VISION GROUP

NATIONAL PRIDE • GLOBAL EXCELLENCE

HOME SCHOOLING MATERIAL

PASS O LEVEL

BIOLOGY, PHYSICS & ENGLISH

YOUR GUIDE AWAY FROM SCHOOL

BIOLOGY PAPER ONE SOLUTIONS (OB003)

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SECTION A

1 **D** — Low temperature inactivates enzymes and, therefore, bacterial and fungal enzymes are inactivated preventing decomposition of food items kept in a refrigerator.

2 **A** — Quill feather has long quill, small after-shaft, long shaft, long vane and is located on the wings and tails of chickens.

3 **D** — High humidity, low temperature and weak wind reduce the rate of transpiration because more vapour collects around the leaf, vapour moves slowly and are not easily blown away from the leaf respectively.

4 **C** — Coronary circulation involves movement of blood to and from the heart wall, systemic involves movement of blood to and from other parts of the body except the lungs and heart wall while in open circulation, blood flow is not confined to blood vessels.

5 **A** — The number of organisms in an ecosystem depends on the amount of resources that they need in the ecosystem. The more the resources, the higher the carrying capacity and the more organisms inhabit the ecosystem.

6 **C** — Pitching is the tendency for the head to plunge vertically downwards, rolling is the tendency for the body to rotate long its longitudinal axis, while instabilities involve pitching, rolling and yawing.

7 **B** — Homeostatic systems maintain a fairly constant internal environment of organisms by restoring deviations of entities back to the norm.

8 **B** — Man feeds on vegetables, chicken and grasshopper hence man is a primary consumer, secondary consumer and tertiary consumer by feeding chickens that eat grasshopper.

9 **D** — Human growth and development after birth proceeds from neonate, infant, toddler, childhood, adolescence and adulthood.

10 **A** — Taxis involves movement of the whole body of an organism from one place to another in response to stimulus from one direction.

11 **B** — Coagulation of milk proteins is catalysed by rennin enzymes and the other alternatives do not involve use of enzymes but mechanical means to break down food hence are forms of physical digestion.

12 **D** — The similar features of the organism for putting them in the same higher taxonomic level means they have the same ancestors and the different features for putting them in separate lower levels means they adapted to different environment over time.

13 **B** — When the rubber sheet is pulled downwards, the volume is increased while pressure is decreased in the balloons below atmospheric pressure causing air to enter into the balloons.

14 **C** — Maggots, caterpillar and imago are larva of housefly, larva of butterfly and a young housefly respectively.

15 **D** — The umbilical artery transports blood from the fetal aorta to the placenta, while umbilical vein transports blood from the placenta to majorly the fetal liver that releases it into fetal vena cava.

16 **D** — Evolution is the change of organisms from the simple and less adapted forms to the complex and more adapted forms to the environment. It does not necessarily involve formation of new species.

17 **A** — All the other alternatives are examples of symbiosis. In commensalism the commensal benefits and the hosts neither benefits nor is harmed. In parasitism, the parasite benefits while the host is harmed. In mutualism, both organisms benefit.

SECTION B

18. (a) To
- obtain food and water.
- obtain shelter.
- find mates.
- escape from predators and enemies.

(b) (i) (ii)

c)

Wings during passive flight	Wings during active flight
Are spread at an angle from the body	Are not spread at a fixed angle
Are not moved	Are moved or flapped

(d) The pectoralis major (depressor) muscles contract while the pectoralis minor (elevator) muscles relax pulling the wings downwards. With the wing feathers spread out and overlapping they do not permit air from passing through. The resistance of air to wing provides an up thrust force. This force is transmitted through the coracoids bones thereby lifting the whole body as it moves forward.

19. (a) Movement of materials in and out of cells enables the cells to obtain from their external environment, substances required for its activities and to release waste products and secretions.
(b)(i) The difference in concentrations of two adjacent solutions separated by a single barrier.
(ii) Movement of materials from where they are in a low concentration to where they are in a high concentration.

(c) Title:
An experiment to investigate the effect of different sizes on the rate of diffusion.
Materials and apparatus: Fresh irish potato, knife, ruler, potassium permanganate solution, razor blade, three boiling tubes, blotting paper and stop clock.

Procedure:
- Peel the fresh irish potato.
- Cut three cubes from the fresh potato measuring A (2cm X 2cm X 2cm), B (1cm X 1cm X 1cm) and C (0.5cm X 0.5cm X 0.5cm).
- Pour 5cm^3 of potassium permanganate solution in each of the three boiling tubes.
- Put the potato cubes in each of the boiling tubes of the potassium permanganate solution.
- After 1 hour, remove the cubes and dry their surfaces using blotting papers.
- Cut through each of the cubes and measure the length penetrated by potassium permanganate in each of the potato cubes.

Expected observation:
- Cube A will have the shortest distance penetrated by potassium permanganate solution.
- Cube B will have a moderate or short distance penetrated by potassium permanganate solution.
- Cube C will have the longest distance penetrated by potassium permanganate solution.

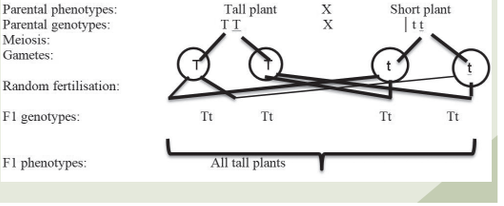
Expected conclusion:
The rate of diffusion is higher in small-sized structures but lower in big-sized structures.

20. (a)(i) Autosomes are chromosomes that carry genes which determine nonsexual characteristics, while sex chromosomes are chromosomes that carry genes which determine sexual characteristics.

(ii)

Autosomes	44 or 22 pairs
Sex chromosomes	2 or a pair

(iii) **Testis:** Sperms.
Ovary: Ova or eggs.
(b) Because all ova produce only X sex chromosome while a sperm contains either X or Y sex chromosome and each has equal chance of fertilising the ovum.
(c) (i) Environmental variation. The variation in height was not passed on to offspring and was reversed by when grown in the other soil sample.
(ii) Let T represent allele for tallness in plants. Let t represent allele for shortness in plants.



21. (a) The clay soil particles are small. This results into small sized air spaces between soil particles providing little space for air hence low aeration and few soil microorganisms, little space for water to pass hence low drainage but highwater retention capacity and narrow diameter hence high capillarity.

(b) Title:
An experiment to compare the rates of soil drainage between clay and loam soils.
Materials and apparatus:
Clay soil, loam soil, water, two funnels, two measuring cylinder, filter paper, beaker.

Procedure:
- Play a filter paper in each of the funnel.
- Place the funnel on top of each measuring cylinder.
- Power clay soil inside a one funnel and loam soil inside the other funnel.
- Pour water of equal amount in each soil sample.
- After 30 minutes, remove the funnels containing soil samples.

Observation
More water collected in the measuring cylinder whose funnel had loam soil and little water collected in the measuring cylinder whose funnel had clay soil.

Conclusion
Loam soil has higher water drainage capacity than clay soil.

Write to us: Email: *learners@newvision.co.ug*

Thursday, May 28, 2020

PASS O'LEVEL

BIOLOGY PAPER ONE QUESTIONS (OBIO004)

1. Which of the following parts of the mammalian digestive system do not form part of the alimentary canal?
   A. Stomach and ileum.
   B. Pancreas and liver.
   C. Colon and duodenum.
   D. Liver and oesophagus.
2. Which class of phylum arthropda does the organism represented in ***figure 1*** below belong to?

Figure 1

   A. Insecta.
   B. Arachnida.
   C. Diplopoda.
   D. Crustacea.
3. ***Figure 2*** below shows the relationship between population size of a predator and its prey over time.

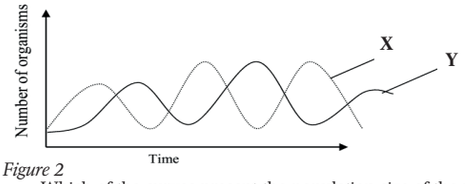


Figure 2

Which of the curves present the population size of the prey?
   A. Y because it starts below curve X.
   B. X because its peak is always higher than for curve Y.
   C. Y because it increases after increase in curve X.
   D. X because it has the lower minimum points than curve Y

4. The function of the ligament is to connect bone to;
   A. bone.
   B. joint.
   C. tissue.
   D. muscle.
5. ***Figure 3*** below shows leaf arrangement on the stem of a plant.

Figure 3

Which type of leaf arrangement is represented in the figure?
   A. Spiral arrangement
   B. Alternate arrangement
   C. Opposite arrangement
   D. Whorl arrangement
6. Which of the following carbohydrates is found in high concentration in sugar cane making used in production of table sugar?
   A. Starch
   B. Sucrose
   C. Maltose
   D. Glycogen
7. Which of the following is a type of dry fruits represented in **figure 4** below?

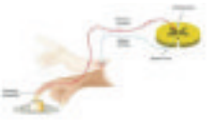
Figure 4

   A. Follicle
   B. Schizocarp
   C. Capsule
   D. Legume
8. The results of an experiment to determine percentage of humus in a soil sample are shown below:-
   Mass of crucible =10g
   Mass of crucible + wet soil = 50g
   Mass of crucible + soil after drying =40g
   Mass of crucible + soil after heating to red hot = 30g
   What is the percentage of humus in the soil sample?
   A. 25%
   B. 20%
   C. 15%
   D. 30%
9. Which of the following is the main reason for requirement of oxygen in germination?
   A. To allow production of energy.
   B. For activation of enzymes involved in germination.
   C. For aerobic respiration to occur.
   D. To allow reactions to occur.
10. Which of the mammalian teeth illustrated below is used for tearing food?

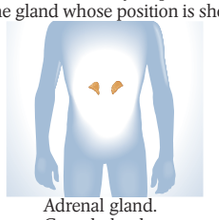
11. The allele whose phenotypic effect is expressed in the heterozygous condition is;
   A. Homozygous.
   B. Genotype.
   C. Recessive.
   D. Dominant.
12. Which of following is the disease that has affected one of the legs shown in **figure 5** below?

Figure 5

   A. Elephantiasis.
   B. Malaria.
   C. Trypanosomiasis.
   D. Schistosomiasis.
13. High levels of Antidiuretic hormone in blood results in production of;
   A. Much and dilute urine.
   B. Much and concentrated urine.
   C. Little and dilute urine.
   D. Little and concentrated urine.
14. A homozygous red flowered plant was crossed with a homozygous white flowered plant and the offspring had pink coloured flowers? Which of the following is true of the inheritance of flower colours in plants?
   A. It is a co-dominance inheritance.
   B. It is an incomplete dominance inheritance.
   C. All the pink flowered plants are in homozygous condition.
   D. Inheritance of flower colour varies discontinuously.
15. Which of the following is the disadvantage of exoskeleton in insects?
   A. Restricts growth in insects.
   B. Does not protect all parts of insect's body.
   C. Too flexible limiting fast movement.
   D. Does not allow effective camouflage.
16. Which of the following is the best description of puberty?
   A. Onset of adolescent changes.
   B. Stage of growth and development after adolescent stage.
   c. Period of changes after which an individual is sexually mature.
   D. Stage of growth before adolescent stage.
17. Which of the following blood vessels transport deoxygenated blood?
   A. Aorta.
   B. Pulmonary artery.
   C. Renal artery.
   D. Hepatic artery.
18. Which of the following is a product of anaerobic respiration in animals?
   A. Ethanol.
   B. Pyruvate.
   C. Pyruvic acid.
   D. Lactic acid.
19. The main reason for sweating while performing physical activities is to loss;
   A. excess heat.
   B. excess water.
   C. excess mineral salts.
   D. Urea.
20. Which type of response is shown in **figure 6** below?



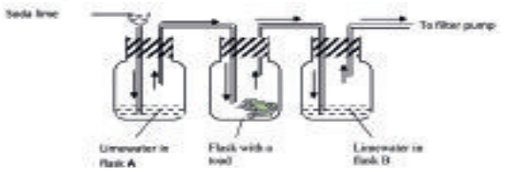
   A. Voluntary response.
   B. Learned response.
   C. Conditioned response.
   D. Involuntary response.
21. What is the gland whose position is shown in **figure 8** below?



   A. Adrenal gland.
   B. Gonad gland.
   C. Thyroid gland.
   D. Pituitary gland.
22. Which of the following methods cannot be used to prevent infestation by tapeworms?
   A. Eating well cooked meat.
   B. Proper disposal of fecal wastes.
   C. Wearing shoes to avoid stepping on faeces.
   D. Boiling all drinking water.
23. Which of the following terms best describes development in organisms?
   A. Permanent increase in dry mass of the organism.
   B. Specialisation of structures to perform specific functions.
   C. Irreversible increase in the size of an organism.
   D. Elongation of cells of organisms.
24. Which of the following best describes changes in plant cover during succession.
   A. Mosses → Lichens → Ferns → Grasses.
   B. Lichens → Mosses → Ferns → Grasses.
   C. Ferns → Grasses → Trees → Mosses.
   D. Mosses → Ferns → Grasses → Shrubs.
25. Which type of asexual reproduction is undergone by amoeba?
   A. Binary fission.
   B. Multiple fission.
   C. Fragmentation.
   D. Conjugation.
26. Which of the following is a part of the gynoecium of a flower?
   A. Filament.
   B. Style.
   C. Petal.
   D. Sepal.
27. Chemotaxis is movement of;
   A. part of an organism in response to chemicals substances.
   B. the whole organisms in response to chemical substances.
   C. part of an organism towards chemical substances.
   D. the whole organism toward chemical substances.
28. Which of the following is the response of an organism to increase in temperature?
   A. Presence of thick layer of fats beneath the skin.
   B. Hairs on the skin lie flat on the skin surface.
   C. Vasodilation of skin blood vessels occurs.

D. Rapid contraction and relaxation of skeletal muscles.

29. **Figure 8** shows experimental setup used to investigate whether carbon dioxide gas is produced during aerobic respiration.



Which of the following is correct explanation for the observation made from the lime water in flasks B? It;

A. turned milky due to carbon dioxide that entered the setup through flask A.
B. remained colourless as no carbon dioxide entered.
C. turned milky due to carbon dioxide produced during respiration by the toad.
D. Remained colourless as no carbon dioxide was produced by toad as it died due to lack of oxygen.

30. By which method does tea leaves move through out a hot water to form tea?

A. Active transport.
B. Osmosis.
C. Phagocytosis.
D. Diffusion.

SECTION B

31. **Figure 9** below shows results obtained during an experiment to investigate the effect of weather on the rate of photosynthesis using a pond weed. The number of bubbles produced were counted everyday at 10:00am for five days.

Day	Weather	Number of bubbles
1	Very cloudy	04
2	Moderate cloudy	10
3	Little sunny	13
4	Very sunny	15
5	Little cloudy	07

Figure 9

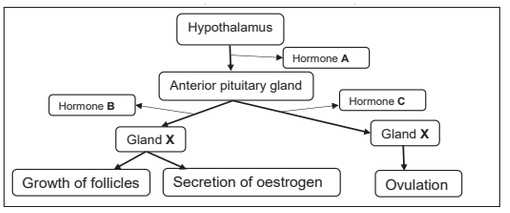
a) Plot a graph of relationship between weather and the number of bubbles that were produced.
b) Explain the source of bubbles during the experiment.
c) With a reason from your graph, identify the weather during the rate of photosynthesis was;
i) Highest.
ii) Lowest.
d) Explain the different weather conditions on the rate of photosynthesis.
i) Sunny conditions.
ii) Cloudy conditions.
e) Suggest;
i) Two adaptations of a leaf for obtaining sunlight energy.
ii) One adaptation of a leaf for obtaining carbon dioxide.

32. The table below shows the habitat, thickness of medulla and concentration of urine produced in three mammals who live in different habitats.

Organism	Habitat	Relative thickness of the medulla in arbitrary units	Urine concentration in arbitrary units
A	Lake	9.8	520
B	Moist land	1.0	140
C	Desert	2.6	2880

a) State the relationship between thickness of medulla and the
i) the concentration of urine.
ii) habitat.
b) Explain your response in (a)
i)(i) above.
ii) (ii) above.
c) Suggest the problem that would be faced by organism
i) A if transferred to land.
ii) C I transferred to a lake.

33. **Figure 10** below shows relationship between glands and hormones secreted within the first 14 days of the a menstrual cycle.



a) Identify hormones A, B, and C and suggest a stimulus that stimulate secretion of each.

Hormone	Name	Stimulus that stimulate secretion
A		
B		
C		

b) Which of the hormones is secreted into blood during the period of the cycle when there is blood discharge through the vagina?
c) Explain the effect of pregnancy on the secretion of hormone;
i)B.
ii) C.
d) Identify gland X and any other hormone secreted by it.

SECTION C

34. (a) Suggest the role of microorganisms in
i) formation of compost.
ii) root nodules.
ii)determining properties of soil.
b) Describe different activities that enrich the soil with nitrogen and its compounds for plants to absorb.
c) Describe how improper disposal of polythene bags affect the properties of soil.

35 (a) State the difference between a population and a community.
(b) Describe the different factors that affect the population growth.
(c) Describe how you would use the capture-recapture method to estimate the population size of rabbits in a bush.

36. (a) Describe the following processes in mammals;
i) Inhalation.
ii) gaseous exchange
(b) State two differences between inhaled and exhaled air in mammals.
(c) Suggest why an insect cannot be drowned by inserting its head in water.

37. (a) State two stimuli and the receptor in mammals that detect them.
(b) Describe the adjustments that occur in the eye when seeing a;
i) nearby object.
ii) distant object.
(c) Draw and label the parts of the tongue responsible for sensing sour, bitter, salty and sweet tastes.

ENGLISH PAPER ONE SOLUTIONS (0E003)

A eulogy is a type of speech given at a burial ceremony in honour of someone that has passed on. It is usually in praise of the deceased for their achievements and showing what society will miss about them. Generally, it is to bid farewell to the deceased. It should have the following;

1. FORMAT

(a)Title: Key words - eulogy and deceased or their name. (2marks)
(b)Protocol (*2 marks*)
- Religious leaders
- the bereaved family
- fellow mourners.

Note i). *The highest in rank at a funeral are the religious leaders regardless of whether the president or ministers or MPs etc are in attendance. All those are fellow mourners.*
ii) *There is no need of signing off.*

(c)Self introduction	(1 mark)
(d)Purpose of the speech	(1 mark)
(e) At least 2 or 3 paragraphs	(1 mark)
(f)Conclusion	(1 mark)
- May his soul rest in eternal peace	
- We shall greatly miss you etc ----------	
Total	**08 marks**

2. CONTENT

(a) How you came to know the deceased	(2 marks)
(b) Good things about the deceased e.g achievements/contributions to society and the Wildlife Club/what shall be missed about him.	(2 marks)
(c) Cause of death	(2 marks)
Total	**6 marks**

3. LANGUAGE

5-6: Very Good
4: Good
2: 3 Fair
0: 1 Poor

SAMPLE OF A EULOGY

A EULOGY GIVEN BY THE PRESIDENT OF THE WILDLIFE CLUB IN HONOUR OF THE DECEASED.

The religious leaders, the bereaved family and fellow mourners. My name is Namulindwa Sharon, a student at St. Christine's High School. It is with so much grief that I stand here today on behalf of the Wildlife Club of St. Christine's High School to say farewell to our leader, friend and mentor, Ssekiyaga Ibrahim, who departed from us yesterday.

As we played football in the evening, Ibrahim collapsed and became unconscious. We rushed to give him first aid and later carried him to the sickbay, where the school nurse attended to him. Since his condition was worsening, he was rushed to the hospital, where he breathed his last, leaving us in immeasurable pain and shock! At only 17 years, Ibrahim has really gone too soon!

I came to know Ibrahim way back in 2017 when we joined Senior One at St. Christine's High School. He was friendly and easy to get along with, so we became friends. Besides, he showed traits of a leader when he comforted fellow Senior One students who were crying when their parents left them in boarding school for the first time. He hated to see anybody suffer. Due to his brilliant ideas, hard work and trustworthiness, we did not hesitate to elect him the treasurer and mobiliser of the Wildlife Club. I want to assure you that each coin served its purpose and the club was booming. His ambition was to become a pilot but sadly, his dream has been cut short.

To the bereaved family, it is the Lord who gives and it is He who takes away. Only God can fill the vacuum Ibrahim has left behind and only He can strengthen you in this trying moment.

Ibrahim, we shall greatly miss you. May your soul rest in eternal peace!

EDGAR MUTARYEBWA,
AUTHOR AND TEACHER

SARAH TUMWEBAZE,
ST MARY'S COLLEGE, KISUBI

SECTION B SAMPLE COMPOSITION

Question: Describe a situation when you had given up hope, but something unexpected happened.

AT THE END OF THE TUNNEL

I absolutely agree with the music diva who in her own wisdom observed that God has the final say in our lives. Disillusioned and pessimistic as mortal man may be, certain occurrences may not be in anyone's wildest dreams but alas! At the eleventh hour, something inexplicable can take place by happenstance.

Saturday 21st June, 2018 was a day like any other for

Turn to page IV

From page III

Batanda Jackson, a bydweller, until he went to make ends meet. Despite the fact that poverty had impoverished him and put a crimp in his family, he was this kind of African that fought tooth and nail to put food on the table, against all odds.

No sooner had he set foot in the street than a diabolic, enormous cat crossed his path. This, he later relayed, was an ill omen that bespoke the great calamity that would soon befall him.

"I rebuke and render you powerless in God's name!" he imprecated ferociously. Nevertheless, he was undaunted and he had already crossed the Rubicon so he could not regress back home.

On arrival at the construction site, Batanda's fellow compatriots in the struggle for survival already had their hands full. Helter-skelter, he peeled off his clothes, shoved them in his rucksack and domed his fooled dungarees for work. Other workers were up hill and dowdale the building.

Wheel barrows of different loads crisscrossed, spades ate into mixtures of half-solid concrete, bricks and blocks exchanged hands and the site was a hub of activity. All of them were like worker bees at their best inside a bee hive. Gigantic tipper trucks piled colossal amounts of sand, others stones and marble while some workers were at the apex of the building, others at midpoint and others at the basement.

When the mighty landlord and owner of the site manifested, he was as happy as a clam. When he saw the lofty building that was larger than life, like God, he nodded his head full of gratification and contentment. It was quite a profligate achievement. His wife who had stayed in their new luxurious Lamborghini car that cost an arm and a leg stepped out. He gave her an affectionate close embrace to congratulate themselves on that feat of strength. Workers marvelled at them lost in admiration for the two love birds.

However, this was just a calm before the storm. Everything was sailing smoothly when suddenly the situation turned hell on wheels. There was a creak from the basement, then from the rear and boom! The magnificent building caved in with a thundershock that could awaken the dead! It brought down with it all workers, falling viciously on everyone within its vicinity, including the couple that was still in close embrace. This raised alarm as all and sundry rushed in to see the tragic happening. It was a situation of panic and tragedy.

The police hastened to the scene armed to the teeth to rescue those still alive and to retrieve the bodies. The task was no child's play as it lasted five days. On the fifth day, all of us had dwindled hopes of finding someone alive. Batanda's kith and kin had even performed his last funeral rites.

"Heeelp, he..ee..lp"

"Hurry! Someone is still alive!" One policeman scurried anxiously. Everybody was thrown into astonishment by a faint voice.

Batanda was dug out alive after five days underground. He was so hungry he that could eat a horse! However, in lieu giving him food first, he was whisked away at breakneck speed to the hospital for medical attention.

PAPER TWO SOLUTIONS (OE003)

SUMMARY WRITING

ROUGH COPY

CHALLENGES ASSOCIATED WITH THE GREEN REVOLUTION.

The Green Revolution is challenged ~~in a way that~~ many farmers who switched to the new varieties but have not been able to increase their output ~~much~~, because they were ~~not able~~ unable to ~~have~~ access the supporting technology like fertilisers, ~~insecticides and water~~. The new varieties require tonnes of fertilisers which are not available. There is increasing dependence on pesticides. The poor farmer cannot afford the added costs without credit. These varieties demand much more care in cultivation and in labour requirements ~~than ordinary crops~~. Marketing, storage and transport of the surplus produce are all new problems. Some of high-yielding cereal varieties are ~~already proving~~ susceptible to diseases and any resistance may lessen with time. ~~The Green Revolution will increase water pollution~~. Water pollution will increase due to heavy use of fertilisers. It has widened the gap between the rich and the poor.

FAIR COPY

THE CHALLENGES ASSOCIATED WITH THE GREEN REVOLUTION.

The Green Revolution is challenged by many farmers who switched✓[1] to the new varieties but have not been able to increase✓[1] their output because they were unable to access the supporting technology✓[1]. The new varieties require tonnes of fertilisers✓[1] which are not available✓[1]. There is increasing dependence✓[1] on pesticides. The poor farmer cannot afford✓[1] the added costs✓[1] without credit✓[1]. These varieties demand much more care in cultivation✓[1] and in labour requirements✓[1]. Marketing✓[1], storage✓[1] and transport✓[1] of the surplus produce are all new problems. Some high-yielding cereal varieties are susceptible to diseases✓[1] any resistance may lessen✓[1] with time. Water pollution✓[1] will increase due to heavy use of fertilisers. It has widened the gap✓[1] between the rich and the poor.

2B
2.1 B
2.2 D
2.3 C
2.4 A
2.5 A

3A
3.1 We had better go now because it is late.
3.2 Having to wait for twenty-one more days in quarantine is stressful.
3.3 Much as he wanted to pass the examination, he didn't (did not) work hard for it.
3.4 Do you know the time the Mombasa train will depart?
3.5 I would rather remain in school and complete my studies than marry.
3.6 To embezzle government funds is to condemn innocent citizens to starvation.
3.7 Terissa is an intelligent and industrious girl.
3.8 Teddy asked whether it would be possible for them to watch a football match that night.
3.9 If he had driven his car cautiously, he wouldn't have met an accident.
3.10 His rescue was dismissed by his parents as silly.

3B
3.11 A
3.12 D
3.13 C
3.14 B
3.15 A
3.16 D
3.17 A
3.18 A
3.19 A
3.20 C

ENGLISH LANGUAGE QUESTIONS (OENG004)

PAPER ONE

SECTION A

This question is compulsory. Use 180-200 words.

1. 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.

SECTION B

Choose one question and write a composition of 500-600 words.

2. Describe an incident when you did something out of peer pressure and what happened as a result.
3. Write a story based on the proverb 'spare the rod and spoil the child'.
4. How should candidates be helped to prepare for their final exams after the COVID-19 lockdown?
5. "Countries should vote for a new president after every 5 years". Do you agree?
6. Write a story with the title 'SAVED FROM THE CLAWS OF DEATH'.
7. Discuss what the government of Uganda should do to help its citizens out of poverty.

PAPER TWO

1 Read the following passage and answer the question that follows.

The department of Forestry Bio-diversity and Tourism, Makerere University carried out a study which aimed at establishing the prevalence of food insecurity and the impact of commercial sugarcane growing in Busoga region in Eastern Uganda.

The study indicated that commercial sugarcane growing, although contributing to increased household income, does not necessarily increase food adequacy among households. Researchers said there are few varieties of food crops cultivated by sugarcane growing households and the households are also short of money to supplement what they grow. More people have taken to growing sugarcanes on a commercial basis, resulting in the conversion of different land-use types to monoculture sugarcane plantations.

"Many households in the region, especially around Kakira Sugar factory, rent out most of their land to rich out-growers and remain with a little patch which they also use for growing cane," said Dr. Edward Mwavu. However, the researcher was sure to note that most men used the income acquired from commercial sugarcane growing to marry more women.

"This might compromise the sustainable management of their agro-diversity as well as food production, consequently exposing them to food insecurity and malnutrition. According to the study, 87% of the households in sugarcane growing areas reported not having adequate and nutritious foods to meet their family needs. Households also reported employing various coping mechanisms that included offering labour in exchange for food, borrowing food, rationing of food and at times stealing from their neighbours. It also emerged that male-headed households were most insecure due to disregard for food in favour of other assets, such as houses, bicycles and clothes. Those who owned land were most food insecure since they rented it out for four harvest seasons in a bid to make quick money, subsequently remaining with little for food.

Food insecurity in the region was also worsened by increasing trends in crop failures, family sizes, trade in food items in the villages and declining food availability, land available for crop cultivation and livestock numbers. The work involved 208 households in two commercial sugarcane growing districts of Jinja and Mayuge. The study recommends policy-makers to establish poverty alleviation and food security initiatives that will focus on providing alternative sources of income for the sugarcane growing households. Affected households were also urged to allocate more land for growing food crops as opposed to cash crops as a remedy to food insecurity.

(Source: New Vision, May 29, 2019)

Question: In about 120 words, summarise the impact of commercial sugarcane growing on households in Busoga region.

2A. Read the passage and answer the questions that follow.

EXPORTS: TRUCK DRIVERS PUT PROTOCOLS TO TEST.

The messengers of regional trade in the East African Community (EAC) are truck drivers. Uganda's imports and exports are channelled through these unsung heroes. However, of late, they are at the forefront in importing the highly infectious coronavirus into Uganda.

EAC heads of state are caught between a rock and a hard place — a catch 22 position. Like the European Union, the EAC is a single territory, a common market, a single market to accelerate economic growth and development. It is for this reason that products with a Uganda National Bureau of Standards (UNBS) quality Q-mark are recognised in Kenya.

Similarly, products with the Kenya Bureau of Standards (KEBS) mark are recognised in Uganda without need for repeat testing. Since we are one market, professional trust should grow and develop across borders.

There are discussions on harmonisation of standards to mitigate variations in technical regulations within the region. For commodities, the East African Business Council (EABC) has called for harmonisation of standards of the most traded products to reduce transit time and cost of doing business across regional borders.

Fast forward to truck drivers and testing for COVID-19, standards come into play in the medical industry. In the health care sector, testing standards and vigilance are clearly not identical among the six East African countries — Uganda, Kenya, Tanzania, Rwanda, Burundi and South Sudan. Tanzania's COVID-19 cases have skyrocketed over the past weeks, sending a cold chill down the spine of the region.

How do we balance the freedom and rights of the integration pillars and lockdown standard operating procedures without compromising health and trade?

The EAC common market protocols adhere to freedom of movement of goods, persons, labour and workers. This includes truck drivers who are the messengers of trade in the region.

Regional heads of state need to either agree on standard operating procedures for testing in the EAC or assign joint testing teams in each territory as some experts have insinuated. The former is similar to standards for goods tested in each region with the assumption that each country is carrying out tests with the right kits and health standards.

The latter raises issues of trust and can spark disagreements among health professionals. Who makes the final call at testing centres comprising different EAC nationalities? The compromise which Present Yoweri Museveni brings forward is testing done in a neighbouring country's territory closer to the border, for example Naivasha, on the same day of entry into Uganda's territory. It must be noted that an hour's difference in travel involving interaction before entry through a border is enough transit time for new infections.

In the same way, that a seal on a container should not be broken until destination, truck drivers carrying cargo after testing should stay put in their trucks with controlled interaction. However, one cannot stop drivers from disembarking to refuel or answer the call of nature. This would be inhuman.

Explicit documentation showing the timeframe and origin-of-test requires countercheck technological mechanisms through use of QR codes and readers. A COVID-19 test in Nairobi done a week prior to entry into Uganda would be outdated. Wrist tracking devices to be worn by drivers at all times can be an innovation in the transport industry.

The EAC operational principles require non-discrimination of nationals of partner states on grounds of nationality, including equal treatment of EAC citizens. If Uganda mistreats truck drivers from other countries, they will in turn do the same to ours and hurt exports in the long-run when the lockdown ceases.

Source: New Vision Thursday, May 14, 2020

Questions:

2.1 Why are truck drivers regarded as the unsung heroes?
2.2 Explain why you think the EAC heads of state are caught between a rock and hard place.
2.3 In which two ways do experts think the problem of truck drivers can be solved?
2.4 Explain two challenges President Yoweri Museveni brings forth as regards joint testing of truck drivers.
2.5 Explain the meanings of the following words and expressions as used in the passage.
(i) mitigate
(ii) skyrocketed
(iii) disembarking
(iv) stay put

3A Re-write the following sentences as instructed without changing the meaning.

3.1 She was grief-stricken. No one would understand what she was saying. (Join using 'too')
3.2 He did not meet either of the women. (Re-write using 'neither')
3.3 'Yoweri, you are not smart. Why haven't you ironed your school uniform?' asked Kanda. (Rewrite in reported speech).
3.4 You should not have come to such a place. (Begin: I would rather…)
3.5 The play was made so real that most of us forgot we were in the theater. (Begin: So ……)
3.6 If I had the opportunity, I would have attended the seminar. (Re-write beginning: Had ……)
3.7 The trousers were washed thoroughly but the stains remained. (Begin: Not even…….)
3.8 I managed to control my temper. (Re-write using 'succeed')
3.9 The Nsambya nurse made the patient take medicine. (Begin: The patient ……..)
3.10 I rarely found any problem with him. (Begin: Rarely...).

3B Choose the most correct alternative.

3.11 My grandmother lost her glasses and she had to get new ones from the ……
A. eye doctor
B. physician
C. optician
D. pathologist

3.12 He……..the appointment without good reason
A. turned down
B. turned off
C. put off
D. let down

3.13 If there is any word you don't understand in the book, look…….the dictionary.
A. it up from
B. it up in
C. it up using
D. it up with

3.14 If any of the candidates cheated, they would be disqualified. This sentence tells us that;
A. Some candidates cheated and they were disqualified.
B. Some of the candidates tried to cheat.
C. None of the candidates cheated.
D. No candidate cheated and no one was disqualified.

3.15 The family relies on her for everything. This means she is;
A. the bread earner of the family.
B. the bread winner of the family.
C. the bread seeker of the family.
D. the bread hunter of the family.

3.16 I gave you two thousand shillings. Please give me my…
A. change
B. balance
C. remainder
D. left over

3.17 I needn't have laughed,……..?
A. did I?
B. didn't I?
C. needn't I?
D. need I?

3.18 The new shop will sell only…….
A. stationery
B. stationary
C. stationry
D. stetionery

3.19 Peter bought a……..coat.
A. blue new beautiful woolen
B. beautiful woolen new blue
C. new blue woolen beautiful
D. beautiful new blue woolen

3.20 Afande Felix Kaweesi was……a few years ago.
A. killed
B. murdered
C. finished
D. assassinated

PHYSICS PAPER ONE SOLUTIONS (OP003)

SECTION A

1. **B**
When a wave (ripple) moves from one medium to another of different depth, its direction changes. This is referred to as refraction and is caused by the change of wave length and velocity of the wave.
When a wave moves from shallow water to deep water, its;
- Wave length increases
- velocity increases
- Frequency and period remain the same.

Read about what happens when the ripple is from a deep to shallow boundary.

2. **B.**
Power points or electrical appliances are usually connected in parallel with
the mains supply so that;
(i) They receive the same full voltage from the mains supply or source.
If they were in series, they would share the mains voltage which might be lower than what they require to operate.
(ii) When one circuit is faulty or switched off, the other circuits remain working.

3. **A** $Q = mc\theta$
$Q = \frac{20}{1000} \times 4200 \times (60 - 30)$
$Q = 84 \times 30$
$Q = 2520J$

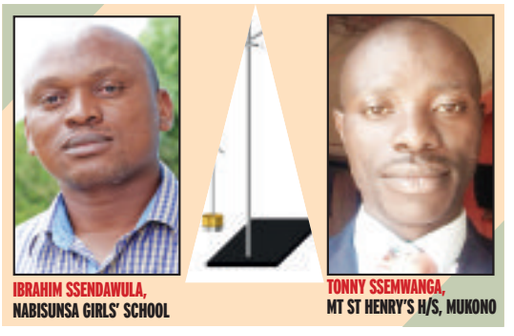
Note: *Mass has to be changed from grammes (g) to kilogrammes (kg). That is why we have divided 20g by 1000.*

4. D
Quantity of Charge = current x time
Both current and time must be in S.I units.
Quantity of change = 5 x (2 x60) = 600C

5. A.
When white light strikes the soap film, its split into the seven different colours. This is as a result of refraction.
Read about Dispersion of white light.

6. B
$E = I(R + r)$, where E = EMF of the cell, I = current, R = external resistance and
r = internal resistance.
Note: *EMF of a cell is the p.d across the cell when on open circuit, i.e. when not supplying current. It is when the switch is open. E = 4.5V from the table.*

$4.5 = Ir$
$4.5 = 3.0 + 3.0r = \frac{4.5\text{-}3.0}{3.0} = 0.5\,\Omega$



IBRAHIM SSENDAWULA, NABISUNSA GIRLS' SCHOOL

TONNY SSEMWANGA, MT ST HENRY'S H/S, MUKONO

7. **D**
A dynamo or sometimes simply referred to as a generator transforms mechanical energy into electrical energy. Kinetic energy is a form of mechanical energy possessed by a body in motion.
Read about the mode of operation of a DC and AC generator and a DC motor.

8. **D.**
Power x time = mass x S.H.C. x change in temperature
$IVt = cm\theta$
10 x 240 x t = 5 x 4200 x 80
$t = 700s$

Turn to page VI

From to page V

9. **B.**
From definition, magnification is the ratio of image distance to object distance.
So, *magnification*, $m = \frac{v}{u}$

10 **B**
In a greenhouse, strong radiations (short wavelength) penetrate through the glass of the greenhouse to its interior. The plants in the greenhouse absorb the incident radiation and in turn emit a weaker (long wavelength). This weaker radiation cannot pass through the greenhouse glass.

11. **C**
The bubble rises to the surface because the air bubble is less dense than mercury. However, as the air bubble rises, the pressure exerted on it by the mercury lowers. Since pressure is inversely proportional to volume (Boyle's law), its volume increases, which leads to bursting.

12. **A.**
The slope of a displacement-time graph is a measure of speed or velocity. The graph should start at a point above zero because the car had already covered some distance before it reached the traffic lights. The graph should show an increasing steady speed.

13 **D.**
Absolute zero temperature is the temperature at which the molecules are moving at their lowest possible kinetic energy. At this stage, its assumed that all the heat has been removed from the substance.

14. **B.**

$Density = \frac{mass}{volume}$

$But\ mass = \frac{weight\ (force)}{g} = \frac{4000}{10} kg$ *and volume* = *base area* x height $= (2.5x2)m^3$

$\therefore$ density $= \frac{4000}{10} \div 2.5 \times 2 = \frac{4000}{5.2 \times 2 \times 10}\ kgm^{-3}$

15. **A**
A notch is cut or scratch on a weak point on a material. If this cut or scratch is subjected to forces that pull the material apart (tensional forces), it spreads more rapidly than when subjected to forces that push the material together (compressional forces).

16. **A**
When the charged gold leaf is left in the open, its charge leaks away to the surroundings as a result of the moving air carrying away its charge. Since the amount of charge on the leaf reduces, then it collapses.

17. **D.**
When sound waves pass through a metal bar, the atoms of the metal, atoms of the metal absorb energy from the waves causing them to vibrate about their mean positions. The atoms do not get permanently displaced from the original positions.

18. **C.**
Effective resistance $= \frac{2.0 \times 3.0}{2.0 + 3.0} + 1.8 = \frac{6}{5} + 1.8 = 1.2 + 1.8 = 3.0\ \Omega$

19. **B**
velocity = frequency x wavelength
$3.0 \times 10^8 = 6.6 \times 10^8 \lambda$
$\lambda = \frac{3.0 \times 10^8}{6.6 \times 10^8} = 4.55 \times 10^{-1} m$

Read about the electromagnetic spectrum and understand where the different electromagnetic waves are located in the spectrum. Study properly the variations in the wave length and frequency of these radiations.

20. **A**
When the temperature of gas molecules is increased, the molecules move faster, hence increasing its average kinetic energy. When temperature is reduced, the average kinetic energy lowers. Therefore, average kinetic energy depends on temperature.

21. **B**
Let x and y represent the atomic and mass numbers of P written as ${}^{x}_{y}P$. $\Rightarrow 234 = 234 + x \Rightarrow x = 0$
$90 = 91 + y \Rightarrow y = -1$. So ${}^{x}_{y}P = {}^{0}_{-1}P$. This is a symbol of a beta particle.

22. **C**

A fuse is a thin wire of low melting point which melts when the current exceeds a required value so as to break the circuit.
Note: *A fuse must be connected to the live wire.*
$I = \frac{P}{V} = \frac{750}{240} = 3.15A$
The ideal fuse to be used should have a maximum rating which is a slightly higher than the normal current expected. Therefore, the 5A fuse is the appropriate one to be used.

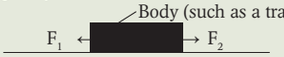
23. **B**
Pitch of a note is the loudness or softness of sound. It depends on the frequency of sound produced, the higher the frequency the higher the pitch.
The frequency of a note from a guitar string can be increased by;
Shortening the string
Increasing tension (tightening of the string)
Reducing the thickness of the string

24 **C.**
$power = IV = \frac{V^2}{R} = \frac{12^2}{100} = \frac{144}{100} = 1.44W$

25. D.
Stability of a body can be increased by;
- Lowering the centre of gravity
- Widening the base area

Therefore, when a heavy load is placed on its roof rack, its centre of gravity will be raised and this lowers its stability.

26. **D**



$F_2 - F_1 = ma$, if $F_1 = F_2$, then $ma = 0 \Rightarrow a = 0$ (since $m \neq 0$)

If equal and opposite forces act on a body in motion as shown in the diagram above, the resultant force on the body becomes zero. At this point, the acceleration of the body is zero. This implies that speed of the body does not change, i.e. speed remains constant.

27. **A**
A four-stroke engine is an internal combustion engine in which the piston completes four separate strokes while turning the crankshaft. A stroke refers to the full travel of the piston along the cylinder, in either direction. The four separate strokes are termed: intake, compression, power (sometimes referred to as combustion) and exhaust.

Read about the two stroke petrol engine and also make a comparison between the petrol and diesel engines.

28. **C.**
$efficiency = \frac{M.A}{V.R} \Rightarrow \frac{80}{100} = \frac{M.A}{5} \Rightarrow M.A = 4$
$M.A = \frac{load}{effort} \Rightarrow 4 = \frac{load}{10} \Rightarrow load = 40N$
Velocity ratio (V.R) is got by counting the number of pulleys in the system or counting the number of portions of the string supporting the lower block.
For this case, the pulleys or strings are five.

29. **D**
Archimedes' principle states that when a body is wholly or partially immersed in a fluid, it experiences an up thrust equal to the weight of the fluid displaced.

Read about the law of flotation.

30 **A**
A simple cell is made up of two electrodes and an electrolyte. A more reactive metal acts as the cathode while the less reactive metal is the anode. It commonly consists of a copper rod (Positive electrode) and the zinc rod (Negative electrode) dipped into dilute sulphuric acid (Electrolyte).
Electrons flow the negative electrode (zinc plate) to the positive electrode (copper plate) while current flows from the positive to negative plate.

Read about the;
Defects of a simple cell
Differences between primary cells and secondary cells.

31. D.
When you touch a metal on a cool day, your body is at a higher temperature compared to the metal, so heat moves away from your hand to the metal. This process is called conduction. Since your body losses heat to the metal, the temperature of the hand lowers hence feels cold.

Read about the three modes of heat which include conduction, convection and radiation.

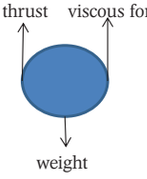
32. **D**
Pressure exerted on a surface depends on the surface area in contact. The bigger the area in contact, the less pressure exerted and the smaller the area in contact, the pressure exerted.
A hippopotamus has wider feet in contact with the mud compared to the feet of a goat in contact with the mud. Because of the wide hooves, a hippopotamus exerts less pressure on the ground than the goat hence finds it easier to walk on mud without sinking.

33. **B**
Radioactivity is the spontaneous disintegration of heavy unstable nuclei to form stable nuclei accompanied by release of radiations.

Read about the types of radiations which include alpha, beta and gamma rays.

34. **C**
When a balloon filled with hydrogen is released into the air on a calm day, it rises up. As it rises, the pressure exerted on the gas particles reduces, but the volume of the balloon increases until when the balloon bursts. (Boyle's law).

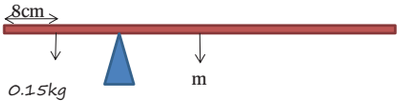
35. B
When a metal sphere is dropped in a viscous fluid, it first accelerates because its downward force (weight) is greater than the total upward force (up thrust + viscous force).



As the particle accelerates downwards, its upward force increases until a point when the total upward force is equal to the downward force. At this point, the net force acting on the body is zero and therefore its acceleration is zero. The body then moves with a constant velocity called terminal velocity.

36 **A**
A nuclide is written as ${}^{A}_{Z}X$ where A = mass number and Z proton number. A = N + Z where N = number of neutrons.
If number of protons = 29, then; 63 = 29 + neutrons
$\Rightarrow$ neutrons = 63 − 29 = 34.
For a neutral atom, number of protons = number of electrons.
So the number of electrons = 29

37 **C.**



Let m = mass of the metre rule
$0.15 \times 0.17 = m \times 0.25$
$m = \frac{0.15 \times 0.17}{0.25} = 0.102kg$

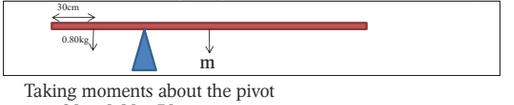
38. **C.**
Atmospheric pressure $= hpg = \frac{760}{1000} \times 1.36 \times 10^4 \times 10 = 103360 = 1.03 \times 10^{-2}\ Nm^{-2}$

39. **C.**
The diagram demonstrates refraction through a glass block. It can be used to determine refractive index of the glass block. But refractive index,
$n = \frac{\sin i}{\sin r}$. Therefore, a graph of sin i against sin r will give a straight line.

40 **B.**
When two similar charges are brought close to each other, there is repulsion but when two unlike charges are brought close to each other, attraction occurs. This is summarised as the law of electrostatics which states that;
Like charges repel while unlike charges attract.
If a negatively charged ebonite rod is brought near the cap of a negatively charged electroscope, the gold leaf will increase in divergence since both charges are similar (negative charge).

SECTION B

41. (a). The moment of a force about a point is the product of the magnitude of the force and the perpendicular distance of its line of action from the point.
(b). To work out such questions, we employ the principle of moments, let m be the mass of the metre rule. We also need to note that the weight of a uniform metre rule acts at the centre of gravity. Consider the illustration below;



Taking moments about the pivot
$mg \times 20 = 0.80 \times 30$

Note: *(Here we may not change the units of length since the length is multiplied on both sides of the equation)*

$m \times 10 \times 20 = 0.80 \times 30$
$m = \frac{0.80 \times 30}{10 \times 20}$
$m = 0.12\ kg$

Also Read about the following:
- The S.I units of moments and principle of moments
- Couple of a force and its applications (opening a tap, steering wheels, riding a bicycle etc.)
- Applications of moments (the beam balance, the crowbar,

the reason why a handle of a door is always fixed at the side opposite to the hinge, among others)
- Determination of unknown mass given a standard mass and a uniform beam of known mass and length)
- Determination mass/ weight of a metre rule given a standard mass
- Centre of gravity and stability (Neutral, stable and unstable equilibria)
- Determination of C.O.G of regular and irregular laminae
- Why it is advisable to load buses at the base than at the top deck
- Why structures should have wider bases than tops
- Why you always bend on the opposite side when carrying a load (for instance a jerry can) in the other hand.

42. (a). The statement that "An electrical appliance is rated 240 V, 60 W" means that when this appliance is connected to a 240 V mains supply, it gives out energy at a rate of 60 joules per second.

(b) We mainly have three mathematical relations that help us to determine the electrical power dissipated by an electrical appliance;

$P = IV, P = I^2R, P = \frac{V^2}{R}$

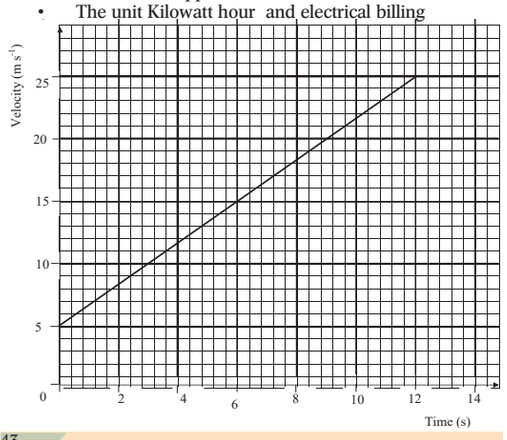
Since we have been given Power and Voltage, then we employ the first relation:

$P = 60\,W, V = 240\,V, I = ?$

$P = VI$

$60 = 240 \times I \Rightarrow I = \frac{60}{240} = 0.25\,A$

Also read about:
- The difference between potential difference and Electromotive force and their S.I units
- The series and parallel connection of resistors
- The relationship between Voltage, current and resistance
- Relationship between e.m.f and internal resistance and the meaning of a lost volt.
- Ohm's law and its applications, the factors that affect the resistance of a conductor (Ohmic and non-Ohmic conductors)
- The formulae for electrical heat energy dissipated in an electrical appliance
- The unit Kilowatt hour and electrical billing



43.

Note: *The slope of a velocity-time graph is acceleration.*

Acceleration, a = $\frac{\text{change in velocity}}{\text{change in time}}$

$a = \frac{25-5}{12-0} = \frac{20}{12} = 1.67\ m\,s^{-2}$

(b) The force acting on the mass.

$m = 2\,kg, a = 1.67\ m\,s^{-2}, F = ?$

$F = ma$

$F = 2 \times 1.67 = 3.34\,N$

(c) The distance covered is always obtained by determining the area under the Velocity-Time graph after 6 seconds.

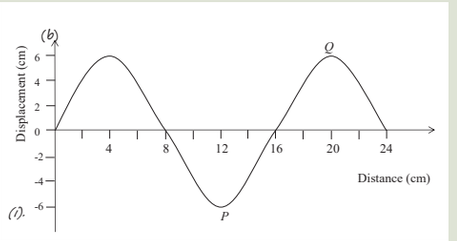
$S = \frac{1}{2}(6) \times (5 + 15) = 60m$

$Work = F \times s = 3.34 \times 60 = 200.4\,J$

Note: (i). ***The area under a velocity-time graph is the total distance covered(this area is always in metres (m) because we multiply velocity (ms^{-1}) with time (s) this results in metres, (ii). The slope of a velocity-time graph is acceleration or deceleration of the object***

Read about:
- How to describe different Velocity-time graphs
- Sketch of velocity-time graph for a body:- thrown vertically upwards
- A body moving with uniform/ steady/ constant acceleration(deceleration)
- A body moving with non-uniform acceleration
- The Newton's laws of motion, inertia, equation of linear motion, motion of a ticker timer, motion in a lift (when we feel weightless in a lift)
- Application of the laws of motion (Flexing on the knees by jumpers, delay to bring a fast moving ball to rest by a goal keeper, why when an inflated balloon is opened at the mouth and released, the it loses the air as it moves in the opposite direction)
- The working of a rocket/ jet engine etc.

44. A transverse wave is the one which is propagated by vibrations perpendicular to the direction of travel of the wave.



(i). P is a trough. Q is a crest.

(ii) If the frequency of the wave is 20 Hz, then using $v = f\lambda$, the velocity of the wave can be determined;

$f = 20\,Hz, \lambda = 16\,m, v = ?$

$v = f\lambda$

$v = 20 \times 16 = 320\ m\,s^{-1}$

Read and understand the terms: Frequency, period, wave length, amplitude, wave front, crest, trough, rear faction etc.
Difference between electromagnetic and mechanical waves
Why is it not possible to communicate to a friend on the moon without use of devices?
The transverse and longitudinal waves and their examples
Harmonics and overtones as applied in waves
Explain why echoes cannot be heard in small sized room

45. (a) Define focal length of a converging lens.
This is the distance from the optical centre to the principal focus of the lens.
(b) The focal length of a converging lens is 20.0 cm. What is its power?

Note: ***Recall that power of a lens is the reciprocal of the focal length of the lens expressed in metres. We first covert the focal length to metres and then obtain its reciprocal. The result obtained is the power of the lens. It is measured in dioptres (D).***

$f = 20.0\,cm = 0.20m$

$power = \frac{1}{f}$

$power = \frac{1}{0.20} = 5D$

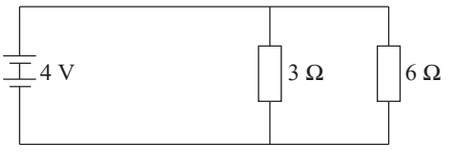
(c) State any two properties of an image of a real object formed by a diverging lens.
The image is erect, diminished, and virtual.

Read more about;
- Differences between real and virtual images
- The rules followed to draw the graphical representations of the images formed at various positions of the object from the lens (beyond C, at C, between C and F, at F and between F and the optical centre)
- Lenses and their applications
- Terms used and related to lenses
- The methods/experiments to determine the focal length of lenses
- The determination of the nature of the images formed by lenses using the graphical method
- The devices like the lens camera which use the lenses
- The human eye, its operation, defects and how they can be fixed

46. (a) State Ohm's law.
The current passing through a conductor at constant temperature is proportional to the potential difference between its ends.

Note: ***For definitions, laws, principles, theories and hypotheses, much care must be taken so as you do not change the meaning in them. Changing their meaning renders your work wrong and so you do not score the marks. On this ground, you are encouraged to read hard and understand them.***

(b)



Two resistors of resistances 3 Ω and 6 Ω are connected across a battery of 4 V of negligible internal resistance as shown above. Find the
(i) Combined resistance.
Let combined resistance be R

$\frac{1}{R} = \frac{1}{3} + \frac{1}{6} = \frac{2+1}{6} = \frac{3}{6}$

$R = 2\,\Omega$

(ii) Current supplied by the battery.

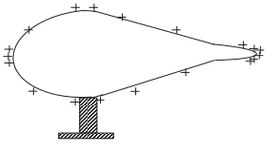
$R = 2\,\Omega$, e.m.f. $= 4\,V$, $I = ?$

Using Ohm's law: $V = IR$

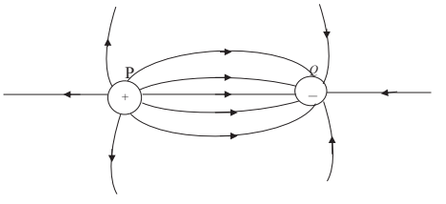
$4 = I \times 2 \Rightarrow I = \frac{4}{2} = 2A$

Also read about:
- The formulae , Verification of Ohm's law(Ohmic and non-Ohmic conductors, factors determining the resistance of a material
- Sketch of I-V graphs of different Ohmic and non-Ohmic conductors
- Whether the parallel or the series arrangement of resistors allows higher current or potential difference.
- The use of the voltmeter and ammeters to measure and record voltage and current.

47. (a). When two insulators of different materials are rubbed together, some of the surface electrons acquire enough energy to break off the material with less affinity for electrons and cling to the material with a higher affinity for electrons. The material to which the electrons stick becomes negative ion, while the material that lost some of its electrons becomes a positive ion.
(b) Note: more charge collects at the sharp ends of the conductor than at the larger ends. So the charge distribution all over the conductor will be like the one in the figure below;



Note that a lightning conductor has sharp spikes because a lot of charge concentrates on these sharp spikes before it is transmitted to the Earth. Read more about the working of a lightning conductor.



Sketch the electric field pattern due to the two charges P and Q placed near each other as shown above.

Note: ***The lines of force always run from the positive charge to the negative charge, they are curved and never cross each other***

Also read about:
- The field between two similar charges, charged plates
- Charging a body by contact, induction, friction
- The gold leaf electroscope, its parts and their uses.
- The different uses of a gold leaf electroscope (comparing magnitude of charge on different bodies, comparing conductors and insulators, determining sign of charge on a body)

48. (a). The electromotive force of a battery is the total work done in joules per coulomb of charge conveyed in the circuit in which the battery is connected.
(b) Dry cell, dynamo, thermocouple, photo cell, lead-acid

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cell, etc.
(c). Lost volts is the p.d. required to send current through the internal resistance of a cell.

Also read about:
Terminal potential difference, Primary and secondary cells, the defects of a simple cell (local action and polarisation), the remedies to such defects, the lead-acid battery and the care it requires, the process of charging the battery etc.

49.(a).(i) Mass number.
Mass number is the number of protons and neutrons in the nucleus of an atom.
(ii) Atomic number
Atomic number is the number of protons in the nucleus of an atom.
(b) Name two radiations emitted by radioactive substances.

Gamma radiation, or γ – radiation,

Beta radiation, or β – radiation,

Alpha radiation, or α – radiation.

Read about:
- The terms isotope, radioactivity, the effect of emission of alpha particles, beta particles, half-life and how it is determined, the different applications of the radiations in (medical, industries etc.)
- Demerits of such radiations to our health and the precautionary measures.
- The behaviour of such radiations in the electric and magnetic fields (to which pole or electric plate each radiation is defected)
- Comparison of the penetrating power of the radiations using an ordinary piece of paper, aluminium and lead and other related areas.

50. (a) (i). Height, h = 550 – 50 = 500 m, mass in one second, m = 2000 kg,
g = 10 m s^{-2}
Potential energy per second, Q = mgh
Q = 2000 ×10 × 500
Q = 10,000,000 W

(ii) the maximum electrical power output of the station if the whole system is 80% efficient.
Electrical power output, P = $\frac{80}{100}$ x 10,000,000
P = 8,000,000 W

(b) Potential energy per second = kinetic energy per second
$mgh = \frac{1}{2}mv^2$
10,000,000 = $\frac{1}{2}$×2000×v^2 = 1000 × v^2
Hence v = $\sqrt{10,000}$ = 100ms^{-1}

Read about:
- The different types of machines, the terms efficiency, velocity ratio mechanical advantage, work input and work output
- Reasons why it is not practical to have a machine that is 100% efficient
- How to improve the efficiency of a machine
- The relationship between work, power and energy etc.

PHYSICS PAPER TWO QUESTIONS (0PHY004)

Assume where necessary;
Acceleration due to gravity = 10ms^{-2}
Refraction index of glass = 1.52
Refractive index of water = 1.33
Speed of sound in air = 330ms^{-1}

1. (a) What is meant by:
i) Velocity ratio of a machine?
ii)Pitch of a screw?
(b) A screw jack with a lever arm of 40cm and a pitch 2.0cm is used to raise a heavy load
i) Find the velocity ratio of the screw jack.
ii)State two practical applications of a block and tackle pulley system
(c) (i) State the **principle of conservation of linear momentum.**
(ii) A dog of mass 8kg chases a bicycle rider at a speed of 20ms^{-1}. The mass of the rider and the bicycle is 48kg and is moving at a speed of 5ms^{-1}. If the dog rams and sticks into the spokes of the bicycle, find their common velocity after collision, and the type of the collision.
(d) A balloon is blown full of air and its neck tied with a thread. Explain briefly what happens when the balloon is simultaneously untied and released.
(e) (i) State **Archimedes' principle**.
(ii) A swimmer of weight 600N dives into water in a swimming pool and displaces 200N of water. Find the weight of the swimmer when fully under water.

2. (a) Define the term **specific latent heat of fusion**.
(b) Describe an experiment to determine the specific latent heat of fusion of ice.
(c) A calorimeter of heat capacity 60JKg^{-1} contains 0.5 kg of water at 30^{o}C. Dry steam is passed into the water until the temperature of the calorimeter and water rises to 60^{o}C. Calculate the mass of steam condensed.
(d) Explain why the boiling point of water drops as one climbs a high mountain.

3. (a) (i) State the **laws of refraction of light.**
(ii)With the aid of a diagram, explain how the terms 'real depth' and 'apparent depth' come about.
(b) (i) Define the term critical angle.
(ii) A ray of light moves from water to glass at an angle of incidence of 30^{o} in water. Find its angle of refraction in glass.
(c) An object 5cm high is placed perpendicularly on the principal axis at a distance of 45cm from a converging lens of focal length 15cm. By graphical construction, determine:
i) The position
ii) The height
iii) The magnification, of the image formed

4. (a) Define the following terms as applied to waves:
i) Wave front.
ii)Wave length.

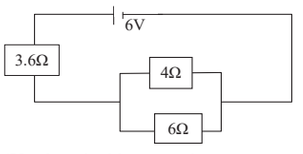
(b) (i) State three differences between light and sound waves.
(ii) A turning fork of frequency 525 Hz causes an air column in a closed pipe to resonate with its fundamental note. Calculate the;
i) length of the tube.
(c) (i) Describe an experiment to demonstrate resonance in sound.
(ii) If the fundamental frequency of a note is 600 Hz, find the frequency of a note two octaves lower.
(d) State two ways in which the frequency of vibration of a stretched wire can be increased.

5 (a) Draw a labeled diagram of an **X-ray tube** and use it to describe how X-rays are produced.
(b) State one way of increasing;
i) The intensity of the X-rays produced
ii) The strength of the X-rays produced
(c) Define the following terms:
i) Activity.
ii) Half-life
iii) A radioactive nucleus of lithium disintegrated according to the equation.

Complete the equation and name the radiation particle, P.
(d) A 96g sample of a radioactive Isotope has 90g decayed in 80 days. Determine:
i) The mass remaining
ii) The half-life of the sample
(e) Give any two uses of radioactivity

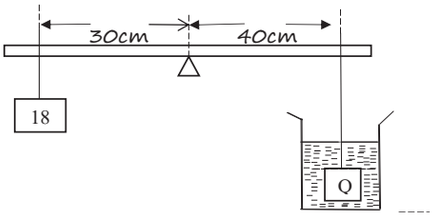
6. (a) Explain what happens when two insulators of different materials are rubbed together.
(b) Describe how a lightning conductor safe guards a building from lightning
(c) State Ohm's law

(d)



A battery of e.m.f 6Vand negligible interval resistance is connected to 3.6Ω, 4Ω and 6Ω resistors as a shown in figure 1 above. Find the:
i) Total current flowing through the circuit.
ii) Power dissipated in the 3.6Ω resistor.
(e) Sketch the I – V characteristics for the filament lamp.

7. (a) (i) What is meant by **centre of gravity**?
(ii) Describe an experiment to determine centre of gravity of an irregular lamina.
(iii) State the factors which affect the stability of a body.
(b) (i) State the **principle of moments.**
(ii) When is a body said to be in unstable equilibrium?
(c) A uniform beam is pivoted at its centre as shown below:



A mass of 180g is suspended at 30cm from the centre of the beam. The beam balances horizontally when a block, Q, suspended at 40cm from the centre of the beam is immersed in a liquid of density 800kgm^{-3} as shown above. If the volume of the liquid displaced is 1.0 x 10^{-5}m^{3}, find:
i) The mass of liquid displaced.
ii) The weight of Q in air.

8. (a) (i) State Faraday's law of electromagnetic induction.
(ii) With aid of a well labeled diagram, describe the mode of
operation of a direct current generator.
(iii) State two ways of increasing the e. m. f produced by the generator.

(b) What is the country wide commonly used type of transformers?
(c) A 250V mains transformer of 2000 turns in the primary winding is used to operate a 200W, 80V electric motor.
Find the;
(i) Current flowing through the motor
(ii) Number of turns in the secondary winding

(d) (i) What is a kilowatt hour?
(ii) Find the cost of using four 200W bulbs for 10 hours if one unit of electricity costs sh.540.

BIOLOGY, PHYSICS AND GENERAL PAPER TOMORROW