



Agriculture ACSEE

**Past Paper Questions and
Answers by Topic**

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Form VI

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Form V

1.0 Farm Power

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1. (a) Identify the following types of oils based on US Society of Automotive Engineers
- (i) Four engine oils
 - (ii) Four gear and transmission oils
 - (iii) Two multigrade oils.
- SAE 40
SAE 10, SAE 20
- (b) Briefly explain five functions of lubrication system.
- (c) Briefly describe three types of lubrication systems
- (d) Differentiate between detergent oils and grease.

1	(a) (i) 30/40 SAE .	
	(ii) 90/100 SAE or 90/140 SAE	
	(iii) SAE 70 - 90 .	
1	(b) (i) It reduce friction for all moving parts example in reciprocating parts .	
	(ii) It reduce noise of engine parts .	
	(iii) It clean the engine parts example ^{outside} gear and ribs .	
	(iv) It reduce wearing of engine parts .	
	(v) It reduce leakage of moving parts	
1	(c) (i) Forced Lubrication system , by applying a pressure ^{outside} .	
	(ii) Induced Lubrication system , pressure applied inside the moving part .	
	(iii) Application of ^{grease} and oils .	
1	(d) Detergent oil	Grease .
	(i) Applied outside of the engine	(i) Applied inside the engine .
	(ii) The oil is dirty sometimes	(ii) The grease is always clean .

Extract 1.1.1 is a sample of answers from a candidate who performed averagely in the question. The candidate attempted well all parts of the question except in part (a) (ii) and (a) (iii), in which he/she failed to identify gear and transmission oils and multigrade oils.

2.0 Workshop Technologies

2018 PAST PAPERS

2. (a) What are the functions of each of the following workshop tools?
- (i) Wood float → used to make the perpendicular wall
 - (ii) Bolster →
 - (iii) Rasps →
 - (iv) Bastard file →
 - (v) Hand drill →
- (b) (i) Suggest four measures to be taken in order to increase life span of files.
- (ii) Outline ten safety rules to be adhered when working in a farm workshop
- (c) Write the functions of four types of saws used in farm workshop.

Q20	Functions of the workshop tools are as follows:
(i) Wood float	There is a masonry tool that is used for placing or laying mortar before it is placed on the surface (wall).
(ii) Bolster	There is a masonry tool that is used in cutting bricks or blocks for construction.
(iii) Rasps	There is a workshop tool that is used for smoothing rough surface and reducing the diameter of a wood metal and sharpening of metal.
(iv) Bastard file	There is a workshop tool that is used for sharpening metals and also reducing diam.
(v) Hand drill	There is a workshop tool that is used for smoothing surfaces and provide suitable surface and removing of diameter of a metal or wood.

(V) Hand drill

There is a workshop tool that is used for drilling wood and metal to make holes where different bolts or nuts are inserted. There are hand drill and multi-purpose where it works on both wood and metal while hand drill bore holes on wood.

Q(b) (i) Measures to be taken to increase life span of files.

(a) Proper storage of files

Files should be stored in a dry and place away from moisture content to prevent rusting and other corrosion.

(b) File should be cleaned by using a file card.

File should be cleaned using a file card to avoid breakage of teeth and make it to work blunt when operating the process. So it is advised to clean it using file cards.

(c) Avoiding spilling of oil to the file card.

These is a measure to increase life span of files in a workshop by avoiding spilling of oil to the files as these may block the teeth and make it to operate worse.

(d) Files should be kept in a cabinet and arranged in a manner to prevent knocking to one another to increase efficiency and also they should be protected against moisture to prevent rusting and corrosion to take place.

Q(b) (ii) The following are the rules adhered in a farm workshop:

(a) Floor should be kept clean from obstruction and avoid spilling of oil to the floor to avoid accident in a workshop.

(b) Machine should be operated by one person to avoid accident

(c) Do not smoke cigarette in a workshop to avoid fire hazards.

(d) Wear safety clothes such as overall and avoid wearing loose clothes to prevent injury and reduce them as possible.

(e) Wear goggles and shield when welding and forging to avoid personal injury and eye problems in a workshop.

(f) Use proper tool for a particular and proper tasks to be performed.

(g) Do not run in the workshop to avoid personal accidents.

(h) Do not operate a machine or a power saw till instructed by a supervisor and make sure the drive belt is in proper tension.

	(i) Wear gumboot when operating with a power saw to avoid injury and accidents in a workshop.
	(ii) After working with a workshop tool clean it and arrange it to the cabinet store nice well and arranged manner for the prolonged life span..
	(iii) Do not run and make noisy in the workshop.
2(c).	The four types of saws used in a farm workshop are.
	(i) Rip saw. There is used to cut wood along the grain.
	(ii) Cross cut saw. There is used to cut wood across the grain.
	(iii) Tenon saw and dove tail saw. Tenon saw is used for sawing small works for making tenon joint and dove tail saw is used for making tenon dove tail joints.
	(iv) Coping saw and Bore saw. Coping saw is used for making curves or cutting tight works and bore saw is used for cutting logs along the grain.

Extract 1.2.1 is an example of good responses to the question. The candidate provided correct responses to all parts of the question but missed only some few points in part (b) (ii).

3.0 Plant Diseases

2018 PAST PAPERS - 2

5. (a) Explain the meaning of the following terms as they are used in plant diseases:
- (i) Inoculation
 - (ii) Signs
 - (iii) Toxicity
 - (iv) Epidemiology
 - (v) Pellet
- (5 marks)
- (b) Describe damping off in tomatoes under the following headline:
- (i) Causative agent
 - (ii) Two symptoms of the disease
 - (iii) Two control measures
- (5 marks)
- (c) How can the disease be controlled by using the following methods?
- (i) Avoidance
 - (ii) Exclusion
 - (iii) Eradication
 - (iv) Immunization
 - (v) Protection
- (10 marks)

5. (a) <u>Inoculation</u> - Is the attachment of the disease causing organisms to the surface of the host ready to cause infection and disease.
(i) <u>Signs</u> - there are visible indication of the emergence of infection in the plant.
(ii) <u>Toxicity</u> - This refers to the ability of the chemical used in control of plant disease to bring about effect or change.
(iii) <u>Epidemiology</u> - This refers to the study of disease causing micro-organism and in relation to the disease they cause to plants.
5. (b) <u>Pellet</u> There are small particles in solid form which form on which chemicals can exist for disease control in plants
5. (b) Damping off in tomatoes
(i) Causative agent It is caused by Fungi
(ii) Two symptoms of the disease - Wilting of the plant is one of the symptom of damping off in tomatoes - Tomato fruit appear black or with black patches instead of green when not ripe and red when ripe
(iii) Two control measures - Avoid excessive watering of tomato plant this will stimulate the emergence of fungi which will cause damping off

- Avoid application of excessive nitrogenous fertilizers which stimulate damping off and also the fungi causing damping off in the field of tomato

(c) Methods of controlling diseases

i) Avoidance as principle of disease control in plants involves measures example cultural methods in planting to prevent the emergence of disease causing agents in plants.

5. (c) ii) Exclusion as the principle of disease control ensures that the multiplication and spread of the disease causing organism is inhibited by example maintenance of field hygiene and the use of clean planting material

iii) Eradication as the principle of disease control in the plants involves physical destruction of disease causing organism or removal of the affected plant from an area to prevent further spread

iv) Immunization as the principle of disease control involves the use of resistant variety in planting this ensures that the disease rate is of low chance to plants.

v) Protection as the principle of disease control in the plants, the use of chemicals to the crop plant and the soil is employed used in order to minimize the effect of disease to plants.

Extract 2.5.1 indicates good responses to the question from one of the candidates. The candidate succeeded to provide correct responses to almost all parts of the question. Nevertheless, the candidate failed to give the causative agent and symptoms of damping off in tomatoes in part (b) (i) and part (b) (ii) respectively. In addition, he/she failed to explain how diseases can be controlled by the avoidance method in part (c)(i).

2018 PAST PAPERS - 2

4. (a) Fungi is among the most serious disease agent of crops in tropics causing 80% of plant diseases.
(i) Give four characteristics which make fungi to be important disease causing agent. (4 marks)
(ii) Apart from causing disease to plants, what are other economic importance of fungi? Give three points. (3 marks)
- (b) Describe the following:
(i) Localized symptoms
(ii) Growth distortion
(iii) Witches brooms
(iv) Galls and knots
(v) Etiolation (10 marks)
- (c) Nematodes can cause damage to crops through direct mechanical injury during feeding and also production of toxin.
(i) What is the causative agent of root knot nematode? (1 mark)
(ii) List two symptoms and two control measures of root knot nematodes. (2 marks)

<p>✓ @ Four characteristics of fungi which make it to be important pathogen are:</p> <p>> Fungi can remain dormant even when the environmental conditions are not favourable.</p> <p>> Fungi have good dispersal of their inoculum such as mycelium and spore, example by wind.</p> <p>> Fungi use alternate hosts to attack their hosts. They have many hosts which provide them with food for their survival.</p> <p>> They have high reproductive rate, they produce many spores to increase their survival thus attacking many hosts on a short time.</p>	
<p>@ (ii) Fungi are used in manufacture of antibiotics such as penicillin from penicillium, which is used in treatment of many animal diseases.</p> <ul style="list-style-type: none">• Fungi spoil food, example bread moulds spoil bread, thus making it poisonous for human use.• Fungi such as mushroom can be used as human food.	

A (b) (i) Localized symptoms

Localized symptoms are those disease symptoms which affect only one part of plant. Example leaf spot appear only on the surface of leaf and not otherwise.

(ii) Growth distortion

This is the abnormal development of the plant part or tissues example overgrowth, gall formation and malformation of leaves. Leaves become twisted or rolled affecting their growth.

(iii) Witches brooms

It is the symptom of plant disease in banana, where leaves break off due to the effect of wind.

(iv) Galls and knots

These are swellings overgrown from the plant tissues. Galls are formed on leaves where leaves tissues swells and forms rounded, or irregular structures.

Knots are the root swellings which may be due to infection. Example root knot in leguminous plant

v) Etiolation.

This is the yellowing of leaves due to lack of light. Etiolation is due to insufficient light.

where by the green colour of the leaves disappear forming yellow leaves colour.

C (i) Meloidogyne spp

(ii) Symptoms of root knot nematode

- > Stunting of the plant growth
- > Swellings, called knots appear on roots

Control of root knot nematodes

- Use of chemicals to control nematodes
- Planting of resistant crop varieties.

Extract 2.4.1 illustrates one of the good responses to the question. Besides failing to describe witches brooms and etiolation in part (b) (iii) and (b) (v) respectively, the candidate responded correctly to all the other remaining parts. The candidate had sufficient knowledge and field experience in disease causing agents.

4.0 Introduction to Weed Science

2018 PAST PAPERS - 2

- | | |
|--|------------------|
| 3. (a) Why is a volunteer plant classified as a weed? Give two reasons. | (2 marks) |
| (b) Suggest nine agronomic ways of reducing the effects of weeds to crops. | (9 marks) |
| (c) Chemical application is the most effective way of combating weeds. | |
| (i) Outline five merits of this method. | (5 marks) |
| (ii) Assess four factors affecting the efficiency of this method. | (4 marks) |

3(a) i) Because they compete with crop plant for nutrients and water in the crop field.

ii) It lower the quality and quantity of the plants which because dormancy for crop plants.

3(b) i) Use of cover crops - This use to minimize the effects of weeds because fill the space where the weeds can grow.

ii) Mulching - Practice - Covering of the soil with the dry grass material help to reduce weed effect because it hinders and inhibit the grown up weed for light.

iii) Crop rotation - The process of alternating the crop with in the field help to destruct the habit of the weed.

iv) Deep Tillage - Tillage practice control the weed when it exposing the weed roots to be removed by rakes.

v) Weeding - This is the process of removing the weeds from the farm either by cultivation.

vi) Application of the herbicides - chemical application help to reduce the effects of the weed because it inhibit their growth.

vii) Slashing and Uprooting - weed in the farm are controlled by uprooting completely from the crop field.

viii) Bush-burning and flooring - burning of the weed help to destruct the root of the weed which dormanced in the soil.

ix) Allowing fallow period - is the agronomic practices which the farm kept without culturing the crop this help to control or reduce the dependent weed which always require plants for their survival.

- 3(c) i) + Chemical method are more effective to control the weeds.
- It is used in the areas where other methods are insufficient since it's specific to the weeds.
 - It does not require labour like mechanical method of controlling weeds.
 - It does not destroy the soil structure.
 - It saves time and reduces the cost of production.
 - Applicable to the mud soil where other methods are difficult.

ii) → Rate of chemical formulation, the lower concentration of the herbicide affects its efficiency. It should be formulated to appropriate rate.

→ Climatic condition application of the chemical method affected by the climatic condition such as rain fall where it may be washed out.

→ Resistance of the weeds. Some of the weeds develop the resistance to the chemical method application example *Sorghum spp.*

→ Growth stage of the weed. Chemical method is more suitable to early stage of the weed growth because when become mature, one difficult to control.

→ Time of application. herbicides are more effective to apply during the evening to avoid evaporation of the weed during the day and

Extract 2.3.1 represents the candidates' good responses to the question. In the question, the candidate missed only one point on the agronomic ways to be used to reduce effects of weeds to crops in part (b). The candidate possessed adequate knowledge and practical skills in weeds and their control.

5.0 Introduction to Animal Nutrition

2018 PAST PAPERS – 2

7. (a) (i) Differentiate between a feedstuff and a feed. (2 marks)
 (ii) What do you understand by the term maintenance ration? (1 mark)
 (iii) Account for four factors that affect maintenance requirement of farm animals.
- (b) (i) Briefly explain two roles played by reticulum in ruminant animals. (4 marks)
 (ii) Analyse four microbial activities that take place in the rumen of ruminant animals. (2 marks)
 (iii) Elaborate the functions of gizzard and caecae in the poultry digestive system. (4 marks)
- (c) (i) With two examples for each, give two categories of vitamins basing on their solubility. (2 marks)

7. (a) (iii) Factors that affect maintenance requirements of farm animals.	
(i) Body size and weight	
- Animals with large body sizes and weights have greater value of energy used for metabolic activities hence they require more amounts of maintenance ration than smaller animals.	
(ii) Age of the animals	
- Older animals have greater metabolic activity hence they require greater amounts of maintenance energy hence than younger animals.	
(iii) Species of the animals	
- Different species among farm animals have different metabolic activity and hence their maintenance requirements also vary from species to species - for example, cows and donkeys do not have similar requirements.	
(iv) Activity of the animal among farm animals.	
- The animal with greater activity usually has greater maintenance requirements than the one with low activity - for example Drought animals produce power to pull ox-equipments thus require greater amounts of maintenance requirements than dairy cows.	
(b) Roles of reticulum	
(i) To sieve the fine textured food materials from coarse textured food materials. Reticulum performs a major function of separating the fine textured food to coarse roughage. This is necessary to ensure that the coarse roughage are separated and efficiently digested.	
(ii) To thoroughly mix the food materials with water which thereby providing a greater surface area for	

7(b) the cellulase enzymes from bacteria to digest more cellulose that might have escaped in the rumen.

(ii) Microbial activities that take place in the rumen.

(i) Production of Vitamin B complex together with B_5 , B_6 and B_{12} Vitamins.

- Inside the rumen the microorganisms also perform a microbial activity of manufacturing Vitamins B complex with other B vitamins which play an important role as a source of Vitamin B for the animal.

(ii) Conversion of Nitrates to ammonia.

- All the nitrates present in the plant tissues are converted to ammonia through microbial activity.

(iii) Digestion of Cellulose by cellulase enzyme.

- Another microbial activity in the rumen is that the bacteria and protozoans produce cellulase enzyme which in effect it digests the cellulose present in roughage feeds into leaving a form which is readily digested by animal enzymes. By doing this they simplify the digestion of the food by animal enzymes.

(iv) Anaerobic fermentation and production of Methane
Also, bacteria present in the rumen some of them are anaerobic which facilitates fermentation of the roughage anaerobically leading to escape of gases as methane (CH_4).

(v) Functions of gizzard and Digestive caecae

- The function of the gizzard is to perform mechanical digestion of the feed which comes from the preruminus.
It has muscles which enables it to do so.

7.(b) — Function of caecum is to enable digestion of cellulose as it contains bacteria similar to those in rumen which are to digest cellulose by cellulase enzyme secreted by them in case the feed contains roughages.

(c) Categories of vitamins based on solubility

(i) Water soluble vitamins - These are vitamins which are readily soluble in water and are normally transported with the fluid tissues of the body. For example, Vitamin B₁, Vitamin B₂ and Vitamin B₁₂ and Vitamin C

(ii) Lipid soluble vitamins - These are vitamins that are readily soluble in lipids especially fats and are transported with fats. For example - Vitamin A, Vitamin D, Vitamin E and Vitamin K.

(ii) Sources of Vitamin E

- (i) fresh green roughage grasses and legumes.
- (ii) Blood meal and Plant fruits.

Deficiency problem

(i) It leads to retardation of growth since it acts as activator for metabolic activities.

In Extract 2.7.2, the candidate attempted well many parts of the question. He/she only failed to analyse microbial activities in the rumen of ruminant animals in part (b) (ii) and in part (c) (ii). He/she also failed to identify the sources and deficiency symptoms of vitamin E in animals.

6.0 Pasture Agronomy

2018 PAST PAPERS – 2

8. (a) Enumerate four factors affecting yield potential of a given species of pasture. (4 marks)
- (b) Suggest three measures that can be taken in order to improve natural pasture in Tanzania. (3 marks)
- (c) (i) What it meant by top dressing as used in pasture management? (2 marks)
(ii) Why is it important to use top dressing in pasture? Give four reasons. (4 marks)
- (d) (i) Why additives are added in napier grass when making silage? Give a reason. (2 marks)
(ii) Explain one problem associated with poor forage compaction during silage making. (5 marks)
(iii) List five characteristics of good quality silage.

<p>8@</p>	<p>(i) Soil fertility A fertile soil supports pasture growth thus increasing yield potential of pasture species</p>	
	<p>(ii) Water availability Sufficient rainfall or irrigation increase the yield of pasture species whereby little moisture in the soil reduce yield</p>	
	<p>(iii) Pest and disease attack Both pest and disease reduce yield and quality of pasture. Thus, pest and disease should be controlled to increase pasture yield.</p>	
	<p>(iv) Method of utilization of pasture Paddocking improves pasture utilization. This method allows regrowth of the pasture after being grazed thus increasing yield..</p>	
	<p>(v) Manure and fertilizer application This provides nutrients for pasture growth</p>	
	<p>(vi) Paddocking This allows regrowth of the pasture after grazing</p>	
	<p>(vii) Pest and disease control Natural pasture should be free from pest and diseases attack.</p>	

<p>S(i) Top dressing is the application of chemicals to the pasture plants so as to improve its nutritive value. It is aimed to supply essential nutrients for pasture growth.</p> <p>(ii) Reasons for top dressing in pasture</p> <ul style="list-style-type: none"> • To supply nutrient elements necessary for growth of pasture species. • To improve the nutritive value of the pasture species. • To increase the yield of pasture, top dressed pastures produce more than pastures where there is insufficient of nutrient supply. • Top dressing is aimed to support microbial activities in the soil to improve soil fertility. <p>(iii) The aim of additives is to allow microbial decomposition of sugar and prevent napier grass from being decomposed by microbes.</p> <p>(iv) Poor forage compaction during silage making allows oxygen, aerobic condition into the silage. Aerobic condition allow aerobic respiration of silage which reduce the quality of silage.</p>	
<p>S(iii) Characteristics of good quality silage.</p> <ul style="list-style-type: none"> → Should be at pH of 4.2 → Should have 5% to 9% lactic acid → Good quality silage should be fine textured and not slimy producing good odour → Should be free from moulds and other material which reduce its quality → Should be light yellow in colour and not brown or black 	

Extract 2.8.1 is a sample of good responses to the question. The candidate scored all marks in almost all parts of the question but failed to give the correct meaning of top dressing in part (c) (i).

7.0 Agricultural Production Economics

8.0 Farm Planning

2018 PAST PAPERS

9. (a) Why is it necessary to plan the farming activities? (2 marks)
- (b) (i) Differentiate between gross margin and partial budget as used in farm planning.(2 marks)
(ii) Site two situations where partial budget can be applied in a farm. (2 marks)
- (c) Suggest four main ways in which profit on the farm can be raised using Gross Margin planning. (4 marks)
- (d) A farmer wants to change over from growing his normal 20 hectares of maize to growing 20 hectares of haricot beans. Both crops are grown in the same season in that particular area. Maize yield was 400kg per ha selling price Tshs.400per kg and costs stood at 10kg seed per ha at 4,000/= a kg, 4 tonnes of fertilizer at Tshs.1,000,000 per ton, harvesting and picking costs are Tshs. 10,000 per hectare. 5 tractor hours at Tshs.50,000/= per hour. Expected yield for haricot beans is 1800kg per ha at Tshs. ,200/= per kg using 4kg seeds per ha at Tshs.2,000/= per kg, 3 tonnes of fertilizer at Tshs. 1,000,000/= per ton, harvesting costs at Tshs.9,000 per hectare, 4 tractor hours at Tshs 50,000/= per hour. Use this information to prepare a partial budget and advice the farmer whether the change is worthwhile or not.

09(a). - In order to ensure that the allocation of scarce resources on the farm gives optimum and satisfactory return to the farmer.	
(b). (i). Gross margin	Partial budget:
- Is the difference between output and variable costs. Helpful in allocation of resources by considering their return (whether profitable or loss).	- It's the technique used to determine the effect of partial change of farm business.
(c). Ways of raising profit by using Gross Margin.	
(i). By reducing amount of fixed costs.	
(ii). By expanding one enterprise without reducing the other enterprise.	
(iii). By substituting one enterprise with another.	
(iv). By improving gross margin of enterprises that are already present in the farm through better husbandry.	
(d). Given.	
Present farm business = Maize farming.	
Introduced new business = Maize brewing.	
Area of the farm = 20 hectares.	
Revenue lost.	
Yield = 400 kg per ha \times 20 ha = 8000 kg.	
Price = 400 per kg. \times 8000 kg = 3,200,000 Tsh.	
= Maize yield (Revenue lost) = 3,200,000 Tsh.	

9. (d). Costs saved (Marine costs)	
Seed 10 kg/ha	- 4,000/- per kg
Fertilizer 4 tonnes	- 1,000,000/- per ton
Harvesting 20 ha	- 10,000/- per ha
Tractor 5 hrs	- 50,000/- per hour.

Extra Revenue.

$$\text{Yield} = 1800 \text{ kg per ha} \times 20 \text{ ha} = 36,000 \text{ kg.}$$

$$\text{Price} = 1,200/- \text{ per kg.} \times 36,000 \text{ kg.} = 43,200,000$$

Extra Costs.

Seeds 4 kg per ha	- 2,000/- per kg.
Fertilizer 2 tonnes	- 1,000,000/- per ton
Harvesting 20 ha	- 9,000/- per ha
Tractor 4 hrs	- 50,000/- per hour.

PARTIAL BUDGET.

LOSSES		GAINS.	
Extra costs.	Tsh.	COST SAVED	Tsh.
Seeds	160,000	Seeds	800,000
Fertilizer	3,000,000	Fertilizer	4,000,000
Harvesting	180,000	Harvesting	200,000
Tractor	200,000	Tractor	250,000
REVENUE LOST		EXTRA REVENUE	
Yield	3,200,000	Yield	43,200,000
	6,740,000		48,450,000
Net gain	41,710,000		48,450,000
	48,450,000		48,450,000

09. (d). A farmer can make change from growing Maize to growing Haricot beans since the change will be worthwhile with a profit of 41,710,000 Tsh.	
9 (b)(ii). - When replacing one enterprise with another - Introduction of supplementary enterprises.	

Extract 1.9.1 represents good responses to the question. The candidate provided correct responses in almost all parts of the question. The candidate demonstrated adequate knowledge of farm planning techniques.

9.0 Introduction to Soil Science

2020 PAST PAPERS - 3

1. You are provided with specimens S_1 for experiment I and S_2 for experiment II, two 250 cm^3 measuring cylinders, two 100 cm^3 beakers and a wall clock. Perform the following procedures and answer the questions that follow:

Procedures

Experiment I

- (i) Put 100 cm^3 of water in a 250 cm^3 measuring cylinder.
- (ii) Using a 100 cm^3 beaker, put specimen S_1 up to the 100 cm^3 mark.
- (iii) Empty specimen S_1 into the measuring cylinder at step (i) and shake well.
- (iv) Let the mixture stand for ten minutes while observing what happens in the mixture and record the final reading of the mixture in the measuring cylinder.

Experiment II

Repeat the same procedures of Experiment I for specimen S_2 using another set of apparatuses.

Questions

- (a) What have you observed after shaking well the mixture in experiments I and II? (1 mark)
- (b) What is the inference of your observation in experiments I and II? (2 marks)
- (c) Giving a reason, comment on the volumes of the mixture in experiments I and II after shaking well the mixture and letting it to stand for 10 minutes. (2 marks)
- (d) Calculate the percentage of air composition in each of specimen S_1 and S_2 . (10 marks)
- (e) Based on the percentage of air composition calculated in part (d), suggest the type of soil in each of specimens S_1 and S_2 . In each case give a reason for your suggestion. (3 marks)
- (f) Referring to the percentage of air composition in each of specimens S_1 and S_2 , briefly describe air-water relationship in the two specimens. (2 marks)

	1. (a) After shaking well the mixture in experiments I and II there were bubbles which formed in both measuring cylinders.
	(b) The inference of observation is that, in the Specimen S ₁ and S ₂ there was amount of air which escape when S ₁ and S ₂ added to water because air spaces are occupied by water.
	(c) The volume of the mixture in experiment II is large compared to the volume of mixture in experiment I, this was because Specimen S ₂ have less air spaces than the Volume of solid S ₂ is high compared to S ₁ which have large air spaces which water occupy hence have low volume.

(d) Percentage of air in specimen S₁.

Data:

$$\text{Volume of water} = 100 \text{ cm}^3$$

$$\text{Volume of soil} = 100 \text{ cm}^3$$

$$\text{Expected volume after adding soil with water} =$$

$$100 \text{ cm}^3 + 100 \text{ cm}^3 = 200 \text{ cm}^3$$

$$\text{Readings of cylinder after mixing} = 160 \text{ cm}^3$$

Then ..

$$\text{Percentage of air composition} = \frac{\text{Volume of air} \times 100}{\text{Volume of soil}}$$

But ..

$$\text{Volume of air} = \text{Expected volume} - \text{Volume of}$$

$\xrightarrow{\text{cylinder after}}$
mixing ..

$$\text{Volume of air} = 200 \text{ cm}^3 - 160 \text{ cm}^3$$

$$\text{Volume of air} = 40 \text{ cm}^3$$

$$1. \% \text{ air composition} = \frac{40 \text{ cm}^3}{100 \text{ cm}^3} \times 100\% \\ = 40\%$$

\therefore The percentage of air composition in S_1 is 40%.

Percentage of air is specimen S_2 .

Data:

$$\text{Volume of water} = 100 \text{ cm}^3.$$

$$\text{Volume of soil} = 100 \text{ cm}^3.$$

$$\text{Expected volume after adding soil with water} \\ = 100 \text{ cm}^3 + 100 \text{ cm}^3 = 200 \text{ cm}^3.$$

$$\text{Reading of cylinder after mixing} = 165 \text{ cm}^3.$$

Then ..

$$\% \text{ of air composition} = \frac{\text{Volume of air} \times 100\%}{\text{Volume of soil}}.$$

But ..

$$\text{Volume of air} = \text{Expected volume} - \text{Volume of mixture}$$

Therefore ..

$$\text{Volume of air} = 200 \text{ cm}^3 - 165 \text{ cm}^3$$

$$\text{Volume of air} = 35 \text{ cm}^3$$

Then ..

$$\% \text{ of air composition} = \frac{35 \text{ cm}^3 \times 100\%}{100 \text{ cm}^3}$$

$$= 35\%$$

\therefore The percentage of air composition in S_2 is 35%.

(e) The type of soil in specimen S_1 is Sand. Soil because in reality sand soil have large soil particles which leaves large air spaces between the particles. And type of soil in

1. Specimen S₁ is clay soil because clay particles are highly compacted hence leave low amount of air spaces then result to low percentage of air composition.

(F) Air-water relationship in the two specimen is that water have tendency of occupying more space compared to air in a soil. For example in Specimen S₁, there was high percentage of air composition that is why the total volume of mixture is low compared to Specimen S₂ and this is because a large volume of water in Specimen S₁ was used to fill the air spaces in a soil and vice versa is true for Specimen S₂.

2018 PAST PAPERS

6. (a) Give five ways employed in soil air management. (6)
- (b) Briefly explain four factors affecting the composition of soil air. (6)
- (c) Analyse the effects of the following physical properties of soil on soil temperature:
- (i) Soil colour (6)
 - (ii) Soil moisture (6)
- (d) Describe the following terminologies as used in soil science:
- (i) Infiltration (6)
 - (ii) Percolation (6)
 - (iii) Permeability. (6)

6.	<p>Five ways employed in soil air management are</p> <ol style="list-style-type: none">1. Tillage practice, when the tillage is practised it increase the aeration of the soil since the soil has been loosed2. Drainage; involve removing of water to the soil surface this could increase the soil air3. Adding organic matter this when employed to the soil it increase the soil air by increasing the pore space in the soil4. mulching, when the soil is covered by using dry material such as dry grasses tend to increase soil air
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b) 5. growing crops such as leguminous crop, this crop increase the uptake of air (oxygen) since it has high ability of fixing oxygen from atmosphere

b) four factors affecting the composition of soil air are

1. Physical properties of soil

- This affect in this way when soil structure, soil texture have large compaction it reduce the aeration of the soil since small pore existed by large particle and block structure of the soil

2. Agronomic activities

- This involve cultivation such as tillage of the soil for growing crops, crop plant tend to use air (oxygen) for the growth and hence affect the soil air

3. Microbial activities

- microbial activities within the soil tend to consume the (oxygen) air for their activities of decomposition of materials and to release Carbon dioxide (CO_2) this affect the soil air

4. Seasonal variation

- The variation exerted by temperature and moisture content in the soil it result to reduce the air required by the soil hence affect it

b Q The effect of the following physical properties of the soil on soil temperature

(i) soil colour

- In soil there is different colour exerted on it factors for example black colour absorb heat from atmosphere and to increase soil temperature while white colour (white soil colour) tend to reflect heat and reduce the soil temperature.

(ii) soil moisture

- When the moisture presence in the soil it tend to cool the soil and hence reduce the soil temperature required by the plant for proper growth.

(d) (i) infiltration

- Refer to passage or infiltration of the water down the soil through the small channels (capillaries).

(ii) percolation

- Refer to the movement of material downward the bedrock through vertical columns.

(iii) permeability

- Refer to the ability of material that able to pass through membrane of one layer of soil to another down the soil.

In Extract 1.6.1, the candidate, having knowledge and practical skills on the physical properties in the soil, provided correct responses in nearly all parts of the question. However, the candidate provided a partially correct response to the effect of soil moisture in soil temperature in part (c) (ii) and failed to describe the term permeability in part (d) (iii).

Form VI

1.0 Farm Mechanization and Machinery

2018 PAST PAPERS

4.	(a) What do you understand by land clearing?	(2 marks)
	(b) Elaborate four principles of chaining as a land clearing method.	(4 marks)
	(c) Propose three methods that can be used to dispose the vegetation removed from land clearing.	(6 marks)
	(d) What are the eight important questions to be considered when selecting machine model to be purchased?	(8 marks)

4	<p>(a) Land clearing: Is the process where by land is kept free from several obstacles such as vegetation, stones, timber to provide area for agriculture production such as crops cultivation.</p> <p>(b)</p> <ul style="list-style-type: none">(i) Eradicating and uprooting all vegetation.(ii) Conducting away all wastes in the farm.(iii) Harnessing the land by incorporating soil with organic matter.(iv) Mixing materials throughout the land. <p>(c)</p> <ul style="list-style-type: none">(i) Burning <p>all vegetation from or removed from land clearing can be burned inorder to remove all water which are present in clearing land, burning can be done outside in specific areas or where land clearing conducted</p>	

	(ii) Use as animal feeds. also if vegetation are grass such as nut grass or couch grass can be used as animal fodder instead of being damaged because it is useful to animal
	(iii) Used in manufacturing compost manure also vegetation removed from land clearing can be use in manufacturing of compost manure when is buried and incorporated with soil
4 (d)	<ul style="list-style-type: none"> (i) low operational cost (ii) machine should be easily adjusted and serviced (iii) machine should be manufactured by reliable firm (iv) machine should be purchased at reasonable cost; (v) Spares parts and services of that machine should be available (vi) machine should be able to work even in poor local environment (vii) can be able to conduct more than one works or functions example tractor for ploughing and harvesting, (viii) portable and easily shifted from place to another.

Extract 1.4.1 shows a sample of responses from a candidate who performed averagely in the question. The candidate provided the correct responses in part (a) and gave partially correct responses in parts (c) and (d). In part (b), the candidate failed to elaborate principles of chaining as the land clearing method.

2.0 Farm Structures

2018 PAST PAPERS

3. (a) Classify two types of wood.
- (b) Account for four uses of timber as a building material.
- (c) Give four merits and five demerits of timber as a building material.
- (d) Identify five advantages of using concrete in farm building.

3(a)	<p>Two types of woods.</p> <ul style="list-style-type: none">i) soft woods, used in making papers and some soft kind of books.ii) Hard/rough wood - used in building Some materials example chairs, tables, and doors.
(b)	<p>four uses of timber as a building material.</p> <ul style="list-style-type: none">i) Used in building of chairs, tables and doors as the the building material.ii) Timber is used in building farm crusher structures.iii) Timber is used as roofing material. in the house.iv) Timber is used in floor and wall construction for some building hence are strong when treated well.
(c)	<p>Four merits of timber as building Material.</p> <ul style="list-style-type: none">i) It is not cast full, The timber is not cast full compare to metal when buying it and using .ii) No need of high skill and knowledge when using it during building Compare to the metal used during building are complicatediii) It is available easily, The timber it is available easily compare to metal hence depend on for areas to obtain best timber it is tree which are availb

	<p>ble naturally.</p> <p>iv) It is strength, when the timber is treated well by chemical it is very strength and durable for long lasting to be affected by the different agent like insects.</p>
3(c)	<p>Demerits of timber as a building material!</p> <ul style="list-style-type: none"> i) Timber can be rotten by fungi/hungi, The timber does not longer living compare to metal hence it take short period of time to decay. ii) Can eaten by insects such as termites and hence have low quality to be take short time to living. iii) Affected by weather condition (rainfall and hence decay) Also timber are affected by weather condition hence may be decay after rained by rainfall. iv) It is cost full in transportation from the point where it is produced up to the point of use. v) It is not more durable, The timber it is not take longer time compare to other type of building such metal when used in building.
3(d)	<p>Five advantages of using concretes in farm building</p> <ul style="list-style-type: none"> i) It is very durable, the concretes when used there is durability of house for long time ago to live of house ii) It is easy to mix the mixture are used hence depend in water, gravels and cement only in ratio of the 1:3:4. iii) When used improve strength of both foundation and roofing of the house. iv) It does not rotten when used and hold house Security not easy to be cracked during earthquake. v) May not be attacked by termite, insects and fungi, hence may live long last of time without be broken by any organism.

Extract 1.3.1 is a sample of good responses to the question. The candidate attempted well nearly all parts of the question in exception of part (c) in which he/she missed some points on the demerits of timber as building material. Likewise, in part (d), the candidate missed few points on the advantages of concrete in farm building.

3.0 Introduction to Irrigation

2018 PAST PAPERS

- | | | |
|----|--|-----------|
| 5. | (a) Briefly describe furrow irrigation system. | (3 marks) |
| | (b) Outline three advantages and four disadvantages of furrow irrigation system. | (7 marks) |
| | (c) Suggest four necessary conditions for surface irrigation system to take place. | (4 marks) |
| | (d) Briefly explain six importance of drainage in the irrigated farm. | (6 marks) |

5 a) furrow irrigation: Is the type of surface irrigation whereby water flows in canals following the contour-line. It is mainly applied in crops such as sugar canes whereby water flows in streams which are made of dykes to control water movement within a system.

5 b) i) three advantages of furrow irrigation

- i) It reduces the incidence of fungal diseases spread to plants.
- ii) It does not require high skilled labour during operation.
- iii) It is a cheap method to establish and maintain.

5 b) four disadvantages of furrow irrigation

- i) It needs high amount of water.
- ii) It may cause soil erosion.
- iii) It encourages development of weeds.
- iv) Large amount of water is wasted through evaporation and infiltration.

5 c) four condition necessary for surface irrigation to occur:

- i) The soil should be clay to reduce infiltration of water.
- ii) There should be large amount of water.
- iii) There should be minimum evaporation rate.
- iv) The slope should be gentle.

5 d) six importance of drainage in Irrigated farm.

- i) It improves soil Aeration simply because good drainage opens the fissures facilitating free movement of air within the soil particles.
- ii) It improves microbial activities because good drainage facilitates increase in decomposition of micro-organisms in the soil facilitating soil fertility.
- iii) It reclaims the soil: drainage system reclaims the soil by changing the unproductive soil which was poorly drained to a productive one hence increase amount of crop growth.
- iv) It improves soil temperature: good drainage system in the farm improves soil temperature hence results to decomposition of organic matter in the soil.
- v) It reduces the incidence of spread of diseases such as fungal diseases which tend to multiply in when environment such as high moisture is favoured.
- vi) It removes toxins from the irrigated farms by not allowing accumulation of minerals and salts which may cause increase in soil acidity which affects different properties of the soil for plant-growth.

Extract 1.5.1 indicates good responses to the question. The candidate gave all correct responses to part (c) and missed only a few correct points to parts (a), (b), and (d), demonstrating adequate knowledge of and field practical exposure to irrigation.

4.0 Livestock Reproduction, Breeding, and improvement

2020 PAST PAPERS – 3

3. You are provided with specimens L_1 , L_2 , a measuring cylinder and a beaker. Perform the following procedures and then answer the questions that follow:

Procedures

- Measure 25 cm³ of specimen L_1 and pour it into a beaker.
- Squirt few streams of L_1 into specimen L_2 and observe carefully.

Questions

- (a) What is the aim of the experiment? (1 mark)
- (b) Briefly explain your observations in the experiment. Give three reasons to support your observations. (3 marks)
- (c) What conclusions can you make from the experiment? (1 mark)
- (d) Account for five predisposing factors for what has been diagnosed in the experiment. (5 marks)
- (e) As a livestock scientist provide an advice to the livestock keepers on five measures to be taken in order to obtain clean and normal specimen L_1 . (5 marks)

3	<p>(a) The aim of the experiment is to detect whether the specimen L_1 is affected by Mastitis or not.</p> <p>(b) According to the experiment it shows just a normal fresh milk because</p> <ul style="list-style-type: none">(i) There is no presence of blood clots and pus in the specimen L_1.(ii) The specimen L_1 is not watery.(iii) The specimen does not have bad odour. <p>(iv) The conclusion that can be made from the experiment is that the specimen L_1 is not affected by the disease called Mastitis and hence it is a fresh normal milk.</p> <p>(v) Incomplete milking</p> <ul style="list-style-type: none">- Incomplete milk milking of the animal may lead to the formation of pus and accumulation of microorganisms in the udder and thereby leading to Mastitis. <p>(vi) Age of the animal</p> <ul style="list-style-type: none">- Animal old animals are more affected by disease; because of their weak immunity and hence they are often affected.
3	<p>(d)(i) -d by Mastitis</p> <p>(ii) Milking hygiene</p> <ul style="list-style-type: none">- Bad milking hygiene may lead to establishment of the disease in the animal udder.

(iv) Injuries of the Udder

- When the animal is injured in the udder there is a great chance of entry of microorganisms such as the *Mastitis bacteria* and hence establishment of the particular disease in the animal udder.

(v) Breed and position of the udder in animal body.

- There are some breeds that their position of the udder is in the way that it allows easy entry of bacteria and also they can be easily injured and thus may lead to the establishment of the disease *Mastitis* in the udder.

(vi) Actions to the farmers

- (i) They should use the proper milking practices.
- (ii) They should maintain the milking hygiene.
- (iii) They should treat the wounds present on the animal udder.
- (iv) They should apply the chemical infusion to treat the udder affected by the disease.
- (v) They should prefer complete milking the animals to prevent the accumulation of pus and microorganisms in the udder.

2018 PAST PAPERS – 2

9. (a) Define the following terms as used in livestock breeding and improvement:
- (i) Runt
 - (ii) Libido
 - (iii) Free-martin
 - (iv) Dystocia
- (4 marks)
- (b) Outline four functions of inbreeding in livestock breeding. (4 marks)
- (c) (i) Mention two methods of semen collection from the bull. (2 marks)
- (ii) Examine three semen parameters that have to be evaluated or tested in order to judge its quality before insemination or storage. (6 marks)
- (iii) Enumerate four limitations of artificial insemination as opposed to natural mating. (4 marks)

9.(a) iii) Free-mating

- A situation by which the animals are allowed to stay together and mate during their lifetime without being controlled.

(b) Functions of inbreeding

→ Used to spread a new breed at a particular area. For example when a new breed is brought at that area, the easy way of getting large number of that particular breed is by the process of inbreeding.

→ Production of pure breed. Since it involves the closely related animals. Example brother and sister.

→ Maintenance of genetic stability. Through inbreeding, the genetics of particular animals are maintained and hence no variations.

→ Inbreeding provides a chance of spreading the good characteristics of animals that are desired by the animal keeper in a particular area.

(c) i) Semen collection methods

→ Through the use of plastic vaginas that is placed on the penis of a bull during copulation.

→ Through electrical stimulation of a male, that will result to the release of sperms by the male animal.

- 9.(c) ii) → Semen Viability
 → Semen Visibility
 → Semen mobility

- Semen Viability

The Collected Semen Should be Viable for their normal functioning. The unviable Semen are not required since they are considered functionless. Therefore Semen that are Viable can be used or stored for artificial insemination.

- Semen Visibility

A good quality Semen Should be Visible to be used in Artificial insemination. Lack of Visibility accounts for a poor quality Semen.

- Semen mobility

A Sperm (Semen) Should have the Mobility Strong in order to form a zygote with an ovum of a female animal. Non mobile Semens are not required in artificial insemination.

iii) Limitations of artificial insemination.

→ It requires Skilled labours to perform the artificial insemination hence it requires Money for the payment.

→ The heat period must be detected to the female animals, therefore animal keeper should be active to determine if the animal is at heat period or not at heat period.

9.(c) iv) → The bull may be a carrier of undesirable characteristics, hence the Collected Semens of that particular bull will results to the spread of undesirable characters to other animals.

→ May also lead to the spread of disease from that particular bull to other healthy animals through artificial insemination.

Extract 2.9.1 reflects good mastery of the content. The candidate managed to respond correctly in most parts of the question. However, the candidate failed to define the named terms in part (a) and provided few correct responses in part (b), which focused on the limitation of inbreeding.

5.0 Introduction to Animal Health

2018 PAST PAPERS - 2

6. (a) (i) Define the term animal disease as used in animal health. (2 marks)
(ii) Mention three causes of disease in livestock. (3 marks)
- (b) Briefly describe six groups of micro-organisms which cause diseases in livestock.
- (c) Name three means of classifying animal disease. (12 marks)
(3 marks)

6. (a) (i) Animal disease - Is the abnormal condition that occur in the body of an animal compared to the normal function of the body.
(ii) causes of disease
① Nutritional factor. There are many disease caused by lacking some important nutrient to the farm animals. for example for example Milk fever
② parasite There can either be endoparasite like amoeba Ascaris and tape worm and ectoparasite for example • tick fly - Anaplasmosis • Brown ear tick - Tanz could fever.
③ Mechanical damage. Some wounds and injury present in Many animals are source of disease because create a conducive environment for the parasite to enter.
④ Groups of Micro-organism causing disease. ① Bacteria, these organism cause disease like Anthrax, Mastitis and rinderpest, and pneumonia.

6. (b) (i) Virus, the disease caused by virus include:

- Newcastle disease
- foot and mouth disease

(ii) parasites, these are the organism which cause disease by affecting an animal either internal or external.

for example:

Brown ear tick - East coast fever
transmitter tick & fly - Anaplasmosis

Liver fluke - Damage Liver

(iii) protozoa, the organism cause disease are include ticks which the disease are like

- coccidiosis
- East coast fever
- Malaria

(iv) Fungi, also are causative agents of disease.

b. (c) Means of classifying disease.

(i) classifying in terms of disease causing organism, for example we have disease caused by parasite, fungi virus, and bacteria.

(ii) classifying in terms of contamination.

There are contaminated disease transmitted by contamination and non-contaminated disease ~~do not transmitted by~~ contamination method.

for example

Coccidiosis - Contaminated disease

Fleas - Non-contaminated disease.

(iii) classifying in terms of Nutrient deficiency.

for example:

Milk fever - caused by lack of calcium found in some nutrient.

East coast fever - is not caused by lack of Nutrients.

Extract 2.6.1 represent good responses to the question. The candidate correctly attempted all parts of the question; however, he/she failed to classify animal diseases in part (c).

6.0 Crop Pests

2018 PAST PAPERS - 2

1.	(a) What is a crop pest?	(1 mark)
	(b) Briefly explain five cultural methods that are used to control insects.	(5 marks)
	(c) (i) Account for the four common formulations of insecticides.	(4 marks)
	(ii) Elaborate five different ways through which pest can arise.	(5 marks)
	(d) (i) Name two crops which are attacked by <i>Busseola fusca</i> . (ii) Outline two symptoms of the plants attacked by the pest in (d) (i). (iii) State two cultural methods of minimizing the pest.	(1 mark) (2 marks) (2 marks)

1	<p>① Crop pest is an organism that causes injury to crop and inflicts damage to cultivated crop For example Aphids and cutworms.</p> <p>② Cultural methods to control pest are</p> <ul style="list-style-type: none"> - Crop rotation, the alternation of field crops season after season reduces the chances of pest since pests are specific to their host eg: alternating legumes and higher plants - Field sanitation, ensure that the field is clean before farming operations, removing crop debris and crop remains that might carry pests - Irrigation, as water is flooded on the farm pest on soil are eradicated especially in the stage of growth between egg and larva. - The use of clean approved seeds, sometimes the seeds contain pest inoculum eg: spores and eggs hence proper sanitation of seeds is essential - Practising dead season and closed season, where a season passes without cultivation reduces the survival of crop pest on the field. <p>③ (i) Formulation of insecticides</p> <ul style="list-style-type: none"> - Wettable powder; - are insecticides that are insoluble in water and forms a suspension on mixing with water. - Water soluble insecticides; - these are soluble in water and form a homogeneous mixture - Emulsifiable concentrates; herbicides that are insoluble in water but soluble in organic solvents - Granules and powdered insecticides do not require water
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- 1 (c) (ii) Ways through which pests can arise
- From uncultivated and unproperly cleaned land.
 - In crop debris of the last harvested plants hence proper land cleaning is essential
 - Production in maximum of the susceptible host can attract the occurrence of pest and inflict damage to the planted crops.
 - From unsafe seeds and plant cultivars to be established in the farm, hence the seeds and vegetative propagated parts should be thoroughly checked.
 - Pest can arise when there is absence of the pest control management on the farm, thus creates favourable environment for pest arise.
 - Pest arise when favourable climatic condition is present to support pest growth, for example humidity, temperature and weather in general.

(d) Crops attacked by *Busseola fusca* are

- (i) Maize
- (ii) Sorghum
- (iii) Millet

(ii) Symptoms on the plant affected are

- Bored stem margins and eaten xylem vessels of the plant
- Wilting of the attacked crop
- Yield reduction on the affected crop.

(iii) Cultural methods of managing pest are

- Crop rotation practice
- Efficient field and Seed Sanitation

Extract 2.1.1 represents good responses to the question. The candidate managed to provide correct responses to all parts of the question, except to part (d) (ii), in which he/she missed one symptom of the plant attacked by *Busseola fusca*. The candidate exhibited a better mastery of the content.

7.0 Plant Breeding

2018 PAST PAPERS - 2

2. (a) Identify six roles of plant breeding in crop production. (6 marks)
- (b) (i) What is Heterosis? (2 marks)
(ii) Describe five steps used in production of hybrid seed. (5 marks)
- (c) Account for three purposes of plant introductions. (3 marks)
- (d) (i) What does Pedigree selection mean? (1 mark)
(ii) Give three disadvantages of pedigree selection. (3 marks)

Q	the roles of plant breeding in crop production
(i)	It's help to increase the high yield in which when the plant breed is improved
(ii)	It increase the plant varieties which are resistance to pest and disease
(iii)	Help help to increase the adaptability of the plant to the local environment condition
(iv)	It produce the new varieties of crops which are suitable for the mechanized harvesting
(v)	produce the plant which have good quality
(vi)	produce the plant varieties which are fast rate of growth.
(b)(i)	Heterosis ⇒ Is the superior performance of f1-hybrid compared to the average parent performance of its parents.
(ii)	steps used in production of hybrid seed.
	<ul style="list-style-type: none">Selection of the base population. From which the superior parents can be selected.

- 2 • Selection of the superior parents in the population.
- Interbreeding of the superior parents to produce the hybrids.
 - Evaluation of the field trial.
 - Release of hybrids as the variety.

(C) Purpose of plant introduction:

- (i) For economic uses example vegetables.
- (ii) For the study of origin and evolution of crops plant.
- (iii) For beautification in the garden.
- (iv) For hybridization of new varieties.

(D) Pedigree Selection

This is the method of improvement of self-pollinated plant in which the superior genotypes plant was selected from the records of ancestors.

(ii) Disadvantage of pedigree

- It's consume time because it's requires more time for collecting the data of the long past generation.
- It's expensive because stored data must be dozen documented and preserved.

- It's more can spread the undesirable traits from one generation to another generation because it's use the crossing of very closely individuals.

Extract 2.2.1 is a sample of good responses to the question. The candidate managed to give correct responses to many parts of the question, except to part (b) (ii) and (d) (ii). In part (b) (ii), the candidate did not exhaust all the steps involved in the production of hybrid seeds and missed one disadvantage of pedigree in part (d) (ii).

8.0 Environmental and Technological challenges in Agricultural Development

2018 PAST PAPERS – 2

10. (a) Outline five sustainable agricultural techniques used by farmers to achieve the key roles in protection of crop plants and soil quality. (5 marks)
- (b) Assess three contributions of cover crops in sustainable agriculture. (4.5 marks)
- (c) Briefly explain four effects of crop rotation on agricultural production and sustainability. (6 marks)
- (d) Why modern farming is not sustainable? Give three reasons. (4.5 marks)

10	(a) Five sustainable agricultural techniques used by farmers to achieve the key roles in protection of crop plants and soil productivity	
	• (i) Addition of organic matter to the soil	

10	(a) (i) Green Manuring (ii) Application of organic herbicides and pesticides (iii) Crop rotation (iv) Mulching	
	(b) Three contributions of cover crops in sustainable agriculture • (i) It contributes improvement of soil fertility; through using of cover crops help to prevent loss of soil fertility by weeds. • (ii) It helps to combat weeds; Cover crops are assisting in sustainable agriculture as they prevent growths of weeds in the farms. • (iii) Help to reduce soil erosion; As it covers the bare spaces of soil it reduces the erosion which reduces soil fertility hence contributing to sustainable agriculture.	
	(c) Crop rotation - is the practice of alternating the different type of crop in field year after year. Effects of crop rotation on agricultural production and sustainability • (i) Crop rotation controls weeds; through alternation of crops helps to control the parasitic weeds. • (ii) Crop rotation improves soil fertility; this practice helps to avoid use of organic fertilizers hence ensure sustainability. • (iii) Crop rotation controls crop pests; practice also reduces the use of pesticides by controlling	

	<p>the pests by breaking their life cycles.</p> <p>(iv) Crop rotation help to controls crop disease; although alternating crops helps to control the diseases.</p>
10	<p>(d) Morden farming is not sustainable agriculture because:-</p> <ul style="list-style-type: none"> (i) Envolves use of industrial fertilizers and pesticides; Use of industrial inputs like fertilizers that tend to destruct soil structure is not sustainable agriculture. (ii) It does not follow the principles of organic farming; farming system to be sustainable to be it should observe the principles of organic farming which are principle of health, of care, of ecology and principle of fairness. (iii) It does not take into considerations of future generation; Morden farming focuses only today & neglect the next generation as they also need land for farming.

In Extract 2.10.1, the candidate demonstrated sufficient knowledge of the concept of *sustainable agriculture* by scoring all marks in the question.

9.0 Introduction to Agricultural Prices

2020 PAST PAPERS – 3

2. You are provided with specimens E_1 and E_2 in the 250 cm^3 pyrex beakers, two bunsen burners, two tripod stands, a match box, two wire gauzes and two thermometers. Perform the following procedures and then answer the questions that follow:

Procedures

- Put each of the wire gauze on top of the tripod stand.
- Place tripod stands over the bunsen burners.
- Place each of the beakers containing specimen E_1 and E_2 on wire gauze on the tripod stands.
- Immerse thermometers in each of the beakers containing specimens E_1 and E_2 .
- Light the bunsen burners and heat specimens E_1 and E_2 . Take records of the temperature for each of the specimens after 2 minutes of heating.
- Switch off the bunsen burners and remove beakers from the source of heat to let specimens E_1 and E_2 cool. Take records of temperature for each of the specimens after 5 minutes of cooling.

Questions

- (a) Record the results of the experiment as shown in the following table:

Specimens	Temperature of the specimens after 2 minutes of heating ($^{\circ}\text{C}$)	Temperature of the specimens after 5 minutes of cooling ($^{\circ}\text{C}$)
E_1		
E_2		

(2 marks)

- (b) From the results of the experiment, suggest which specimen can be best used than the other as a coolant in a tractor engine. Give two reasons for your suggestion. (3 marks)
- (c) Briefly describe the mechanism of cooling the tractor engine using the specimen that you have suggested. (4 marks)
- (d) Account for two limitations of a tractor engine cooling system that uses the specimen you have suggested. (2 marks)
- (e) Briefly explain four reasons for engine overheat in a cooling system using the selected specimen. (4 marks)

9 (a)

Specimens	Temperature of the specimens after 2 minutes of heating ($^{\circ}\text{C}$)	Temperature of the specimens after 5 minutes of heating ($^{\circ}\text{C}$)
E ₁	61 $^{\circ}\text{C}$	52 $^{\circ}\text{C}$
E ₂	72 $^{\circ}\text{C}$	64 $^{\circ}\text{C}$

(b) The best specimen to be used as a coolant in a tractor engine is Specimen E₁ due to following.

(i) It takes much time for its temperature to rise hence it can absorb relative large amount of heat before to less it hence could be of economy in a tractor engine. High heat capacity and boiling point.

(ii) It takes short time to cool hence can be easily cooled to remove much heat if removed from the engine as it carry much heat energy and fully cooled within a short time. This tell that the Specimen E₁ has high boiling point, high heat capacity and easily cooled once it get heat energy.

(iii)

(c) Mechanism of Cooling the tractor engine using Specimen E₁.

The cooling system involves the following components as follows:-

- (i) Pump which pump the coolant (Specimen E₁)
- (ii) Radiator which cool the coolant (specimen E₁) after absorbing the heat of the engine block and cylinder jacket.

- (iii) The thermostat which ^{sense} regulate the engine temperature
- (iv) holes which move coolant (Specimen E₁) from the engine to radiator and from radiator to the engine.

2 (c) Jacket System around the cylinder through which the coolant (Specimen E₁) circulated.

The mechanism of cooling is as follows:-

The engine temperature rise is sensed by the thermostat which its valve open to allow ~~not~~ hot coolant from the engine jacket system to enter the radiator for cooling through the upper hole of radiator.

The ~~not~~ coolant (specimen E₁) pass the radiator through its small fins which offer large surface area for cooling of the coolant.

The Coolant leaves the radiator through the hole at lower position of the radiator to enter the jacket system around the cylinder and engine block. The pump is one which push the coolant to jacket system.

The Coolant (specimen E₁) absorbs heat from the cylinder and cylinder head to get transported back to radiator for further cooling. The pump is responsible of pushing the coolant from radiator towards the jacket and circulation as whole.

2 (d) Limitation of a tractor cooling system that will specimen E₁ as coolant.

(i) It has Large number of parts such as pump, thermostat, radiator with fin and fan belt which its care and maintenance is complicated and costly to repair once there is damage or any fault.

(ii) If cleftent of Specimen E₁, white may sometime free to form frost especially in winter season or may evaporate easily and get lost during hot season such as summer especially to desert countries.

(P) Reason of Engine Overheat under the Cooling System that use coolant Specimen E, (which is must be the water)

(i) Leakages of the Coolant in the holes and radiator fins which results to loss of Coolant to cool the Engine hence engine Overheat.

(ii) An Or Unproperly tensioned fan belt which may be tightly or highly Loosen hence water^(coolant) not flowing Sufficiently cooled in the radiator.

(iii) Damage to the thermostat which detect the incorrect Engine temperature hence engine Overheat.

(iv) presence of dirty such as dust particles to the radiator which cause little air drawn toward the radiator fins to cool the ~~water~~ coolant in the radiator hence Engine Overheat.

So the cooling system should be weekly checked to identify any fault also before any form tractor activity the cooling system should be well checked to ensure correct level of coolant in the radiator is at correct level and to detect any faults of the engine cooling system otherwise it may cause the engine overheat and melting of engine components.

10.0 Fundamentals of International Trade

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8. (a) What is an international trade? (2 marks)

(b) Briefly explain the significance of international trade. Give five points. (5 marks)

(c) The following table shows production of two crops by two countries, A and B. Study it carefully and then answer the questions that follow:

Country	Crop	
	Maize (Bags/Ha)	Paddy (Bags/Ha)
A	8	60
B	30	12

(i) Use the law of comparative advantage to describe the production of crops in both countries. (4 marks)

(ii) Justify how the principle of opportunity cost works in both countries. (4 marks)

(iii) Use the law of comparative advantage and principle of opportunity cost to briefly explain the possible trade between the two countries. (5 marks)

8

International trade: Is the exchange of goods and services between one country and another country. In this
Involves often different countries.

For example the exchange of tea from Kenya.

Can exchange the goods with maize from Tanzania.

Significance of International Trade :

(i) It allows or facilitates of specialization in production of a particular product where by a particular country is known to be producing certain primary product.

(ii) It helps to reduce risk in production, since sometimes over production may occur by then help of International Trade goods can be sold to other countries or exchanged to mine countries.

(iii).

Significance of International Trade

(i) It provides protection to the country which is the major primary producer of a particular product or commodity from competition of other countries.

(ii) It provides protection to the countries from excessive over production since it is very likely it may lead to collapse of agricultural prices due to over production.

(iii) International trade helps to stabilize the world price of commodity.

(a)

(i) Used to allocate quota shares to each member of the International trade.

(ii) facilitates specialization in particular either by a particular country producing a particular product.

(c) from the Table

(a) Country A and B are all producing maize but in Country B, there is high production of maize than Country A, hence we can find it by saying that the Country B has a high Comparative advantage in production of maize due to low opportunity cost than Country A which has a high opportunity cost in production of maize.

- Country A and B also are producing meat but the Country A has Comparative advantage in producing meat due to low opportunity cost than Country B which produces small amount of meat.

	<p>(ii) According to the law of comparative principles & opportunity cost which states that "the country with low opportunity cost finds a comparative advantage in producing a particular product between the two countries</p> <p>from the Two Countries Country A has a lower opportunity cost in production of Maize than in Country B hence Country A has Comparative advantage in producing maize than Country B while in production of Paddy (Rice) the Country A has a low opportunity cost in production of paddy than Country B hence Country A has a comparative advantage than Country B in production of paddy (Rice) due to different in opportunity cost.</p>
	<p>(iii) By Considering the law of Comparative advantage and principle of opportunity cost the trade between the two countries are as follows:</p> <p>Country A which have Comparative advantage in Paddy due to low of opportunity cost may trade with the Country B which are less in comparative advantage in production of Paddy to find cost of producing it due soil difference and water availability while more than to have a high opportunity cost in producing Paddy hence they need to exchange with Country B for Paddy Also the same</p> <p>Country B has a comparative advantage in production of maize than Country A due to low opportunity cost in production of maize, the country B must have to trade</p>

	<p>with Country A which are less likely to produce maize. Hence the two countries must have to trade of the Agricultural products. Country A should supply paddy to Country B while Country B should supply maize to Country A.</p>
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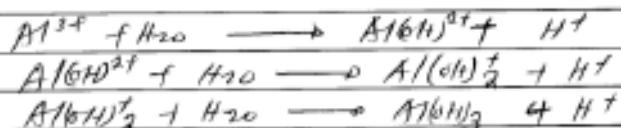
In Extract 1.8.1, the candidate displayed a good understanding of the concept of **international trade** and the **law of comparative advantage**. The candidate provided correct responses to almost all parts of the question, except to part (c) (iii) for which he/she missed few points on using the law of comparative advantage and principle of opportunity cost to explain the possible trade between the two countries.

11.0 Introduction to Soil Chemistry

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7. (a) (i) "Presence of high aluminium ions (Al^{3+}) in soils is known to contribute to soil acidity".
By using well-balanced equations, justify this statement. (4 marks)
- (ii) Differentiate between active and potential acidity. (2 marks)
- (b) (i) What is meant by liming as used in management of acid soils? (2 marks)
- (ii) By using at least one chemical equation in each case, examine four liming materials commonly used in agriculture. (8 marks)
- (c) Make a clear distinction between the following pairs:
(i) Organic fertilizers and inorganic fertilizer. (4 marks)
(ii) Complex/compound fertilizers and straight fertilizers.

f) Q) Al³⁺ contributes to soil acidity because when it hydrolyses, it releases three molecules of hydrogen ions. The presence of aluminium ion, decreases the pH of the soil when it is hydrolysed. The reaction is shown as follows:



One molecule of Al³⁺ is to soil contributes three molecules of hydrogen ions.

(i) Active acidity - is the type of acid which is found in the soil solution.

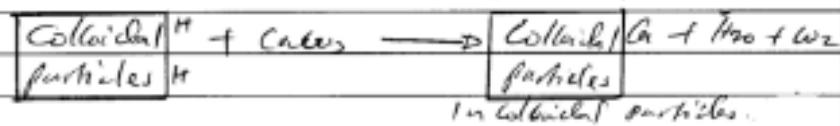
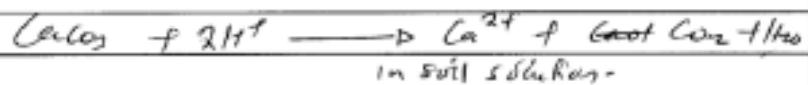
Potential acidity - is the type of acid which is found in the colloidal particles.

(b) Liming is the practice of adding calcium

(c) Liming is the practice of adding alkaline material to the soil for the purpose of neutralizing the acidic compounds in the soil and provide suitable conditions for growth of crops.

7 (b) (ii) ② CaCO₃ (Calcium carbonate)

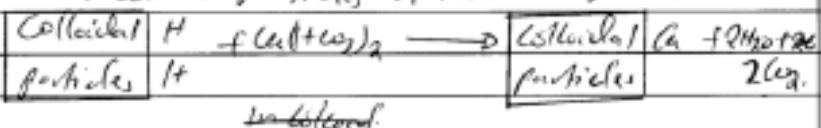
- This is also called limestone. It react with acidic soil as follow.



- Calcium also react with carbonic acid found in the soil to form $\text{Ca(HCO}_3\text{)}_2$ in soil solution.

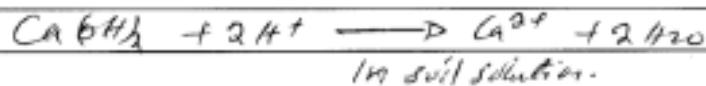


- In colloidal particles it react as follow.

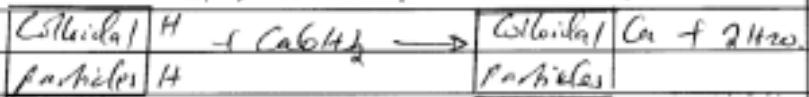


③ Calcium hydroxide (Ca(OH)_2)

- It is also called hydrated lime and it react with acidic soil as follow.



- In colloidal particles it react as follow.



④ Calcium oxide (CaO)

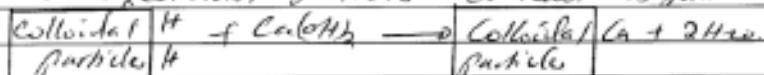
- This is also called limed lime. It firstly react with water to form Ca(OH)_2 .

7(6)(i) It react with acidic soil as follow

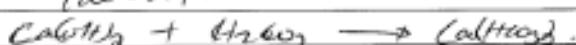


in soil solution.

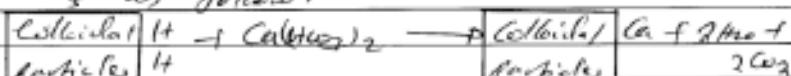
- In the ~~co~~^{colloidal} particle it react as follow:



- Also CaH₄ react with carbonic acid in soil.



It react with acid in the colloidal particle as follow:

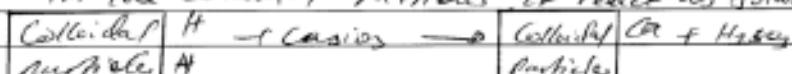


(d) Calcium silicate (Casios)

- This react with acid in the soil as follow:



- In the colloidal particle it react as follow:



(e) Organic fertilizers, These are fertilizer that are obtained from the animal waste products, and also plant. Also it is obtained from the decayed plant materials while

7(6)(i) Inorganic fertilizer - Is the fertilizer that made from the industries formed of Ammonium Sulphate (AS).

(ii) Complex/composed fertilizers, These are fertilizer that contain all three major nutrients which are Nitrogen, Phosphorous and Potassium (NPK) while straight fertilizers are the fertilizer that contains one of the major nutrients

Extract 1.7.1 represents one of the good responses to the question. The candidate provided correct responses in all parts of the question, thus demonstrating adequate knowledge and practical skills to the subject matter.