WUNNA EDUCATIONAL SERVICES

LOWER SECONDARY HOLIDAY PACKAGE

SCIENCE SUBJECTS

SCHOOL NAME:

_____

STUDENT'S NAME:

_____

CLASS AND STREAM:

_____

INSTRUCTIONS:

- Complete all the exercises in this Package.
- Submit your work on the first day back after the holiday.
- Ensure all your work is neat and well-organized.

Make Research but when answering the package ensure that you work independently to ensure that your understanding is reflected.

MATHEMATICS

ITEM 1

You decided to have a Joint party with your family members which will cost a total of Uganda shillings four million. You are nearing a D-Day and you want to find out whether you have enough required amount of money or not. And below are the contributions;

i. Your parents promised to contribute 30% of the money.
ii. Your friends promised 10% more than that your parents promised.
iii. And since you are the owner of the party, you contributed 20% of the required amount.

When you went for shopping, you moved 6km due East from your home and the 8km due south to reach the market, but the old man on the way told you that there is a shortest route you would use to reach the market directly to save time. And you made a booking of shillings; one million, seventy five thousand for all items required for the party.

Task

As a Mathematics learner,

(a) How far from your home to the supermarket if you used a direct route?

(b) Make a simple budget for the party according to the booking.

(c) Do you have the required amount for the party? Justify.

(d) What advice can you give to the party organizing committee?

ITEM 2

Ayebare's family is building a new rectangular flat house with a length of 15 meters and a width of 8 meters. They need to cover the roof with iron sheets, each measuring 2 meters by 1 meter. Two hardware shops, A and B, sell the required iron sheets at different prices.

Shop A sells each iron sheet at Shs 35,000, with a 10% discount for every 50 sheets purchased.

Shop B sells each iron sheet at Shs 40,000, with a 5% discount for every 40 sheets purchased.

Task:

As a Mathematics learner,

(a) How many iron sheets are needed to cover the entire roof of the house?

(b) Calculate the total cost of iron sheets from Shop A, including the discount.

(c) Calculate the total cost of iron sheets from Shop B, including the discount.

(d) Which shop offers the better deal, and how much can Ayebare's family save by choosing that option?

ITEM 3

Nakatude's family owns a small farm in the village, where they grow and sell vegetables. They want to enclose a rectangular garden with a fence. The length of the garden is 5 meters more than the width.

Task

As a Mathematics learner,

(a) What are the dimensions of the garden?

(b) If the fencing material costs Shs 500 per square meter, and they want to spend not more than Shs 50,000 on fencing, is their budget sufficient?
(c) The family makes a profit of Shs 2,000 per square meter of tomatoes sold, and they want to make a profit of at least Shs 150,000. Will they meet their target profit?

ITEM 4

In preparation for S4 prom party, you were chosen by your fellow candidates to be a chairperson organizing committee. You moved from school to town A which is 160km north of your school, for shopping party items. From town A you moved west wards 150km to town B. From B you headed to town C in the direction S75°W which is 90km from B. From C you continued to town D which is 148km and south of B but after you discovered that there is the shortest route you could use to move directly from school to town D.

In the shopping, you bought 400 chicken and each cost UGX 35,000. The farmer gave you a 2% discount on each chicken.

You also bought two identical jerry cans of cooking oil. The larger being of height 30cm and smaller 15cm. The larger has a capacity of 10 litres. And you bought 4 smaller and 2 larger jerry cans.

Task

(a) Determine how far you would move if you used a direct route.
(b) Determine the total cost incurred in purchasing chicken.
(c) What is the maximum amount of cooking oil you bought for the party?

ITEM 5

Two friends, Sarah and Moses, started a poultry project to which they contributed shs. 4,000,000 and shs. 6,000,000 respectively.
They agreed to share the profits in the ratio of their contributions and the project started with 2,000 birds.

After selling all the birds, they made a profit of one million five hundred thousand shillings. They re-invested the profit in the project and the number of birds increased to 2,500. However, Moses and Sarah were not sure of the amount he reinvested as well as the percentage increase in the number of birds.

Task:

a) How much of the profit did Moses and Sarah re-invest in the business?
b) What was the percentage increase in the number of birds?

ITEM 6

Your brother wants to design a children's playground. The playground will have a triangular garden and a circular fence around the garden. The two sides of the triangular garden will measure 50m and 70m, and the angle between them will be 45^0.
Your brother also wants to construct a circular fence around the garden such that the circular fence perfectly touches the three vertices of the triangular garden. Your brother needs help in identifying the type of triangle represented by the triangular garden, coming up with an accurate design of the playground.

Task:

Help your brother to;

a) Construct an accurate design of the children's playground.

b) Identify the type of triangle represented by the triangular garden and give a reason for your answer.

ITEM 7

Jinja Modern SS hired a bus and a minibus to transport students to a study tour. Each trip by the bus costs Shs. 40,000 and that of the minibus costs Shs. 25,000. The bus has a capacity of 42 students and the minibus 14 students. All the 126 students contributed a total of Shs. 200.000. The minibus had to make more trips than the bus. If x and y represent the number of trips made by the bus and the minibus respectively:

Task

a) Write down five inequalities representing the above.

b) (i) Plot the inequalities on the same axes

(ii) By shading the unwanted region, show the region satisfying all the inequalities

c) Use the graph to find the number of trips each vehicle should make so as to send the least amount of money.

ITEM 8

A senior three student, was given three points A (4,0), B (0,3) and C (4,3) of a triangle ABC and asked to enlarge it by both a scale factor 2 and a scale factor -2 on the same axes with the center as the origin, the learner could not distinguish between a positive and a negative scale factor.

Task

a) Guide the learner through and state the images;

i) Of triangle $A_1B_1C_1$ scale factor 2 ii) Of triangle $A_2B_2C_2$ scale factor -2

b) If triangle $A_1B_1C_1$ is an image of triangle $A_2B_2C_2$ under enlargement, state the center and scale factor of enlargement.

c) You have been given two cylinders, one of length 12cm and volume $630cm^3$, another with length 14cm and volume $420cm^3$.

i) State with reasons whether the cylinders are geometrically similar.

ii) What would have been the volume of the smaller one for the cylinders to be similar?

ITEM 9

Lugazi is 45km from Kampala. Kintu sets off at 0815 hours from Kampala riding a bicycle at 15km/hr. Kintu's bicycle broke down at 0915 hours and he was delayed for 45 minutes. He then walked back to Kampala and reached at 1230 hours. Ojok sets off at 0915 hours from Kampala, riding a bicycle and reached Lugazi at 1200 hours.

Task

a) On the same axes, draw the graphs showing the journeys of Kintu and Ojok

b) Use your graph in (a) to find

(i) How far from Kampala Kintu was when his bicycle broke down

(ii) The speed at which Kintu walked back to Kampala.
(iii) Ojok's average speed
(iv) The time when the two men met
(v) The distance from Kampala where the two men met

BIOLOGY

ITEM 1

While attending a medical seminar at Mulago Hospital, the Doctor on duty said it is important to make sure blood group cross-match is made before transfusing blood into a patient. This cross-match is made to make sure the ABO and Rhesus blood group system are compatible.

Task
Write an essay to illustrate the compatibility of various blood groups.

ITEM 2

During a dry season, a tomato farmer started seeing his crops having collapsing stems, folded leaves and some almost drying without any disease. The farmer consulted from fellow farmers in the area who advised him to start irrigating his garden from a nearby water source. He used a watering can, and in a few days the plants that had started collapsing gained and grew up very well which pleased the farmer. However, while as the farmers know about irrigation they don't know how plants benefited from it.

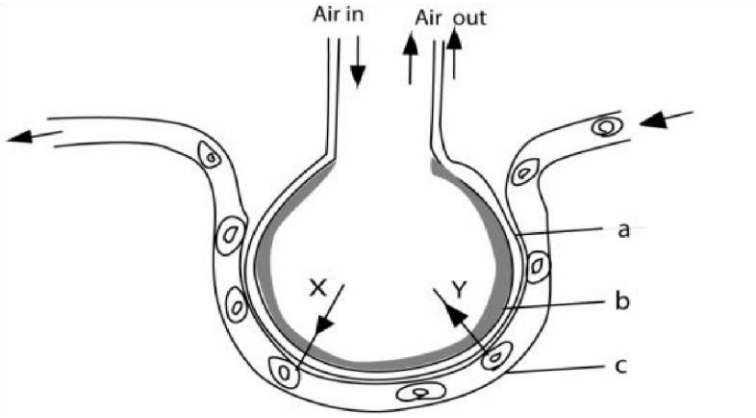
Task:

As a student of biology, write a detailed article educating the farmers about the state of these plants A and B in such a season.

ITEM 3

The lungs in mammals, amphibians, reptiles and birds are one of the essential organs required for survival of terrestrial animals. They have been capable of successfully colonizing land due to their effective mechanism of gaseous exchange via the lungs.

The diagram below shows the structural modification inside the lungs used for gaseous exchange.



Task

a) Identify the structure shown above

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b) Name parts labeled a, b, and c

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c) Identify gases labeled x and y

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d) Describe how the structure above is adapted for efficient gaseous exchange in man

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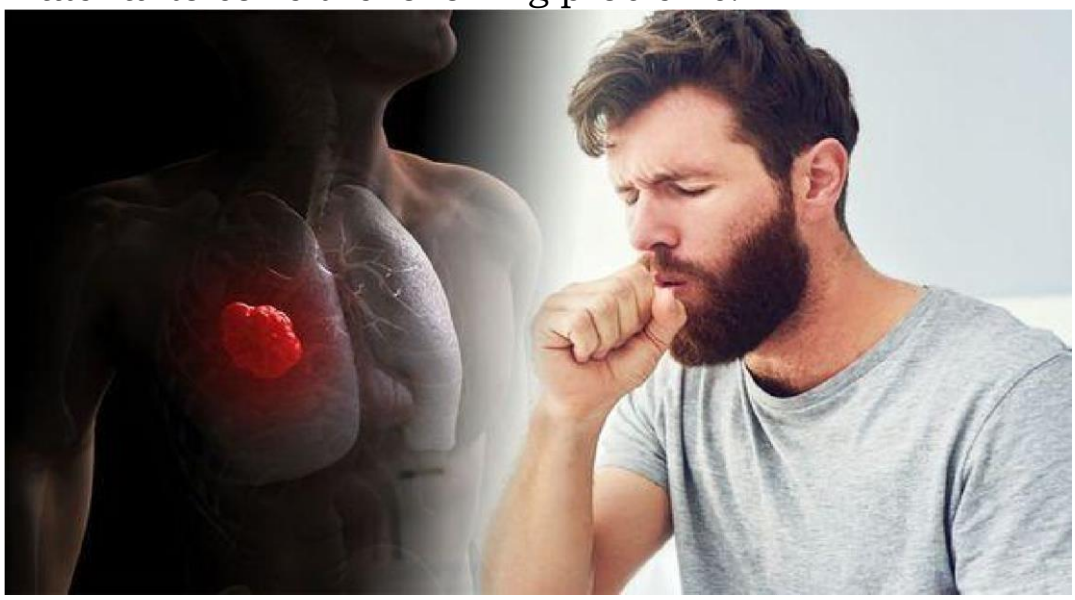
ITEM 4

The respiratory system is liable to attack by disease causing organisms, which compromises the health of the whole body. The figure below shows one of the signs of respiratory diseases. Use it as a correlative supportive material to solve the following problems.



Task

(a) Identify diseases of the respiratory system

(b) State the symptoms and signs of respiratory diseases of the lung

(c) Which forms of investigations can be used to diagnose (identify) respiratory diseases of the lungs in man

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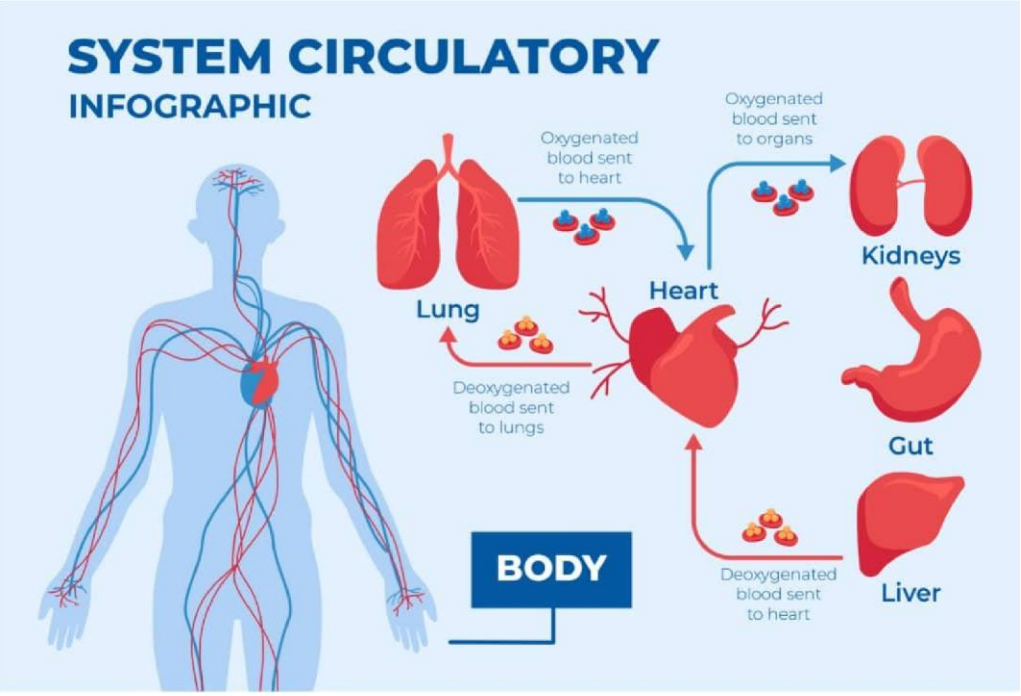
ITEM 5

Fill in the blank spaces using the supporting material below with the correct answer from the box provided.



Oxygenated blood is transported from the heart to all body via the……The fore arms then receive oxygenated blood via the…… The Mesenteric Artery then branches off the Aorta to supply blood to the…… The Hepatic Artery branches off the Aorta to supply the …… Blood rich in nutrients is transported from the gastro-intestinal system via the …… to the liver. The …… is a branch of the Aorta that supplies blood to the kidney. Finally, the Femoral Artery transports blood to the ……De-oxygenated blood is transported from

the legs to the Vena Cava via the ……. The…… drain blood from the kidneys to the Vena Cava. The ……transports blood from the head to the Vena Cava. The Vena Cava then returns deoxygenated blood to the heart, and the heart pumps it to the lungs via the Pulmonary Artery.

Liver, Hepatic Portal Vein, Subclavian Artery, legs, Femoral Vein, gastrointestinal system, Renal Vein, Jugular Vein, Aorta, Renal Artery

ITEM 6

Homosapienis a warm blooded organism referred to as endothermic. It is capable of regulating its temperature at a reference range of about 35 to 38^0C. Even in the toughest fluctuations in environmental temperature, this organism maintains its body core temperature within this range.

Task

Describe how warm blooded organisms maintain their temperature constant.

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An experiment was carried out on a young man in which the volume of air taken in at each breath and the number of breaths per minute were measured at rest and after running.

	Volume of air per breath	Breaths per minute
At rest	$450cm^3$	20
After exercise	$1000cm^3$	38

Task

a) Calculate the total volume of air breathed in per minute at rest and after running?

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b) 20% of the air breathed in consisted of oxygen, but only 16% of the air breathed out consisted of oxygen. Assuming that these figures remain constant, work out the volume of oxygen entering the blood per minute at rest after exercise.

Why does the amount of oxygen taken up into the blood increase after exercise?

(d) Name two commercial uses of anaerobic respiration

ITEM 1

Mugumya logistics is a new company that specializes in transportation of heavy cargo. The company wishes to recruit workers who are powerful enough to load cargo on to large trucks. In order to ensure that only powerful candidates are recruited, the manager uses two criteria to interview the applicants. First, he estimates the power of the applicants. Any applicant who has a power exceeding $\mathbf{4}\boldsymbol{W}$ passes the first interview and goes to second interview where the applicant is expected to lift load of $\mathbf{450}\boldsymbol{N}$ using a machine **75**% efficient and known to have a velocity ratio **4**. The manager was advised to determine the power of the applicant using a stair case of **10 stairs** each of height $\mathbf{12}\boldsymbol{cm}$.One applicant of mass $\mathbf{50}\boldsymbol{kg}$ takes **2 minutes** to run up the stair case. As a learner of Physics;

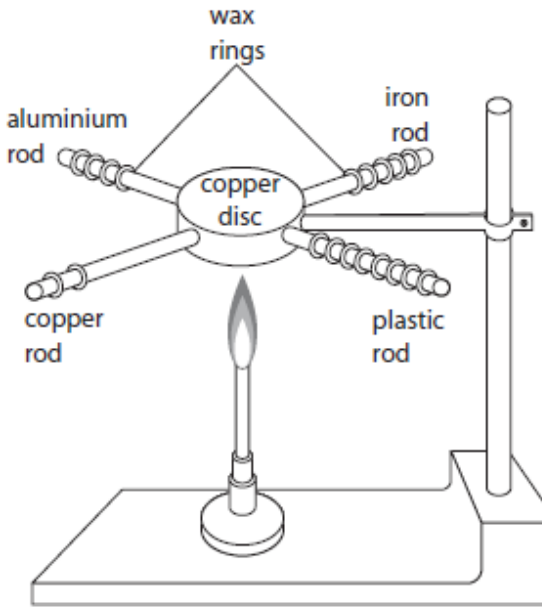
(a) Advise the learner on whether to allow the applicant to proceed to the next interview.

(b) Determine the minimum effort that would be required by the applicant to lift the load.

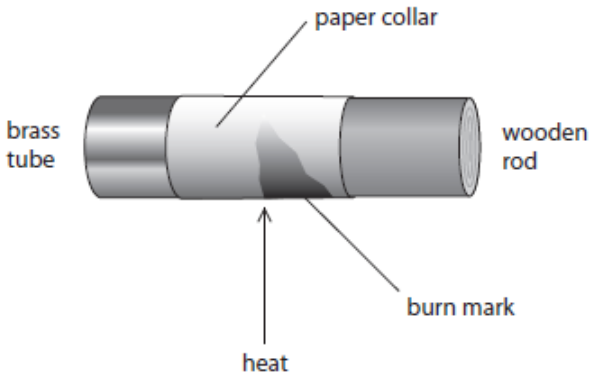
ITEM 2

During a Physics lesson, a teacher performs three separate experiments to demonstrate conduction of thermal energy.

In the first experiment, he inserts four rods of different material into a copper disc and places 8 pieces of wax rings onto each rod. She then heats the copper disc with a Bunsen flame. The figure below shows the results of the experiment after the copper disc was heat for a few minutes.



In the second experiment, he places lumps of ice in a test tube, places a wire mesh on top of ice and fills the test tube with water. He then heats up the top of the test tube until the water boils.
In the third experiment, he inserts a wooden rod into the end of a brass tube and wraps the interface of the two materials with a paper collar which he then heats. The figure below shows the result of the experiment after a few minutes.



As a learner of Physics, help the students who did not attend the lesson that day to understand;

(a) What the first experiment tells us about conduction of thermal energy

(b) The importance of the wire mesh and the observations made in the second experiment.

(c) Why the paper collar was burnt on the wooden rod but not on the brass tube.

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ITEM 3

A war erupted between two groups of soldiers who had camped on opposite sides of a certain hilly area surrounded by small water bodies. The soldiers communicated by throwing a stone in water to alert their colleagues of any danger ahead however the stone could alert their enemies too. One of the soldiers had **small sizable plane mirrors** and a **torn paper box** in his bag. Occasionally, the leader of one group of soldiers sent spies to peep behind the hills to see where the enemy troops were hiding but they could be captured and killed. One day as it was threatening to rain, bright colours of different kind spread out in the sky. This scared the soldiers and they took off and hid in a cave which is very dark inside as the rays from the sun couldn't reach there.

As a learner of Physics,

(a) Advise the leader of the soldiers on how they could be able to see where the enemy troops are hiding without having to climb up the hill.

(b) Help the soldiers understand the cause of the bright colours that spread out in the sky.

(c) Advise the soldiers on how they would solve the problem they faced inside the cave.

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ITEM 4

One morning, a boy woke up and observed that the dust particles in the path of light rays through a small hole in the roof of his room moved randomly. Later in the afternoon, he saw that the dust particles moved even faster. He became curious and asked his elder brother but who failed to give him a convincing explanation. He moved round the house and was amused to see that some substances had fixed volumes and shapes, others had fixed volumes but not shapes while others had neither fixed shape nor volume. Later at night as they were watching the television, his brother told him that inside the television is a state of matter called plasma.

As a learner of Physics, help the boy understand:

(a) Why the dust particles moved randomly

(b) Why some substances have fixed shape and volume while others have fixed shape but not volume while others have neither a fixed shape nor fixed volume.

(c) What the plasma state of matter is. Your explanations may include some examples of plasma.

ITEM 5

During a Physics lesson in a certain school, a teacher told the learners that when heat is supplied to matter, matter progressively changes from one state to another. Before explaining further, the bell for ending the lesson rung. The teacher couldn't explain how matter changes from one state to another but instead instructed the learners to make research. One of the learners approaches you for consultation. As a learner of Physics, help the student know how matter changes from one state to another. Your explanation should include the names of the changes, an illustrative diagram and the application of the different changes in states of matter.

ITEM 6

In a certain country, a Television reporter was reporting live near the ocean about the high tides during night time. Viewers in another country were watching the live broadcast of the news bulletin during day time. There were views of different shapes of the moon in a documentary on the same television that opened up the viewers' minds since they could also testify that they have always been seeing different shapes of the moon desiring for a clear explanation about the incidence, there were also videos about planets of the solar system: claiming that there are gaseous planets in space! A number of viewers did not believe this can be true! And still wondered how it could be day in one country and night in another at the same time.

TASK

As physics learner, how would to help the viewers to understand;

a) The reason for it being day in one place and night in another.
b) The occurrence of High Ocean tides.
c) The existence of gaseous planets. Which they are and what keeps them in space
d) the cycle of the moon and the different stages of the moon

ITEM 7

Ocheng was moving on a rainy day and his umbrella was blown away by a strong wind. On picking it up, he realized that its spring had gone missing and its plastic handle had also flown off. He so much liked his umbrella that he didn't want to buy a new one but to repair it. On picking it, he touched its metallic flame and he felt much coldness than before the wind had blown the umbrella.

On taking it to a specialist, he was told to buy a spring of force constant **50Nm^{-1}** from the neighboring shop. He was given a spring but was doubtful whether it was the required spring or not.

He decided to measure the length and diameter of the spring and found them to be **10cm** and **4cm** respectively. He then applied a force of **2N** onto the spring and it was stretched to **15cm.**

TASK:

As a physics student help Ocheng,

a) Know the tensile strain and stress caused in the spring?

b) Did Ocheng buy the required spring for the umbrella? (support your answer with the necessary calculations)

c) Explain to Ocheng why there was a difference in the coldness felt before the plastic handle of the umbrella had flown off and after when the hand is missing.

d) Explain to him what made his umbrella be blown by wind.

ITEM 8

A rider who has been using a simple bicycle has purchased a new and improved one. The total mass of the rider and this new improved bicycle is **80kg**. The rider uses this bicycle to go up a hill of height **5m** in **20seconds** and he is **75%** efficient. On the other hand, the simple bicycle has two toothed wheels are connected by a chain, with **48teeth** in the big toothed wheel and **16teeth** in the smaller toothed wheel. The rider is looking for more explanations to convince his brother that he is not just wasting money by buying the improved bicycle

TASK

Using your Physics knowledge, help the brother to:

a) (i) Determine the velocity ratio of the simple bicycle.

(ii) Explain the advantages and disadvantages of having a high velocity ratio in the connected toothed wheels.

b) Determine the power used by rider to move up the hill using the improved bicycle.

c) Understand why the rider preferred to use the improved bicycle for riding up a hill.

d) Explain why it is important for the rider to sweat.

ITEM 9

A factory produces small metallic tanks for storing paint and uses a magnetic lifting device to move tanks around the factory and packing them in lorries for delivery. One construction company ordered for large size tanks. However, after manufacturing them, the magnetic lifting device failed to lift the tanks due to their increased weight. Even the packed tanks were found attracted to the other. The same day, the factory engineer was not available which left the attendants puzzled on how to ensure the delivery is done on time.

SUPPORT MATERIAL: A strong electric battery, copper wires, iron rods, and current controllers (variable resistors) are available at the company.

TASK: As a physics student;

a) Advise the attendants on how and which device they can design to effectively load them on lorries for timely delivery
b) Explain how the strength of the device used for loading can be improved
c) Explain why the tanks were found attracted to each other upon delivery
d) Advise the construction company on how they will be able to separate the tanks that are in contact

ITEM 10

The senior woman teacher always advises girls to iron their school uniforms in order to look smart, the girls continuously claim that the clothes cling to their bodies after being ironed which makes them uncomfortable. During one physics lesson, students were introduced to a gold leaf electroscope and they were informed that it can be used perform a number of functions in relation to charges. The students still claim that there are things called lightening conductors on top of the administration block, which are presumed to prevent lightening

TASK: as a physics student,

a) Help the students understand what is meant by electrostatics
b) Explain to the student why their clothes cling on their bodies when they put them on after ironing
c) Explain to the students what the gold leaf electroscope is, giving them some of its functions
d) Help the students understand how the lightening conductor prevents lightening.

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CHEMISTRY

Item 1

A farmer went to an agricultural shop to get advice on how to improve on the yields of his maize plants on his farm. He found two products. Labelled compost manure and Urea but lacked information about the two products.

Task

As a chemistry student;

(a) Help the farmer to;

(i) Understand the two products.

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(ii) Know the need for the products.

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(b) Advise the farmer on the choice of the products to use.

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Item 2

One of the large scale uses of sodium hydroxide is manufacture of soap, to ensure that sodium hydroxide is easily available and at a cheaper cost, government has cleared a local investor to set up a sodium hydroxide

manufacturing plant near lake katwe in kasese district because of the related importance of the manufacturing plant.

However, the community is concerned about its environmental effects and how the manufacturing process will occur.

The school has appointed you to sensitize the community.

Task:

Prepare a presentation you will make during the meeting.

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Item 3

The demand of cement and other building materials has increased in the country. In Tororo, there are many rocks that can be used to manufacture cement, this has made a local saving scheme to source funds and start up a cement manufacturing plant but lacks knowledge on how to the rock can be converted into cement ready to use with minimal environmental impact.

You have been in invited

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Task:
Make a write up you will deliver to Jinja city council answering their concerns. (*11 scores*)

Item 4
There has been a nationwide destruction of natural resources due to increasing population and human activities.

This has attracted the attention of officials from National Environment Management Authority (NEMA).

The officials are planning to sensitize people countrywide about natural resources conservation through organizing workshops in different districts.

Task:

As a chemistry learner, write a message you would deliver upon invitation in workshop organized in your district.

(*11 scores*)

Item 5

People in Seroma village have often been found to be carrying out bush burning, over grazing and stone quarrying. They are now facing breathing problems and low soil fertility and are now wondering why this is happening.

The LC1 chairman has organized an emergency village meeting with a theme,

"**ENVIRONMENT CONSERVATION, A RESPONSIBILITY FOR ALL."**

Task:

As chemistry student and one of the village members, make a write up about the theme that you will present in the village meeting.
(*11 scores*)

Item 6

In one of the societies in Kampala, there is an outbreak of bacterial diseases such as typhoid. The society members rely on each other for medical advice. Recently, a resident complained about persistent stomach ache followed by diarrhoea, but there was no one to advise on proper medication the society members should use.

Task:

As a learner of chemistry;

(a) Advise society members on the possible types of products to use? (b) Carefully educate them on what the products exactly do.

(c) Advise them on the challenges associated with the product use and consequently how to select the products to use.

Item 7

A group of Learners were faced with a unique solid substance, X, which they suspected to be an element. 0.3g of the element could burn in air to form 0.5g of the solid product. One of them picked interest in what could be the chemical formula of the oxide of the element. However, he did not know how to determine the formula. When they contacted the laboratory technician he gave them the atomic number and mass number of X as 12 and 24 respectively, and the symbolic representation of oxygen as $^{16}_{8}O$

As a student of chemistry help the learners to;

(a) Understand the nature of substance X
(b) Determine the formula of the oxide of X
(c) Know the environmental consequences of the element

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ITEM 8

A businessman was selling salt mixed with particles of sand, tricking people who couldn't notice the difference between the salt and its mixture with sand. This made it difficult for residents to use the salt. They need your help to prevent future problems and avoid any chemical dangers

They trust your chemistry knowledge to clarify the situation and prevent further suffering.

Task.

Help the residents to:
(a) Know the behavior of the substances in the mixture.
(b) Evaluate the problems associated with the use of one of the component in the mixture

ITEM 9

People in Kisinza village only have access to borehole water which is not effective in cleaning clothes when soap is used. A local investor has been cleared by government to set up an industry that makes soapless detergents in the area however he is facing resistance from the community members about the issue of starting up the factory and he is equally lacking knowledge about the manufacturing process.

The head teacher has appointed you to go and represent the school in the meeting organized by the chairperson of the area to settle the wrangles between the investor and the citizens of the area.

TASK

Write a message you would deliver in this meeting.

Wunna Educational Services

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