THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

134/2 **AGRICULTURE 2**

(For Both school and Private Candidates)

Time: 2:30Hours **ANSWERS** **Year: 2014**

Instructions

1. This paper consists of **ten (10)** questions in sections A, and B.
2. Answer **five (5)** questions choosing at least one question from each section.
3. Each question carries twenty marks

1(a) Describe the mode of action of the six categories of insecticides.

i. Contact insecticides: These act by directly killing insects upon physical contact, targeting their outer body coverings. Example: Pyrethroids.
ii. Stomach insecticides: These act when ingested, disrupting the insect's digestive system, leading to starvation. Example: Carbamates.
iii. Systemic insecticides: These are absorbed by the plant and ingested by pests feeding on the plant tissues, affecting their internal systems. Example: Neonicotinoids.
iv. Fumigants: These act by inhalation, disrupting the respiratory system of the insects. Example: Methyl bromide.
v. Nerve poisons: These interfere with the insect's nervous system, causing paralysis and death. Example: Organophosphates.
vi. Growth regulators: These disrupt the normal development of insects, preventing them from maturing or reproducing. Example: Juvenile hormone mimics.

(b) Outline twelve safety guidelines to be taken when spraying insecticides.

i. Wear protective clothing, including gloves, goggles, and masks.
ii. Avoid spraying in windy conditions to prevent drift.
iii. Ensure proper calibration of the sprayer to avoid over-application.
iv. Mix chemicals in well-ventilated areas.
v. Do not eat, drink, or smoke while handling insecticides.
vi. Wash hands thoroughly after spraying.
vii. Avoid spraying near water sources to prevent contamination.
viii. Store insecticides in a locked, labeled cabinet away from food and children.
ix. Dispose of empty containers properly by following local regulations.
x. Read and follow the manufacturer's instructions carefully.
xi. Keep first aid materials and emergency contacts readily available.
xii. Rotate insecticides to avoid pest resistance development.

(c) False codling moth and Blue bug are among the stubborn pests. For each:
False codling moth
i. Crop: Citrus.
ii. Damage: Larvae bore into fruits, causing internal damage and premature fruit drop.
iii. Control methods:

Use pheromone traps to monitor and reduce populations.
Apply biological control using parasitoids or entomopathogenic fungi.

Blue bug
i. Crop: Cotton.
ii. Damage: Sucks sap from plants, causing wilting and reduced yields.
iii. Control methods:

Spray with recommended insecticides.
Practice crop rotation to disrupt the pest's life cycle.

2(a) Enumerate eight problems associated with the use of pesticides/insecticides when controlling pests.

i. Development of pest resistance due to repeated use of the same chemicals.
ii. Environmental pollution affecting soil, water, and air quality.
iii. Harmful effects on non-target organisms, including beneficial insects and wildlife.
iv. Human health risks, including poisoning and long-term health effects.
v. High cost of pesticides, making them unaffordable for small-scale farmers.
vi. Residues on crops, leading to food safety concerns.
vii. Loss of biodiversity due to habitat destruction and chemical exposure.
viii. Secondary pest outbreaks caused by the elimination of natural predators.

(ii) Give two examples of successful biological control in agricultural fields based on insects by insects.

i. Introduction of lady beetles to control aphid populations.
ii. Release of Trichogramma wasps to target and parasitize moth eggs.

(b) Differentiate the following terms as applied in the field of plant pathology:

i. A sign and a symptom
A sign refers to the physical presence of a pathogen (e.g., fungal spores). A symptom is the plant's response to the infection (e.g., leaf yellowing).

ii. Chlorosis and wilting
Chlorosis is the yellowing of leaves due to lack of chlorophyll. Wilting is the drooping of plants caused by water stress or vascular blockages.

iii. Stunting and wilting
Stunting is reduced growth due to stress or infection. Wilting is the loss of turgidity in plant tissues caused by insufficient water uptake.

(c) In the following pathogens, state the disease transmitted and the type of crop affected:

i. Xanthomonas ampelisris: Bacterial blight in grapes.
ii. Colletotrichum lindemuthianum: Anthracnose in beans.
iii. Phytophthora infestans: Late blight in potatoes.
iv. Helminthosporium maydis: Southern corn leaf blight in maize.

3(a) What is meant by the following terms?

i. Noxious weed

A noxious weed is a plant classified as harmful to agriculture, ecosystems, or livestock. These weeds are often invasive and difficult to control. Example: Parthenium grass.

ii. Notorious weed
A notorious weed refers to a plant known for causing significant agricultural or ecological problems due to its rapid growth, competition with crops, or difficulty to eradicate. Example: Water hyacinth.

(b) Elaborate five ways in which herbicides work in controlling weeds.

i. Contact action
Herbicides destroy plant tissues upon direct contact with the surface. Example: Paraquat.

ii. Systemic action
Herbicides are absorbed through the leaves or roots and translocated throughout the plant, killing it from within. Example: Glyphosate.

iii. Pre-emergent action
Herbicides are applied to the soil to kill weeds before they emerge. Example: Atrazine.

iv. Post-emergent action
Herbicides are sprayed on growing weeds to kill them after emergence. Example: 2,4-D.

v. Selective action
Herbicides target specific weed species without affecting desired crops. Example: Dicamba for broadleaf weeds.

(ii) Briefly explain five environmental factors that affect the effectiveness of herbicides.

i. Temperature
High or low temperatures can affect herbicide absorption and activity. Optimal temperature enhances efficiency.

ii. Rainfall
Excessive rain after application may wash herbicides away, reducing their effectiveness.

iii. Soil type
Clay and organic matter in soil can adsorb herbicides, reducing their availability to weeds.

iv. Humidity
High humidity increases herbicide absorption by plants, improving effectiveness.

v. Light intensity
Some herbicides degrade quickly under strong sunlight, reducing their potency.

(iii) State three disadvantages of using herbicides in controlling weeds.

i. May harm non-target plants and reduce biodiversity.
ii. Can cause environmental pollution if misused.
iii. Leads to the development of herbicide-resistant weed species.

(c) Give the botanical name and life span of each of the following weeds:

i. Crows foot grass: Eleusine indica, annual.
ii. Double thorn: Oxygonum sinuatum, annual.
iii. Nut grass: Cyperus rotundus, perennial.
iv. Wild finger millet: Eleusine coracana, annual.

4(a) What is 'Relative Fitness' as applied in the effect of selection on genetic variation?

Relative fitness refers to the reproductive success of an individual or genotype compared to others in the population. It measures the contribution of a genotype to the next generation.

(ii) Examine four characteristics to be considered when developing varieties for sustainable crop improvement.

i. High yield potential
The variety should produce higher yields to meet growing food demands.

ii. Pest and disease resistance
It should be resistant to common pests and diseases to reduce dependency on chemical control.

iii. Drought and climate resilience
The variety should adapt to adverse climatic conditions for consistent productivity.

iv. Nutritional quality
Improved varieties should have enhanced nutritional value to support better human and animal health.

(b) Briefly describe the following methods of breeding self-pollinated crops:

i. Pure line selection
This involves selecting the best-performing plants from a population, growing them separately, and repeating the process for several generations to achieve uniformity and desired traits.

ii. Pedigree selection
Involves selecting superior plants based on their ancestry, recording their traits, and crossing them to improve desired characteristics over generations.

(c) Outline two principles which rest on the concept of 'natural selection'.

i. Variation
Individuals within a population vary in traits, some of which may provide a survival advantage.

ii. Differential survival and reproduction
Individuals with advantageous traits are more likely to survive and reproduce, passing these traits to offspring.

(ii) State three importance of natural selection.

i. Drives the evolution of species by favoring adaptive traits.
ii. Promotes biodiversity through the survival of diverse organisms.
iii. Maintains ecological balance by favoring organisms suited to specific environments.

(iii) What is the effect of natural selection?

Natural selection leads to the adaptation of species to their environments, ensuring survival and evolutionary progress.

5. State the causative agent, two typical symptoms, and suggest two methods which farmers may apply to control each of the following plant diseases:

(a) Coffee berry
Causative agent: Colletotrichum kahawae.
Symptoms:
Dark lesions on berries.

Premature berry drop.
Control methods:

Prune and destroy infected branches.

Apply fungicides like copper-based sprays.

(b) Covered kernel smut
Causative agent: Tilletia indica.
Symptoms:

Kernels replaced by black, powdery smut.

Foul odor from infected grains.
Control methods:

Use disease-resistant varieties.

Practice crop rotation with non-host crops.

(c) Cassava mosaic
Causative agent: Cassava Mosaic Virus (CMV).

Symptoms:

- Yellow or green mosaic patterns on leaves.
- Stunted growth.

Control methods:

- Use disease-free planting materials.
- Introduce resistant cassava varieties.

(d) Charcoal rot
Causative agent: Macrophomina phaseolina.

Symptoms:

- Blackened, rotted stem bases.
- Wilting and death of plants.

Control methods:

- Ensure proper irrigation to avoid stress.
- Practice crop rotation to disrupt the pathogen's life cycle.

7(a)(i) Briefly describe the process of semen collection using artificial vagina in artificial insemination in cattle.
The process involves several steps:

I. Prepare the artificial vagina by adjusting its temperature to mimic natural conditions, typically around 42–45°C.

II. Introduce a teaser animal or use a restrained cow to stimulate the bull.

III. Place the artificial vagina over the bull's penis during mounting.

IV. As the bull ejaculates, the semen is collected into a sterilized container attached to the artificial vagina.

V. The collected semen is then evaluated, processed, and stored for artificial insemination.

(ii) Enumerate six advantages of frozen semen.

- Ensures long-term storage without losing viability.
- Facilitates the transportation of semen to distant locations.
- Reduces the risk of transmitting diseases during breeding.
- Allows the use of superior genetics across various herds.
- Enables semen use even after the death of the donor bull.
- Supports efficient breeding programs by synchronizing insemination times.

(b) Explain the term ‘selection’ as it is used in livestock breeding and improvement.

Selection refers to the process of choosing animals with desirable traits to become parents for the next generation. It aims to improve productivity, adaptability, and overall genetic quality in livestock populations.

(ii) Differentiate natural selection from artificial selection.

Natural selection occurs when environmental factors determine which animals survive and reproduce.

Artificial selection is a deliberate process where humans choose animals with preferred traits for breeding.

(iii) Outline four genetic consequences of selection.

Increases the frequency of favorable alleles within a population.

Reduces genetic variation due to the preference for specific traits.

Leads to genetic improvement in desired traits over generations.

May result in inbreeding if selection is not carefully managed.

(c) Briefly explain two advantages and two disadvantages of selection based on pedigrees.

Advantages:

- Provides reliable information on the genetic potential of an animal based on ancestry.
- Facilitates the identification of animals with superior traits for breeding programs.

Disadvantages:

- Limited accuracy if pedigree records are incomplete or inaccurate.
- Does not account for environmental factors that may influence an animal's performance.

8. (a)(i) Elaborate three physical appearance signs and two morphological conditions that show the animal is in good health.

Physical appearance signs:

- Bright and alert eyes.
- Smooth, shiny coat indicating good nutrition.
- Active behavior and normal movement.

Morphological conditions:

- Firm, well-developed muscles.
- Proper body condition without signs of emaciation or obesity.

(ii) Explain briefly five predisposing factors of livestock diseases.

- Poor nutrition weakens the immune system, making animals prone to infections.
- Stress from transport, overcrowding, or extreme weather conditions.
- Presence of parasites that compromise health and productivity.
- Unsanitary living conditions increase exposure to pathogens.
- Genetic predisposition to certain diseases in some breeds.

(b)(i) Give four importance of keeping animals healthy.

- Ensures higher productivity in terms of milk, meat, or eggs.
- Reduces veterinary costs by preventing diseases.
- Improves reproductive performance and overall efficiency.
- Ensures the production of safe, high-quality animal products for consumers.

(ii) Briefly explain five preventive measures and three routine management practices that are used to control livestock diseases.

Preventive measures:

- Vaccinate animals against common diseases.
- Provide clean and sufficient water to reduce dehydration and stress.
- Ensure proper sanitation and hygiene in animal housing.
- Control pests and parasites through regular deworming and insecticides.
- Quarantine sick animals to prevent the spread of disease.

Routine management practices:

- Regular health check-ups to detect early signs of illness.
- Balanced nutrition to strengthen immunity.
- Timely removal of manure and waste to maintain a clean environment.

9. (a)(i) State the sources of calcium in farm animals' feed.

- Sources include limestone, bone meal, alfalfa, and dairy products like milk and whey.

(ii) What would happen to the high milk producing cow if it relies on feeds containing insufficient amount of calcium?

- The cow may develop hypocalcemia (milk fever), characterized by weak bones, reduced milk production, and muscle tremors.

(iii) Why essential amino acids must be supplied in the animal's diet?

- Essential amino acids cannot be synthesized by the animal's body and must be provided through the diet for proper growth, reproduction, and maintenance.

(b) Point out two roles played by each of the following nutrients in farm animals:

Phosphorus:

- Supports bone and teeth formation.
- Plays a role in energy metabolism through ATP production.

Magnesium:

- Maintains proper nerve and muscle function.
- Essential for enzymatic activities in metabolism.

Vitamin A:

- Improves vision and eye health.
- Boosts immune function to fight infections.

(c) Examine six factors that have to be considered in formulating rations.

- The nutritional requirements of the animal based on age, weight, and production stage.
- The availability and cost of feed ingredients.
- The digestibility and palatability of the feed.
- Inclusion of balanced vitamins and minerals.
- Prevention of toxic substances or contaminants.
- Seasonal variations in feed availability.

(d) Briefly explain five environmental factors affecting feed intake in ruminants.

- High ambient temperatures reduce feed consumption.
- Humidity affects the comfort and feed intake behavior of animals.
- Availability of clean drinking water encourages feed intake.
- The quality of forage and its digestibility.
- Stress caused by overcrowding or predators can reduce appetite.

10. (a)(i) Examine five advantages of establishing improved pastures.

- Ensures consistent availability of high-quality forage.
- Reduces dependency on purchased feeds, lowering costs.
- Enhances soil fertility through leguminous crops.
- Improves animal productivity by providing nutrient-rich forage.
- Reduces environmental degradation through soil stabilization.

(ii) Account for four reasons that make natural grassland generally to be of low feeding value.

- Low nutrient content due to poor soil fertility.
- High fiber content reducing digestibility.
- Presence of unpalatable or toxic weeds.
- Limited growth during dry seasons or harsh conditions.

(b) State six criteria to be used in selecting grasses for establishing pastures.

- High nutritional value and digestibility.
- Ability to withstand grazing pressure.
- Adaptation to local soil and climatic conditions.
- Fast growth and regrowth after grazing.
- Resistance to pests and diseases.

Compatibility with legume species for mixed pastures.

(c) Briefly describe the following grazing methods as ways of managing pastures:

Continuous grazing: Animals graze freely on a large area without restrictions, leading to potential overgrazing.

Zero grazing: Animals are confined, and forage is brought to them, preventing overgrazing.

Deferred grazing: Pasture is rested for a specific period to allow regrowth before grazing resumes.

Rotational grazing: Livestock are rotated across multiple paddocks, allowing pastures to recover.

Strip grazing: Animals graze a small section of the pasture at a time, controlled by movable fences.