

G12 ECZ AGRICULTURAL SCIENCE 2019 PAPER 1 SOLUTIONS

Grade 12 ECZ Agricultural Science 2019 Paper 1 (5037/1) — Theory

Wednesday 7 August 2019 | 2 hours | Section A (Q1–5, answer all) + Section B (Q6–10, answer any three)

The full question paper appears first (its pages are out of order in the source scan) — worked answers follow in question order.

- 9 (a) Explain the term:
- (i) entrepreneurship, [5]
 - (ii) budgeting. [5]
- (b) A farmer who had a maize enterprise and a broiler enterprise on a farm made the following transactions for the broiler enterprise: purchased 10 bags of broiler mash of mass 50kg each at K150.00 per bag. Bought a vaccine against Gumboro disease at K50.00 and spent a total of K200.00 on the operations of the tractor. Spent K500.00 on monthly wages of regular farm workers. The farmer sold 100 broiler birds at K40.00 each.
- (i) Calculate the gross margin of the broiler enterprise (show your working). [5]
 - (ii) Suggest ways of increasing the gross margin of the broiler enterprise. [5]

[Total: 20]

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- 10 (a) Describe the recommended characteristics of a good storage structure on a farm for fresh vegetables. [9]
- (b) Explain the importance of a well maintained crop storage farm structure. [8]
- (c) State how farm implements are protected from rusting. [3]

[Total: 20]

Centre Number	Candidate Number

Candidate Name _____

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level

Agricultural Science**Paper 1 Theory**

5037-1-865

5037/1**Wednesday****7 August 2019**

Additional Materials

Answer Booklet

Time: 2 hours**zedpastpapers.com****Instructions to candidates**

Write your **name**, **centre number** and **candidate number** in the spaces at the top of this page and on the Answer Booklet.

There are **Ten** questions in this paper.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer any **three** questions.

Write your answers in the Answer Booklet provided.

At the end of the examination:

- 1 fasten the Answer Booklet securely to the question paper.
- 2 enter the numbers of the **Section B** questions you have answered in the grid for Examiner's use.

Information for candidates

The number of marks is given in brackets [] at the end of each question or part question.

You are advised to spend no longer than 40 minutes on **Section A**.

Cell phones are not allowed in the examination room.

FOR EXAMINER'S USE	
Section A	
Section B	
Total	

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Section A

Answer all questions in this section

- 1 **Figure 1A** shows an activity carried out by a learner on a soil sample and **figure 1B** shows the apparatus used to carry out the activity.

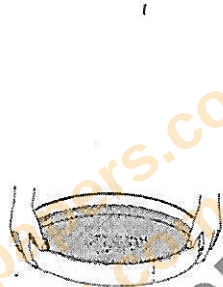


Figure 1A

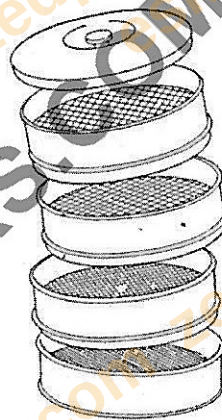


Figure 1B

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- (a) (i) Identify the activity represented by **figure 1A**.

..... [1]

- (ii) Name the apparatus in **figure 1B** used to carry out the activity in **figure 1A**.

..... [1]

- (b) State the function of the apparatus in **figure 1B**.

..... [2]

- (c) List the **four** soil particles of the soil sample collected by using the apparatus represented in **figure 1B**.

1 [4]

2

3

4

2 (a) Define Modern Agriculture.

.....
.....

[2]

(b) State the benefits of teaching Agricultural Science in the Zambian schools.

.....
.....
.....

[2]

(c) How does Agricultural Education benefit the environment?

.....
.....

[1]

(d) Summarise the achievement of agriculture in your area.

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.....
.....
.....

[2]

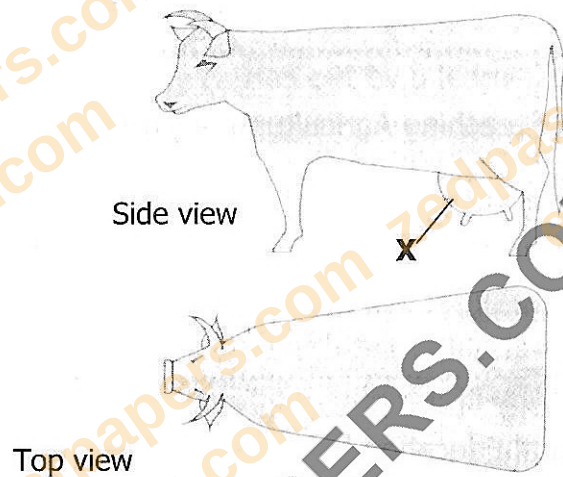
(e) What is the effect on the atmosphere of destroying forests for agriculture?

.....
.....

[1]

[8 marks]

3 **Figure 2** below shows the side view and top view of a farm animal.



(a) (i) Identify the type of animal represented by **figure 2**.

..... [1]

(ii) State **two** reasons for your answer in (a) (i) above.

1 [2]

2 [2]

(b) (i) Name the disease that infects structure **X** in **figure 2** above.

..... [1]

(ii) Explain how the disease is treated.

..... [2]

(c) Describe **two** advantages of artificial insemination.

1 [2]

2 [2]

..... [2]

[8 marks]

4 (a) In Agriculture, what is:

(i) a risk?

.....

.....

..... [3]

(ii) uncertainty?

.....

.....

..... [3]

(b) State **two** methods of calculating depreciation of farm machinery.

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2

..... [2]

[8 marks]

- 5 (a) What are the features of a site suitable for the construction of an improved livestock structure?

1
.....
2
..... [2]

- (b) Describe the size of a milking stall for one dairy cow.

.....
..... [2]

- (c) Draw a plan of a layers' house for 100 layers. Calculate the dimensions of the layers' house allowing 1m^2 floor space for every three layers.

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- (d) Why are animals on a farm protected from bad weather and kept in conditions where diseases and parasites are more readily controlled?

.....
.....
..... [1]

[8 marks]

Section B

Answer any three questions from this section.

- 6 (a) (i) Define a crop pest. [2]
 (ii) Outline the objectives for controlling pests. [3]
 (b) Discuss the advantages of agricultural techniques on crop production. [5]
 (c) How does conservation agriculture achieve suitable benefits? [5]
 (d) Why is intercropping important on the diet of a family in your local area? [3]
 (e) What advice would you give to a farmer to increase crop yields and reduce labour costs? [1]
 (f) Why are crops stored after harvesting? [1]

[Total: 20]

- 7 (a) (i) List the components of a farming system. [3]
 (ii) Name **four** methods of farming. [4]
 (b) (i) State the effects of land tenure by inheritance on agriculture. [5]
 (ii) Suggest how a country can discourage land tenure by inheritance. [3]
 (c) Explain why farmers are advised to grow a crop where the temperature is optimum. [2]
 (d) Summarise how temperature can be modified in a field. [3]

[Total: 20]

- 8 (a) List **five** factors that farmers consider when removing animals from a herd. [5]
 (b) Describe the steps of artificial insemination in cattle. [4]
 (c) State the activities involved in the construction of a deep litter house. [5]
 (d) Describe the damage caused by tick infestation to a cow. [5]
 (e) Explain what would happen to fish in a fish pond if pesticides got into the fish pond. [1]

[Total: 20]

Question 1. Figure 1A shows an activity carried out on a soil sample, and Figure 1B shows the apparatus (a nest/stack of sieves) used.

Answer: (a)(i) Activity in Figure 1A: SIEVING (sieving the soil to separate it).

Answer: (a)(ii) Apparatus in Figure 1B: a set/nest of SIEVES (a soil sieve).

Answer: (b) Function of the apparatus: it separates the soil into its different PARTICLE SIZES (grades the particles by size).

(c) Four soil particles collected by the apparatus:

Answer: 1. Gravel/stones; 2. Coarse sand; 3. Fine sand; 4. Silt (the finest clay passes through).

Question 2. Modern agriculture and agricultural education.

Answer: (a) MODERN AGRICULTURE: farming that uses improved, scientific and mechanised methods — improved seeds, fertilizers, machinery and good management — to raise production (commercial, science-based farming).

Answer: (b) Benefits of teaching Agricultural Science in Zambian schools: it produces skilled farmers and labour; improves food production and food security; opens up careers and employment; and promotes good, modern farming practices.

Answer: (c) How agricultural education benefits the environment: it teaches conservation and sustainable practices (soil and water conservation, afforestation), reducing harmful practices that degrade land and cause pollution.

Answer: (d) An achievement of agriculture in the area: e.g., increased food production and income/employment through improved crop varieties and better methods.

Answer: (e) Effect on the atmosphere of destroying forests: it increases carbon dioxide in the air (less is absorbed), contributing to global warming, and reduces rainfall and the supply of oxygen.

Question 3. Figure 2 shows the side view and top view of a farm animal, with structure X (the udder) on the underside.

Answer: (a)(i) Type of animal: a DAIRY (milk-type) cow.

(a)(ii) Two reasons:

Answer: 1. It is lean and WEDGE-SHAPED (angular, triangular body — narrow in front, wider behind) rather than blocky/fleshy.

Answer: 2. It has a large, well-developed UDDER with prominent milk veins.

Answer: (b)(i) Disease that infects structure X (the udder): MASTITIS.

Answer: (b)(ii) How it is treated: treat with antibiotics (intra-mammary infusion), milk out the affected quarter regularly, keep the udder/parlour hygienic and call a veterinarian.

(c) Two advantages of artificial insemination:

Answer: 1. It allows the use of semen from superior, proven bulls to improve the herd, without keeping a bull on the farm (one bull serves many cows; semen can be stored and transported).

Answer: 2. It reduces the spread of breeding (venereal) diseases and is cheaper and safer than keeping a bull.

Question 4. Risk, uncertainty and depreciation.

Answer: (a)(i) **RISK**: a situation in which the chance (probability) of a loss is **KNOWN** or can be predicted/estimated and insured against (e.g., a known disease outbreak, fire or theft).

Answer: (a)(ii) **UNCERTAINTY**: a situation in which the outcome is **UNKNOWN** and cannot be predicted or insured against (e.g., sudden changes in prices or unexpected weather).

(b) Two methods of calculating depreciation of farm machinery:

Answer: 1. The **STRAIGHT-LINE** method; 2. The **REDUCING (diminishing) BALANCE** method. (Also the revaluation method.)

Question 5. Livestock structures.

(a) Features of a site suitable for an improved livestock structure:

Answer: 1. **Well-drained, slightly elevated ground (to avoid flooding/dampness)**; 2. **Near a reliable water supply and easily accessible, with a firm foundation, good orientation and away from dwellings.**

Answer: (b) **Size of a milking stall for one dairy cow: about 1.7 m long by 1.1 m wide (roughly 1.6–1.7 m × 1.0–1.2 m).**

(c) Plan of a layers' house for 100 layers (1 m² floor space for every three layers):

Answer: **Floor area needed = $100 \div 3 = 33.3 \text{ m}^2$. So the house could be drawn about 8.3 m long × 4 m wide ($\approx 33.3 \text{ m}^2$), with feeders, drinkers, perches and nest boxes shown on the plan.**

Answer: (d) **Why animals are protected from bad weather and kept where diseases and parasites are more readily controlled: so that they stay healthy, comfortable and free from stress and losses, and therefore grow and produce well.**

Question 6. [SECTION B] (a)(i) Define a crop pest; (ii) outline the objectives for controlling pests. (b) Discuss the advantages of agricultural techniques on crop production. (c) How does conservation agriculture achieve suitable benefits? (d) Why is intercropping important in the diet of a family in your local area? (e) Advice to a farmer to increase yields and reduce labour costs. (f) Why are crops dried after harvesting?

Answer: (a)(i) A **CROP PEST** is any organism (e.g., an insect, bird or rodent) that attacks and damages crops, causing loss of yield or quality.

Answer: (a)(ii) **Objectives of pest control: to reduce crop damage and losses, to raise yield and quality, to protect food and income, and to prevent the spread of disease.**

Answer: (b) **ADVANTAGES OF AGRICULTURAL TECHNIQUES: they increase yields and quality, make efficient use of resources, control pests and diseases, conserve the soil and allow operations to be done in good time.**

Answer: (c) **HOW CONSERVATION AGRICULTURE ACHIEVES ITS BENEFITS:** minimum tillage and a permanent soil cover of residues conserve soil and moisture and cut erosion, while crop rotation maintains fertility — giving higher, more reliable yields at lower cost.

Answer: (d) **WHY INTERCROPPING MATTERS FOR THE FAMILY DIET:** it provides a variety of foods (a more balanced diet of different nutrients), ensures food even if one crop fails, and (with a legume) supplies protein.

Answer: (e) **ADVICE TO INCREASE YIELDS AND REDUCE LABOUR:** use improved high-yielding seed and fertilizers and adopt herbicides/mechanisation (and conservation farming) to cut manual labour.

Answer: (f) **WHY CROPS ARE DRIED AFTER HARVEST:** to reduce their moisture content so they do not rot, go mouldy or attract storage pests — allowing safe storage.

Question 7. (a)(i) List the components of a farming system; (ii) name four methods of farming. (b)(i) State the effects of land tenure by inheritance on agriculture; (ii) suggest how a country can discourage land tenure by inheritance. (c) Explain why farmers grow a crop where the temperature is optimum. (d) Summarise how temperature can be modified in a field.

Answer: (a)(i) **Components of a farming system:** the **INPUTS**, the **PROCESSES** (the farm enterprise/operations) and the **OUTPUTS** (with the farmer/management directing them).

Answer: (a)(ii) **Four methods of farming:** shifting cultivation; mixed farming; nomadic/pastoral farming; and commercial farming. (Also subsistence, organic.)

(b)(i) **EFFECTS OF LAND TENURE BY INHERITANCE:**

Answer: It leads to fragmentation of land into small, uneconomic plots; discourages investment and improvement; causes ownership disputes; and limits mechanisation — lowering productivity.

Answer: (b)(ii) **HOW A COUNTRY CAN DISCOURAGE IT:** through land reform and laws, issuing title deeds, consolidating/resettling land, and encouraging leasing or state allocation of land.

Answer: (c) **WHY GROW A CROP AT THE OPTIMUM TEMPERATURE:** at its optimum temperature a crop carries out photosynthesis and grows best, giving the highest yield (each crop has a temperature range for best performance).

Answer: (d) **HOW TEMPERATURE CAN BE MODIFIED IN A FIELD:** by mulching, irrigation, shading (shade nets), windbreaks, greenhouses and adjusting the time of planting.

Question 8. (a) List five factors that farmers consider when removing (culling) animals from a herd. (b) Describe the steps of artificial insemination in cattle. (c) State the activities involved in constructing a deep litter house. (d) Describe the damage caused by tick infestation to a cow. (e) What would happen to fish in a pond if pesticides got into the pond?

(a) **FIVE FACTORS WHEN CULLING ANIMALS:**

Answer: Old age; poor production (low milk/growth); ill health/disease; infertility or poor breeding; and physical defects, injury or bad temperament (also financial need).

(b) STEPS OF ARTIFICIAL INSEMINATION IN CATTLE:

Answer: Detect the cow on heat; thaw and load the stored semen into the insemination gun (catheter); restrain the cow; pass the gun through the vulva, vagina and cervix and deposit the semen in the body of the uterus; then record the service.

(c) CONSTRUCTING A DEEP LITTER HOUSE:

Answer: Select a suitable site; lay the foundation and a concrete floor; build the walls (with wire mesh for ventilation) and roof; spread a thick layer of litter (wood shavings/sawdust) on the floor; and install feeders, drinkers, perches and nest boxes.

(d) DAMAGE CAUSED BY TICKS TO A COW:

Answer: They suck blood (causing anaemia and weakness); they transmit diseases (such as East Coast Fever and redwater); they make wounds that become infected and damage the hide/teats; and the irritation lowers the animal's condition and production.

Answer: (e) IF PESTICIDES GOT INTO THE POND: the fish would be poisoned and killed (the water becomes contaminated).

Question 9. (a) Explain the terms: (i) entrepreneurship, (ii) budgeting. (b) A farmer's broiler enterprise: 10 bags of broiler mash (50 kg) at K150/bag; Gumboro vaccine K50; tractor operations K200; monthly wages of regular workers K500; sold 100 broiler birds at K40 each. (i) Calculate the gross margin; (ii) suggest ways of increasing it.

Answer: (a)(i) ENTREPRENEURSHIP: the ability to organise the other factors of production (land, labour, capital), take risks and make decisions in order to run a farm business for profit.

Answer: (a)(ii) BUDGETING: drawing up a financial plan that estimates the expected income and expenditure of a farm or enterprise over a period, to guide planning.

(b)(i) GROSS MARGIN OF THE BROILER ENTERPRISE = Output – Variable costs:

Answer: Output (income) = 100 birds × K40 = K4,000.

Answer: Variable costs (directly tied to the broilers) = broiler mash 10 × K150 = K1,500 + Gumboro vaccine K50 = K1,550.

Answer: Gross Margin = K4,000 – K1,550 = K2,450. (The tractor operations K200 and the regular workers' wages K500 are fixed/overhead costs, so they are NOT deducted in the gross margin.)

(b)(ii) WAYS OF INCREASING THE GROSS MARGIN:

Answer: Sell more birds or at a higher price (better marketing); lower the variable costs (buy feed in bulk or mix own feed); reduce mortality through good management and vaccination; and improve feed conversion so less feed is used per bird.

Question 10. (a) Describe the recommended characteristics of a good storage structure for fresh vegetables. (b) Explain the importance of a well-maintained crop storage farm structure. (c) State how farm implements are protected from rusting.

(a) CHARACTERISTICS OF A GOOD STORAGE STRUCTURE FOR FRESH VEGETABLES:

Answer: It should be cool and provide good ventilation/air circulation; keep a fairly high humidity so the vegetables do not wilt; be clean and free from pests and rodents; keep out direct sunlight and rain; allow the produce to be arranged so air moves around it; and be easy to clean and inspect.

(b) IMPORTANCE OF A WELL-MAINTAINED CROP STORAGE STRUCTURE:

Answer: It keeps the produce dry and in good condition, reducing spoilage and losses; protects it from pests, rodents, rain and theft; preserves the quality and value of the crop; prolongs the storage life; and saves the cost of replacing damaged produce or the structure.

Answer: (c) HOW FARM IMPLEMENTS ARE PROTECTED FROM RUSTING: clean and dry them after use; oil or grease the metal parts; paint the surfaces; and store them under shelter (in a dry shed).

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