycle be  $M_d$  and  $M_r$  respectively with initial velocities  $u_d$  and  $u_r$  respectively.

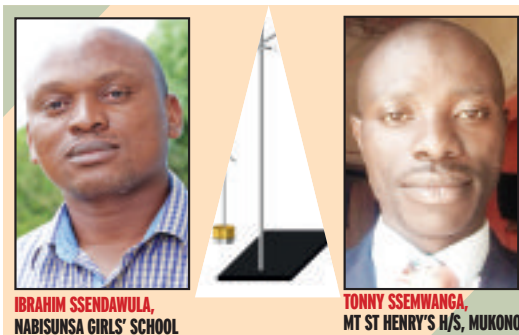
From the principle of conservation of linear momentum  
total momentum before collision = total momentum after collision

$$M_d u_d + M_r u_r = (M_d + M_r) V$$

$$(8 \times 20) + (84 \times 5) = (8 + 84) V$$

$$V = \frac{400}{86} = 7.14 \text{ ms}^{-1}$$

- (d). When a balloon is simultaneously untied and released, it will release air in one direction (backwards) as it moves in the opposite direction (forward). This is in accordance



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with Newton's third law of motion, which states that *action and reaction are always equal but opposite*. The movement of the air is due to action and the movement of the balloon backwards is due to reaction.

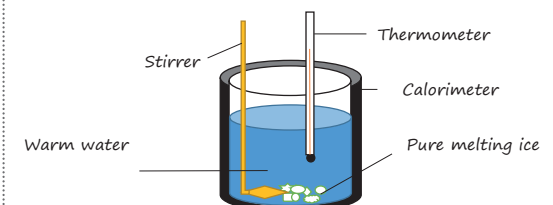
#### Also read about:

- 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.

- (e). (i). **Archimedes' principle** states that when a body is wholly or partially immersed in a fluid, it experiences an upthrust equal to the weight of the fluid displaced.  
(ii) Here we apply Archimedes' principle;  
upthrust = weight of water displaced = 200N  
Also; upthrust = weight in air – weight in water  
200N = 600N – weight in water  
Weight in water = 600N - 200N = 400N

- (a). **Specific latent heat of fusion** is the amount of heat required to convert one kilogram of a solid to liquid at a constant temperature.  
(b). Specific latent Heat of fusion of ice can be determined experimentally by either using the method of mixtures or the electrical method.

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



- Weigh a calorimeter with its stirrer, let the mass be  $m_{cw}$ .
- Pour water in the calorimeter and weigh it again with its contents,  $m_{cw}$ .
- Find the mass,  $m_w$ , of the water added from;  $m_w = m_c - m_{cw}$ .
- 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.
- Record the initial temperature,  $\theta_1$ , of the water in the calorimeter.
- Add small pieces of pure dry ice at  $0^\circ\text{C}$  and stir the mixture gently until when all the ice melts. I.e 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).
- Read and record the final temperature,  $\theta_2$  of the mixture in the calorimeter.
- The calorimeter is weighed once again to find the mass,  $m$ , of the ice that was added.



- Re-weigh the calorimeter and its contents to determine the mass of melted ice,  $m_1$ , from the formula;

$$m_1 = (m_1 + m_{cw} + m_c) - (m_{cw} + m_c)$$

Specific latent heat of fusion,  $l_f$ , is determined as shown below.

Heat lost by warm water + calorimeter = heat used to melt ice + heat gained by cold water from  $0^\circ\text{C}$  to  $\theta_2$ .

$$(m_w c_w + m_c c_c)(\theta_1 - \theta_2) = m_1 l_f + m_1 c_w (\theta_2 - 0)$$

$$l_f = \frac{(m_w c_w + m_c c_c)(\theta_1 - \theta_2) - m_1 c_w (\theta_2 - 0)}{m_1}$$

**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  $100^\circ\text{C}$ ,

(ii). Cooling from  $100^\circ\text{C}$  to  $60^\circ\text{C}$

$$m_s l_v + m_s c_w (100 - 60) = m_w c_w (60 - 30) + m_c c_c (60 - 30)$$

$$2260000 m_s + 168000 m_s = 0.5 \times 4200 \times 30 + 60 \times 30$$

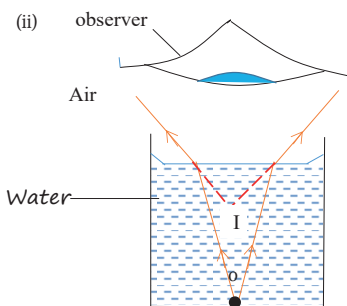
$$m_s = \frac{81000}{2428000} = 0.0334 \text{ kg}$$

(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. Atmospheric pressure depends on altitude i.e as you climb higher on a mountain, the atmospheric pressure reduces. Such low pressure is very easy to acquire making it possible to have water boil even below  $100^\circ\text{C}$ . This shows that boiling point of a liquid (such as water) depends on altitude i.e it drops as you climb higher on a mountain and raises as you move towards sea level.

**Read about:**

- Latent heat and specific heat capacity
- Why steam at  $100^\circ\text{C}$  is more fatal than water at  $100^\circ\text{C}$
- Examples of systems that use latent heat
- Why a pressure cooker takes a shorter time to cook food etc.

3. (a) (i). The incident ray, the refracted ray and the normal at the point of incidence all lie in the same plane.  
(ii). The ratio of sine of angle of incidence to sine of angle of refraction is constant for a pair of media.

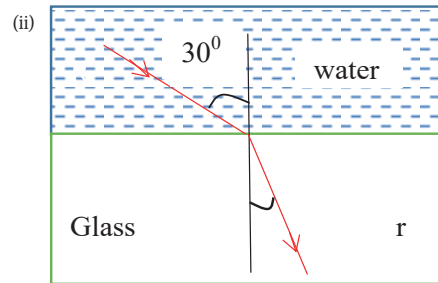


Let O represent the object placed at the bottom of the water container. Rays of light incident from O (real depth) to the water-air boundary are refracted away from their respective normals (from dense to less-dense medium) as they cross boundary. This makes them appear to come from a point I (apparent depth) as they enter the observer's eye. So the object O at the bottom of container appears raised to I. The actual position of O is the real depth, while where I appears to be is the apparent depth.

**Also read about:**

- $n = \frac{\text{real depth}}{\text{apparent depth}} = \frac{c}{v} = \frac{\sin i}{\sin r} = \frac{\text{speed of wave in deeper water}}{\text{speed of wave in shallow water}} \text{ etc}$
- Dispersion of light due to different refractive indices for the different colours of light

- (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  $90^\circ$ .



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

$$n_w \sin i_w = n_g \sin i_g$$

$$1.33 \sin 30^\circ = 1.50 \sin r$$

$$r = \sin^{-1} \left( \frac{1.33 \sin 30^\circ}{1.50} \right) = 26.32^\circ$$

**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).

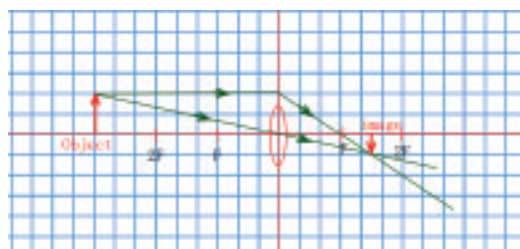
(ii). Make conversion of the given lengths to suit your graph paper

(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

| Characteristic  | Actual length(cm) | Scale length(cm) |
|-----------------|-------------------|------------------|
| Object height   | 5                 | 1                |
| Object distance | 45                | 9                |
| Focal length    | 15                | 3                |



- (i) 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.

(ii) The height of the image is 2.5cm

$$\text{magnification} = \frac{\text{image distance}}{\text{object distance}} = \frac{22.5}{45} = 0.5$$

**OR**

$$\text{magnification} = \frac{\text{image height}}{\text{object height}} = \frac{2.5}{5} = 0.5$$

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.

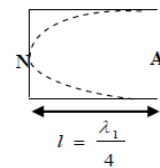
**Also read about:**

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

(b). (i).

| Light waves   | Sound waves  |
|---|--|
| Electromagnetic in nature                               | Mechanical in nature   |
| Transverse in nature                                    | Longitudinal in nature   |
| Travels at a speed of $3.0 \times 10^8 \text{ ms}^{-1}$ | Travels at a speed of $330 \text{ ms}^{-1}$                                    |
| Can travel through a vacuum                             | Can not travel through a vacuum (requires a material medium for transmission). |

**Read about** differences between sound waves and water waves.

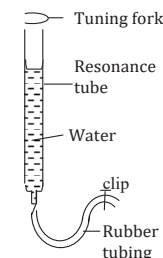


$$\text{Now using } \lambda_1 = \frac{v}{f} = \frac{330}{525} = 0.629 \text{ m. but } l = \frac{\lambda_1}{4}$$

Therefore,  $l = 0.157 \text{ m}$

**Experiment: To Demonstrate Resonance in a closed Tube**

- Fill a resonance tube almost full with water.
- Place a vibrating/sounding tuning fork near and above the mouth of the tube.
- Gradually lower the water level by opening the clip.



**Observation:**

At some level the sound suddenly becomes louder. At this point, resonance is said to have occurred.

**Explanation:**



Sound from the tuning fork travels down and is reflected by the water surface and a stationary wave is formed with a node that corresponds to the water level. The air length of the column in the tube =  $\frac{1}{4}\lambda$

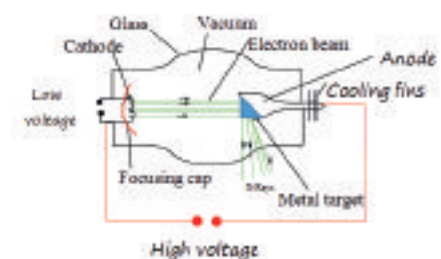


If the water level is lowered further, another point is reached for which resonance occurs again. At this point, the length of the air column =  $\frac{3}{4}\lambda$

**Note:** Other points can be obtained where resonance can occur if the water level is lowered further.

- Increasing tension in the string
- Reducing the mass per unit length of the string

5. (a) **Operation of an X-Ray tube.**



## From page V

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.

### Note:

- ✓ The heat generated is conducted away through the copper anode to the cooling fins or by use of a circulating liquid, oil or water through the hollow anode.
- ✓ Energy Changes in the X-ray tube.  
Electrical energy → Heat energy in the filament → K. E of electrons → heat + X-rays

### Read about why;

the X-ray tube is evacuated.  
the cathode has a concave shape  
the lead shield is used instead of other materials  
metal target is made up of tungsten material

(b) (i) **Intensity of X-rays** can be increased by increasing the filament current (the low P.d). By doing so, we shall be increasing the number of electrons produced in the tube. The more electrons produced, the more X-rays that will be produced.

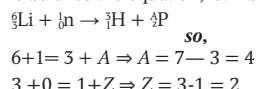
(ii) **The strength of X-rays (sometimes referred to as the penetrating power of X-rays)** can be increased by increasing the applied voltage across the tube (accelerating p.d). The more the accelerating p.d, the more energetic the electrons will be hence the stronger the X- rays produced.

**Read about** the differences between hard and soft X- rays and how they are produced.

(c) (i) **Activity** is defined as the number of disintegrations produced in one second.

(ii) **Half-life** is the time taken for a radioactive nucleus/ substance to disintegrate to half its original value.

(iii) To balance the equation, let P be  ${}^A_Z\text{P}$



This implies that;  ${}^A_Z\text{P} = {}^4_2\text{P}$  This is similar to  ${}^4_2\text{He}$ , which is a helium particle

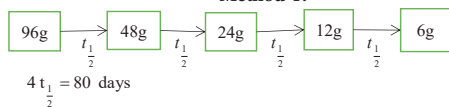
So P is a helium particle.

(d) (i) The mass remaining

$$\text{Mass remaining} = 96\text{g} - 90\text{g} = 6\text{g}$$

(ii) The half-life of the sample

### Method 1:



$$t_{\frac{1}{2}} = \frac{80}{4} = 20 \text{ days}$$

### Method 2:

| Mass remaining (g) | Time taken (days) |
|--------------------|-------------------|
| 96                 | $t_{\frac{1}{2}}$ |
| 48                 | $t_{\frac{1}{2}}$ |
| 24                 | $t_{\frac{1}{2}}$ |
| 12                 | $t_{\frac{1}{2}}$ |
| 6                  | $t_{\frac{1}{2}}$ |

$$4t_{\frac{1}{2}} = 80 \text{ days}$$

$$t_{\frac{1}{2}} = \frac{80}{4} = 20 \text{ days}$$

### Method 3, you can also use a formula.

The mass remaining after a time  $t$ ,  $M_t$ , when an original

sample of mass  $M_o$  decays with a half- life of  $t_{\frac{1}{2}}$  is given by;

$$M_t = M_o \left( \frac{1}{2} \right)^n, \text{ where } n = \frac{t}{t_{\frac{1}{2}}}$$

$$\text{So, } 6 = \left( \frac{1}{2} \right)^n \Rightarrow \frac{6}{96} = 0.5 \Rightarrow \frac{1}{16} = 0.5$$

Introducing logarithms to base 10 on both sides gives;

$$\log_{10} 0.0625 = n \log_{10} 0.5$$

$$n = \frac{\log_{10} 0.0625}{\log_{10} 0.5} = 4$$

$$\text{From } n = \frac{t}{t_{\frac{1}{2}}} \Rightarrow 4 = \frac{80}{t_{\frac{1}{2}}} \Rightarrow t_{\frac{1}{2}} = \frac{80}{4} = 20 \text{ days}$$

**Read about** how half-life can be got using the graphical method.

Try this question using the graphical method and check if you come out to the same answer.

(e) 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

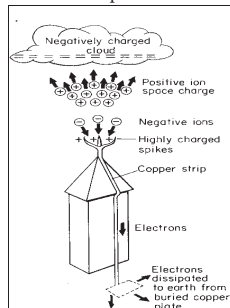
- ✓ Used to study the uptake of fertilisers by plants.
- ✓ Used to sterilise insects, hence eliminating pests that destroy crops.

### (v) Defence

- ✓ Used in the manufacture of weapons of mass destruction like nuclear and atomic bombs.

6 (a) All insulators do not have electrons arranged in the same way i.e. some insulators have electrons held to them fairly loosely while others are tightly bound to their nucleus. e.g. in glass, electrons are held fairly loose compared to silk. When insulators are rubbed together, electrons are transferred (lost) from materials, where they are less held by the nucleus to the other materials where they are tightly held by the nucleus. The insulator that loses electrons becomes positively charged while the one that gains electrons becomes negatively charged. For example; When glass is rubbed with silk, glass tends to lose electrons faster than silk. This results in electrons being lost from atoms of glass and at the same time gained by silk. The lost electrons from glass are loosely carried by atoms of silk, so glass becomes positively charged and silk becomes negatively charged.

(b) **A lightning conductor** consists of a thick copper strip with spikes at one end above the building and a copper plate at the other end buried in the ground. A lightning conductor is used to protect tall buildings from effects of lightning.



### How it works

A moving cloud becomes negatively charged by friction.

When the negatively charged cloud passes over a building, it induces a positive charge on the spikes of the lightning conductor and a negative charges that flows through the copper strip to the copper plate buried in the ground where they are depleted to the earth.

The high charge density/ concentration creates a high electric intensity around the spikes which causes the surrounding air molecules to ionise.

The negative ions are attracted towards the positively charged

spikes thereby neutralising the spikes.

Meanwhile, the positive ions are repelled (or move) towards to the cloud and neutralise the negative charges there. This process reduces the accumulation of charges in the clouds hence minimising chances of lighting occurring. Hence preventing the building from being struck.

(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.

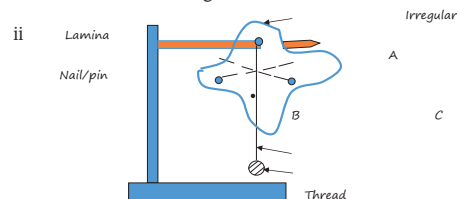
i.e  $V \propto I$

**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.

|   |   |
|---|---|
| (i) From $V = IR$<br>$6 = I \left( \frac{3.6 + 4 \times 6}{4 + 6} \right)$<br>$6 = I(3.6 + 2.4)$<br>$6 = 6I$<br>$I = 1 \text{ A}$<br>Total current flowing throughout the circuit = 1 A | (ii)<br>Power = $I^2 R$<br>$= 1^2 \times 3.6$<br>$= 3.6 \text{ W}$<br>(iii) I - V characteristics for the filament of a lamp.<br> |
|---|---|

7. (a) (i) **Centre of gravity** is the point on a body where its entire 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.



- ✓ Make three holes A, B and C near the edges of the irregular lamina.
- ✓ Suspend the irregular lamina from one of the holes say A, in a such a way that it can swing freely by using a nail or pin.
- ✓ Suspend a plumbline from the same hole.
- ✓ When the plumbline stops swinging, mark a point where it touches the lamina.
- ✓ Draw a line joining the hole to the marked point along the plumbline.
- ✓ Repeat procedure using the other two holes B and C.
- ✓ The point where the lines intersect is the centre of gravity of the irregular lamina.

(iii)

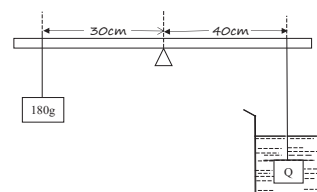
- ✓ Position of the centre of gravity
- ✓ Area of the base

(b) (i) **The principle of moments** states that when a body is in equilibrium under the action of several forces, the sum of clockwise moments about a point is equal to the sum of anti-clockwise moments about the same point.

(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.

**Read about** stable and neutral equilibrium.

(c) A uniform beam is pivoted at its centre as shown below



- (i) Mass of liquid displaced = density of liquid  $\times$  volume  
 $= 800 \times 1.0 \times 10^{-5}$   
 $= 0.008 \text{ kg}$

(ii) The weight of Q in air

**From Archimedes principle,**

Upthrust on a body immersed in a fluid = weight of the fluid displaced.

Weight of Q in air – weight of Q in liquid = weight of liquid displaced.

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.

$$\frac{180}{1000} \times \frac{30}{100} = m \times \frac{40}{100}$$

$$1000 \quad 100 \quad 100$$

$$0.18 \times 0.3 = 0.4$$

$$m = 0.135 \text{ kg}$$

Weight of Q in the liquid =  $mg = 0.135 \times 10 = 1.35 \text{ N}$

Similarly, weight of liquid displaced =  $0.008 \times 10 = 0.08 \text{ N}$

$\therefore$  Weight of Q in air =  $0.08 + 1.35 = 1.43 \text{ N}$

8. (a) (i) Faraday'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.

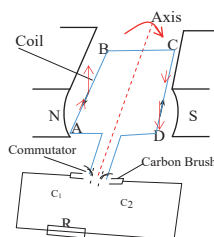
**Read about** the Lenz's law.

(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.



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## DC generator



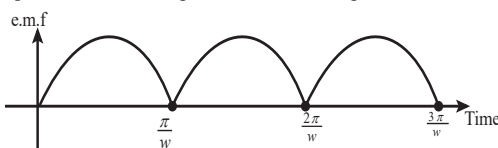
### Structure:

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 that 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.  $C_1$  replaces the position of  $C_2$  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 e.m.f 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 e.m.f 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 e.m.f 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 = 1 V                      | (ii) Number of turns in the secondary ( $N_s$ )                |
| $200 = 80 \times I$                  | From: $\frac{N_s}{N_p} = \frac{V_s}{V_p}$                      |
| $I = \frac{200}{80} = 2.5 \text{ A}$ | $N_s = \frac{V_s \times N_p}{V_p} = \frac{80 \times 200}{250}$ |
|                                      | $N_s = 640$  |

**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

$$= 200 \times 4 = 0.2 \times 4 = 0.8 \text{ kW}$$

Number of electrical units consumed

$$= \text{kWh} = \text{kW} \times \text{h} = 0.8 \times 10 = 8 \text{ units}$$

$$\text{Electrical cost} = \text{number of units used} \times \text{unit cost}$$

$$= 8 \times 540 = \text{sh } 4320$$

**Read about** house wiring.

# PHYSICS PAPER ONE QUESTIONS (OPHY005)

Acceleration due to gravity,  $g = 10 \text{ ms}^{-2}$   
 Specific heat capacity of water =  $4200 \text{ J kg}^{-1} \text{ K}^{-1}$

## SECTION A

- 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)
- 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)
- A car of mass 3000kg starts from rest and accelerates to a speed of  $60 \text{ ms}^{-1}$  in 5s. What is the force applied on the car?  
 A. 45000N B. 3000N  
 C. 60N D. 36000N
- A displacement node on a standing wave is a point of;  
 A. maximum displacement  
 B. minimum displacement  
 C. varying displacement  
 D. average displacement.
- 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.

- A car is uniformly accelerated from rest and after 10s it acquires a speed of  $30 \text{ ms}^{-1}$ , the distance covered during this time is;  
 A. 100m  
 B. 150m  
 C. 200m  
 D. 250m
- A floating body;  
 A. displaces its own volume of fluid  
 B. displaces its own 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.
- White light is separated into component colours by a prism due to;  
 A. interference  
 B. refraction  
 C. reflection  
 D. diffraction.
- A block is pulled with a force of 30N at constant velocity of  $20 \text{ ms}^{-1}$  for a time of 2s, the power developed is;  
 A. 600W  
 B. 300W  
 C. 200W  
 D. 15W
- A current of 3A flows through a resistor of  $6\Omega$  when a battery of e.m.f 21V is connected across it. What is the internal resistance of the battery?  
 A.  $0.67\Omega$   
 B.  $1.00\Omega$   
 C.  $2.00\Omega$   
 D.  $3.50\Omega$

11.

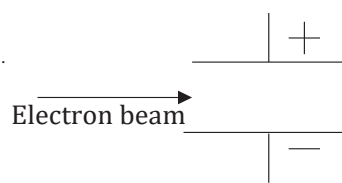


Fig 1

- 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.

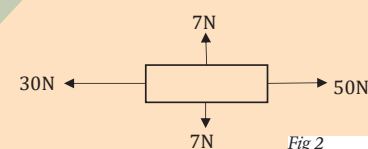
12. The transformer cores are laminated in order to;

- A. reduce eddy current.
- B. decrease electric resistance
- C. strengthen the magnetic flux.
- D. improve the magnetic flux linkage.

13.  $10^4 \text{ kg}$  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.  $2.5 \times 10^3 \text{ W}$
- B.  $4.0 \times 10^3 \text{ W}$
- C.  $4.0 \times 10^6 \text{ W}$
- D.  $2.5 \times 10^4 \text{ W}$

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. Up wards
  - B. Down wards
  - 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.



## From page VII

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. 43200C

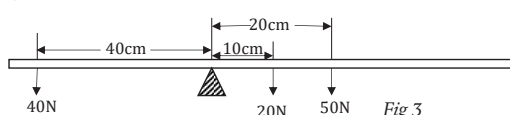
19. The following are S.I units of fundamental quantities except,

- A. Kilogram
- B. Metre
- C. Kelvin
- D. Minute.

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.



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.

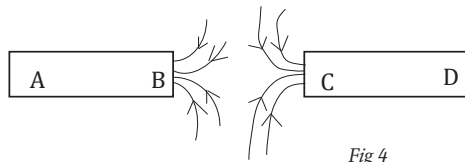
22. The refractive index of glass is 1.5. the angle of refraction in glass for a ray of light incident at  $30^\circ$  is;

- A.  $19.5^\circ$
- B.  $42.0^\circ$
- C.  $45.0^\circ$
- D.  $48.0^\circ$

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.



**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. (ii) and (iii)
- C. (ii) and (iv)
- D. (iii)

29. A car moving at  $4\text{ms}^{-1}$  hits a stationary car of the same mass and the two cars move together, what is their common velocity?

- A.  $1\text{ms}^{-1}$
- B.  $2\text{ms}^{-1}$
- C.  $3\text{ms}^{-1}$
- D.  $4\text{ms}^{-1}$

30. Which of the following light combinations will give white light?

- A. Cyan + blue and magenta + red
- B. Cyan + red and magenta + green
- C. Yellow + red and magenta + blue
- D. Cyan + green and yellow + blue

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. 48s
- B. 1 hour
- C. 2 hours
- D. 8 hours

34. Resistors of  $1\Omega$  and  $4\Omega$  are connected in parallel across a voltage source. If the current in the  $4\Omega$  resistor is 0.8A. what will current in the  $1\Omega$  resistor be?

- A. 0.02A
- 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. (i), (ii) and (iii)
- C. (i), (ii), (iii) and (iv)
- D. (ii), (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. Convection
- 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.  $\frac{1}{2}$
- B.  $\frac{1}{4}$
- C.  $\frac{1}{8}$
- D.  $\frac{1}{16}$

39. The results of rubbing a glass rod with silk and separating them is;

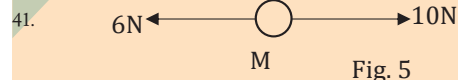
- A. a negative charge of the rod and an equal positive charge on silk.
- B. equal amounts of positive charges on both.
- C. a positive charge on the rod and an equal negative charge on the silk.

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. 2.7N
- C. 1.5N
- D. 0.8N

## SECTION B



Two forces of 6N and 10N act at the same time on a body M of mass 500g as shown in figure 5 above. Find the

- (i) resultant force on M.
- (ii) acceleration of M.

42. (a) State **Archimedes principle**.

(b) A solid weighs 30g in air and 25g when submerged in water. Find the density of a material of the solid.

43.

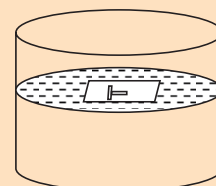


Fig. 6

A pin is placed on a bloating paper which is on the surface of water as shown in **figure 6**.

- (a) Explain what happens after some time.
- (b) Explain what happens when some soap solution is carefully added to the water.

44. (a) What is meant by **specific heat capacity** of a substance?

(b) When a block of iron of mass 4kg absorbs 38KJ of heat, its temperature rises by  $10^\circ\text{C}$ . Find the specific heat capacity of the iron.

45. (a) Explain why the sea remains cooler than land during day time and warmer than land at night.

(b) State any one factor on which the rate of heat transfer along a metal bar depends.

46. (a) Define focal length of a converging lens.

(b) The focal length of a converging lens is 15cm. What is its power?

(c) State any two properties of an image of real object formed in a diverging lens.

47. (a) Define the **Volt**.

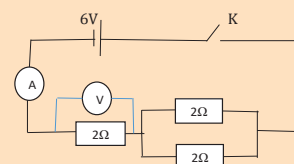


Fig 7

(i) What is the effective resistance in the circuit in Fig 7? (The cell has negligible resistance)

(ii) What will be the reading of the voltmeter when the key K is closed?

48. (a) What is an echo?

(b) An echo sounder on a boat sends down a pulse through the water and receives its echo 1.5seconds later. If the velocity of sound in the water is  $1500\text{ms}^{-1}$ , calculate the depth of the water.

49. (a) What is meant by the **atomic number of an element**?

(b) One isotope of neon is denoted by  $^{20}_{10}\text{Ne}$ . How many neutrons does the isotope have?

(c)  $^{60}_{27}\text{Co}$  is a radioactive isotope of cobalt which emits a beta particle and very high energy gamma rays to form an element X. write a balanced equation for the nuclear reaction.

50. (a) State **Boyle's law**.

(b) A volume of a fixed mass of a gas increases from  $200\text{cm}^3$  to  $300\text{cm}^3$  at a constant temperature. Find the new pressure if the initial pressure is  $75\text{cmHg}$ .