

**G9 ECZ
AGRICULTURAL
SCIENCE
2014 SPECIMEN
PAPER 2
SOLUTIONS**

Grade 9 ECZ Agricultural Science 2014 Specimen Paper 2 (501/2)

2 hours | 8 compulsory structured questions x 10 marks (80 marks), covering the full syllabus

The full question paper appears first -- worked answers follow.



EXAMINATIONS COUNCIL OF ZAMBIA

JUNIOR SECONDARY SCHOOL LEAVING EXAMINATION (GRADE 9) – 2014

AGRICULTURAL SCIENCE 501/2 PAPER 2 (SPECIMEN)

(INTERNAL AND EXTERNAL CANDIDATES)

TIME: 2 HOURS

MARKS: 80

INSTRUCTIONS TO CANDIDATES

- 1 Pull out the Answer Booklet from the question paper.
- 2 Write your **name, examination number, school/centre name and code** on the Answer Booklet.
- 3 Write your answers.
- 4 Answer **ALL** the questions

INFORMATION FOR CANDIDATES

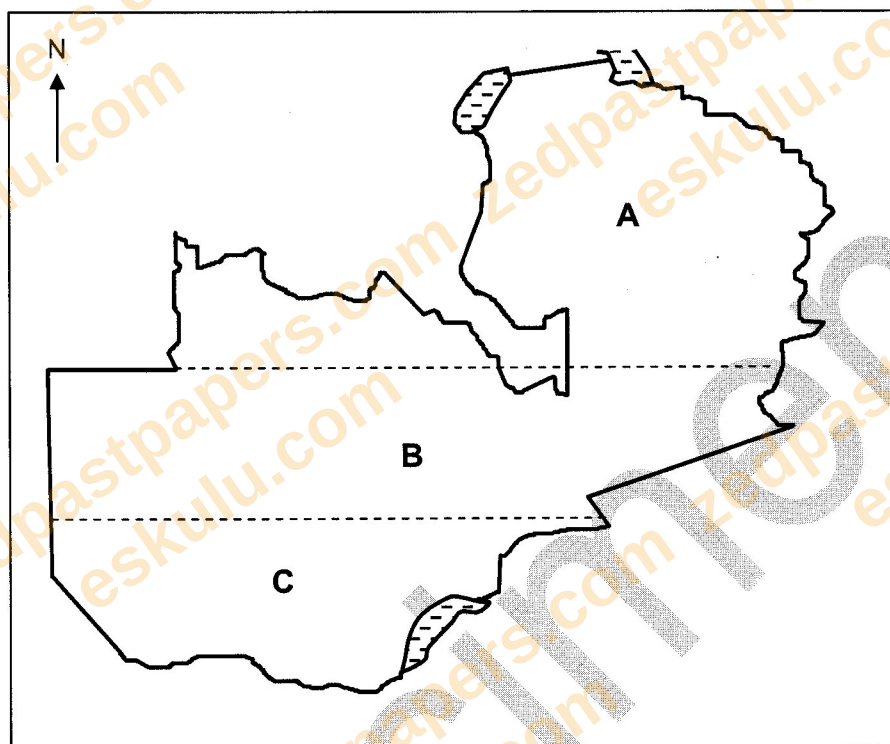
Cell phones are not allowed in the examination room.

Calculators are not allowed in the examination room.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1 AGRICULTURE IN ZAMBIA

Study the map of Zambia shown below and answer the questions that follow.

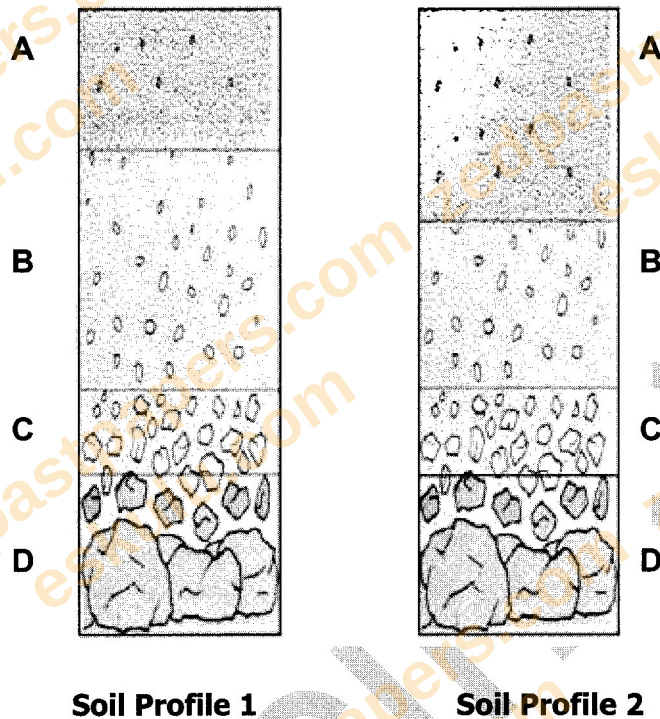


- (a) What is the average amount of rainfall for region 'B'? [1]
- (b) Name the Agro-ecological regions marked A, B and C. [3]
- (c) Explain the difference between small scale farmer and commercial farmer. [3]
- (d) Give **three** reasons why some areas are suitable for commercial farming in Zambia. [3]

[Total 10 marks]

2 SOIL SCIENCE

The diagram below shows two soil profiles taken from different locations in a school.



- (a) (i) Which soil profile, 1 or 2 can support agriculture production successfully? [1]
- (ii) State why the soil profile you have identified can support agriculture production. [1]
- (b) The following is a label on a bag of a type of fertilizer.

50 kg
N: P: K
10 20 10

- (i) State the meaning of the letters N:P:K on the bag. [3]
- (ii) When is this type of fertilizer applied to a crop? [1]
- (c) A maize crop requires 200kg of fertilizer per hectare. Calculate the amount of fertilizer that can be applied on a seed bed measuring 10m long and 1m wide. [4]

[Total 10 marks]

3 CROP PRODUCTION

(a) (i) State **three** adverse effects of weeds on crops. [3]

(ii) How can these adverse effects be prevented? [1]

(iii) Why is post-emergence application of herbicides more desirable to control weeds than pre-emergence application in heavy rainfall areas? [1]

(b) The diagram below shows a wilting tomato plant.



The plant was properly supplied with water, but the condition persisted.

(i) Name the pest that can cause this symptom on the plant. [1]

(ii) Give a reason for your answer in **3 (b) (i)** above. [1]

(iii) Why is hardening carried out before transplanting vegetable seedlings? [1]

(c) (i) Why is it recommended to use certified seed in crop production? [1]

(ii) Name a fertilizer which is commonly used where maize is to be planted in Zambia. [1]

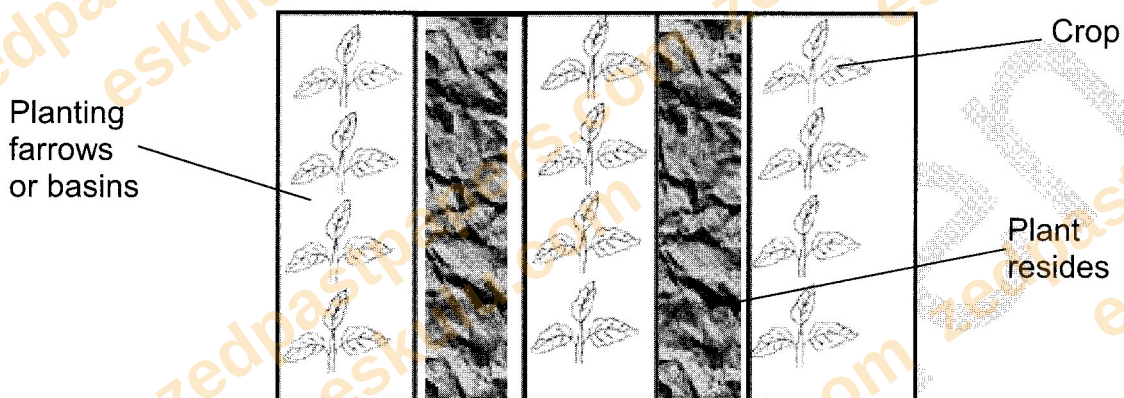
[Total 10 marks]

4 FORESTRY AND CONSERVATION FARMING

(a) A farmer grew maize and groundnuts on one plot. What type of farming system was being practiced? [1]

(b) What advantages will a farmer have for practicing the system in 4 (a)? [2]

(c) The diagram below shows a type of farming practice.



(i) What kind of farming practice is shown above? [1]

(ii) Why are farmers encouraged to practice such a system on their farms? [2]

(d) State the role trees play in the following:

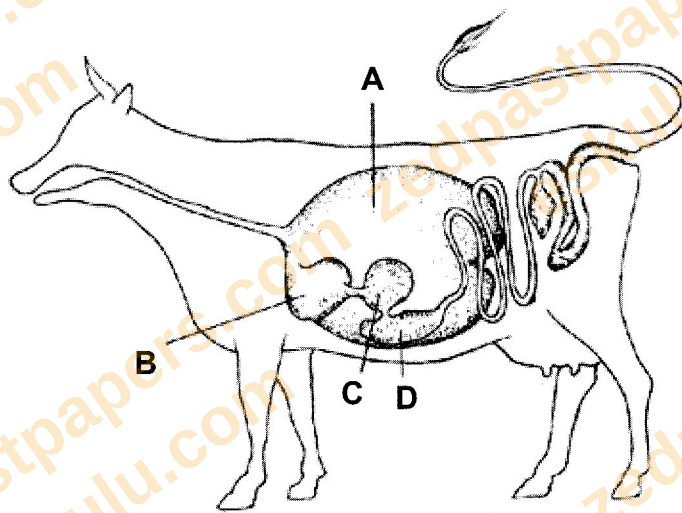
(i) Soil fertility [2]

(ii) Infiltration of water [2]

[Total 10 marks]

5 LIVESTOCK PRODUCTION

(a) Study the diagram of an animal shown below.

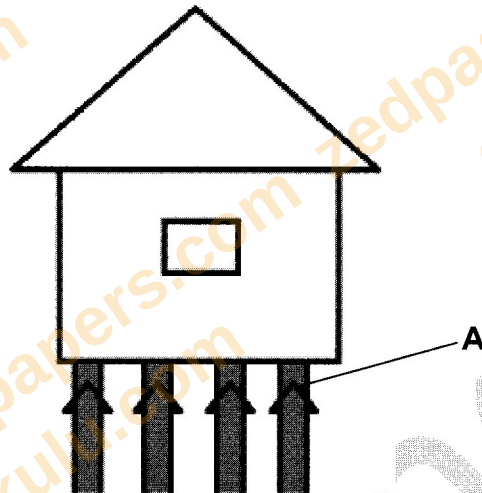


- (i) What type of digestive system is shown in the diagram above? [1]
- (ii) Write the letter of the chamber in which true digestion starts. [1]
- (iii) What is the difference between the digestive system of a pig and the one shown in the diagram? [2]
- (iv) Which other animal has a similar digestive system as the animal shown above? [1]
- (b) In Animal Production what does the term maintenance ration mean? [1]
- (c) Give **two** ways a farmer can prevent and control tick born disease on the farm. [2]
- (d) (i) A cow was serviced on 1st November 2013. In which month is it likely to calf down? [1]
- (ii) Explain how you arrived at the answer **d (i)**. [1]

[Total 10 marks]

6 FARM STRUCTURES

(a) Study the diagram of the storage structure shown below.

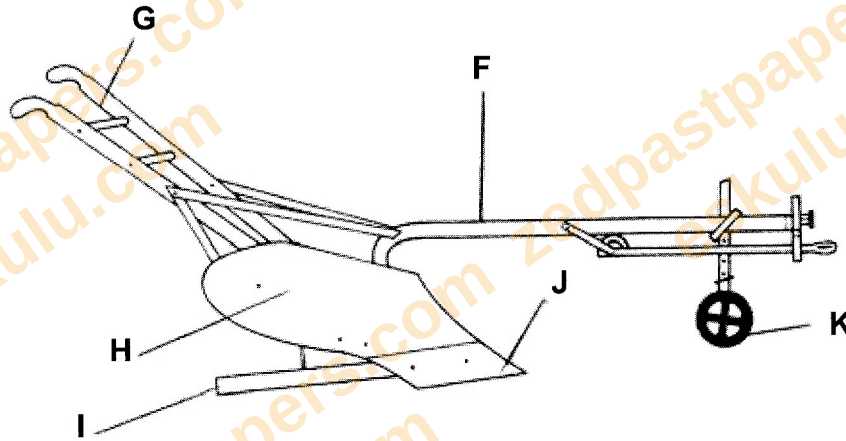


- (i) Identify the storage structure shown in the diagram. [1]
- (ii) Name the part labelled **A**. [1]
- (b) State some features in the diagram which make it unsuitable for grain storage. [2]
- (c) Name **one** improved structure suitable for grain storage. [1]
- (d) List **three** characteristics of a structure suitable for grain storage. [3]
- (e) Describe what a farmer should do to the storeroom before storing the next grain. [2]

[Total 10 marks]

7 FARM MECHINERY

The diagram shows a farm implement.



- (a) What is the name of the farm implement? [1]
- (b) Name the parts of the farm implement labelled with letters **F**, **G** and **H**. [3]
- (c) Explain the functions of **I**, **J**, and **K**. [3]
- (d) Give **three** activities a farmer should carry out to prepare an animal drawn implement for storage. [3]

[Total 10 marks]

8 FARM MANAGEMENT

- (a) Name **two** resources a farmer requires for production. [2]
- (b) A farmer got K1000 from the bank to buy fertilizer. What type of credit did he get? [1]
- (c) What are the main reasons why a farmer must keep records at a farm for production? [2]
- (d) A farmer obtained a loan of K2000 to be paid at a rate of 20% for two years. Calculate the simple interest the farmer will pay in two years. [2]
- (e) What do the following terms mean?
- (i) Opportunity cost
 - (ii) Enterprise [2]
- (f) Name **one** of the laws a farmer should observe when producing crops in terms of inputs. [1]

[Total 10 marks]

Question 1. AGRICULTURE IN ZAMBIA. Study the map of Zambia showing three agro-ecological regions (A in the north, B in the central band, C in the south). (a) What is the average amount of rainfall for region B? [1] (b) Name the Agro-ecological regions marked A, B and C. [3] (c) Explain the difference between small scale farmer and commercial farmer. [3] (d) Give three reasons why some areas are suitable for commercial farming in Zambia. [3]

(a)

Answer: Region B (Agro-ecological Region II) receives an average rainfall of about 800mm-1,000mm per year.

(b)

Answer: A = Region III (the high-rainfall northern zone, over 1,000mm per year); B = Region II (the medium-rainfall central zone, 800mm-1,000mm); C = Region I (the low-rainfall southern zone, below 800mm per year).

(c)

Answer: A small-scale farmer cultivates a small piece of land mainly for subsistence, relying on family labour, simple hand tools and few purchased inputs, producing mostly for home consumption. A commercial farmer operates on a large scale, mainly to make a profit, using hired labour, machinery and purchased inputs (fertilizer, certified seed, chemicals), and sells most of the produce on the market.

(d)

Answer: Three reasons some areas are suitable for commercial farming: they have fertile soils that support high yields; they receive adequate and reliable rainfall (or have irrigation potential); and they have good transport networks/infrastructure giving easy access to markets, plus land that is flat enough for machinery use.

Question 2. SOIL SCIENCE. Study the diagram of two soil profiles (Soil Profile 1 and Soil Profile 2), each showing horizons A, B, C and D from top to bottom.

(a)(i) Which soil profile, 1 or 2, can support agriculture production successfully? [1] (ii) State why the soil profile you have identified can support agriculture production. [1] (b) A fertilizer bag is labelled '50kg, N:P:K, 10 20 10'. (i) State the meaning of the letters N:P:K on the bag. [3] (ii) When is this type of fertilizer applied to a crop? [1] (c) A maize crop requires 200kg of fertilizer per hectare. Calculate the amount of fertilizer that can be applied on a seed bed measuring 10m long and 1m wide. [4]

(a)(i)

Answer: Soil Profile 1 (judgment call: it shows a deeper topsoil, A and B horizon, before reaching the stony C/D layers).

(a)(ii)

Answer: It can support agriculture successfully because its deeper topsoil (A and B horizons) gives plant roots more room to develop and holds more moisture and nutrients before reaching the rocky/stony lower layers.

(b)(i)

Answer: N = Nitrogen, P = Phosphorus, K = Potassium -- the three primary plant nutrients, with the numbers (10 20 10) showing the percentage by weight of each nutrient in the 50kg bag.

(b)(ii)

Answer: This is a basal (compound) fertilizer, high in phosphorus to encourage root development, so it is applied at or before planting rather than as a top dressing.

(c)

Answer: 1 hectare = 10,000 m². Seed bed area = 10m x 1m = 10 m². Fraction of a hectare = 10 / 10,000 = 1/1,000. Fertilizer required = 200kg x (10/10,000) = 0.2kg (200g).

Question 3. CROP PRODUCTION. (a)(i) State three adverse effects of weeds on crops. [3] (ii) How can these adverse effects be prevented? [1] (iii) Why is post-emergence application of herbicides more desirable to control weeds than pre-emergence application in heavy rainfall areas? [1] (b) A wilting tomato plant, properly supplied with water, still shows the wilting symptom. (i) Name the pest that can cause this symptom on the plant. [1] (ii) Give a reason for your answer in (b)(i). [1] (iii) Why is hardening carried out before transplanting vegetable seedlings? [1] (c)(i) Why is it recommended to use certified seed in crop production? [1] (ii) Name a fertilizer which is commonly used where maize is to be planted in Zambia. [1]

(a)(i)

Answer: Three adverse effects of weeds: they compete with crops for water, nutrients and light, reducing crop yield; they harbour pests and disease-causing organisms; and they lower the quality of the harvested produce (e.g. weed seeds mixed in with grain).

(a)(ii)

Answer: These effects can be prevented by timely weed control, such as hand weeding, use of herbicides, mulching, or practising crop rotation.

(a)(iii)

Answer: In heavy rainfall areas, pre-emergence herbicides (applied to bare soil before weeds emerge) can easily be washed away or leached before they take effect, whereas post-emergence herbicides are applied directly onto already-emerged weeds, after the period of heaviest wash-away risk, making them more reliable.

(b)(i)

Answer: Root-knot nematodes (judgment call: microscopic worms that damage plant roots).

(b)(ii)

Answer: Nematodes attack and damage the plant's roots, so even when the soil has enough water, the damaged roots cannot absorb and supply it to the rest of the plant, causing wilting.

(b)(iii)

Answer: Hardening gradually exposes seedlings raised under sheltered nursery conditions to outdoor conditions (full sun, wind, temperature changes) before transplanting, so they can better withstand transplanting shock and survive in the field.

(c)(i)

Answer: Certified seed is guaranteed to be disease-free, genetically pure/true-to-type and to have a high germination rate, which leads to better and more reliable crop yields.

(c)(ii)

Answer: Compound D, the standard basal fertilizer commonly applied when planting maize in Zambia.

Question 4. FORESTRY AND CONSERVATION FARMING. (a) A farmer grew maize and groundnuts on one plot. What type of farming system was being practiced? [1] (b) What advantages will a farmer have for practicing the system in (a)? [2] (c) A diagram shows alternating strips of crop and plant residue/mulch, with planting furrows or basins. (i) What kind of farming practice is shown above? [1] (ii) Why are farmers encouraged to practice such a system on their farms? [2] (d) State the role trees play in the following: (i) Soil fertility [2] (ii) Infiltration of water [2]

(a)

Answer: Intercropping (mixed cropping) -- growing two different crops (maize and groundnuts) together on the same plot.

(b)

Answer: Advantages of intercropping: it makes efficient use of land, space and sunlight, and the groundnuts (a legume) fix nitrogen in the soil, benefiting the maize growing alongside them.

(c)(i)

Answer: Conservation farming using planting basins with crop residue (mulch) retained in strips between the crop rows (judgment call on the exact terminology).

(c)(ii)

Answer: Farmers are encouraged to practise this system because it conserves soil moisture, reduces soil erosion, and improves soil fertility as the retained crop residues decompose and add organic matter to the soil.

(d)(i)

Answer: Trees improve soil fertility by shedding leaf litter that decomposes into humus/organic matter, and (in the case of leguminous trees) by fixing nitrogen in the soil through their root nodules.

(d)(ii)

Answer: Trees improve infiltration of water because their roots create channels in the soil that water can penetrate through, and their canopy softens the impact of falling rain, reducing surface runoff and allowing more water to soak into the ground.

Question 5. LIVESTOCK PRODUCTION. Study the diagram of a cow's digestive system (A = a large chamber, B, C and D = smaller chambers leading to the intestine). (a)(i) What type of digestive system is shown in the diagram? [1] (ii) Write the letter of the chamber in which true digestion starts. [1] (iii) What is the difference between the digestive system of a pig and the one shown in the diagram? [2] (iv) Which other animal has a similar digestive system as the animal shown above? [1] (b) In Animal Production what does the term maintenance ration mean? [1] (c) Give two ways a farmer can prevent and control tick born disease on the farm. [2] (d)(i) A cow was serviced on 1st November 2013. In which month is it likely to calf down? [1] (ii) Explain how you arrived at the answer d(i). [1]

(a)(i)

Answer: A ruminant (compound-stomach) digestive system, with A = the rumen, B = the reticulum, C = the omasum and D = the abomasum.

(a)(ii)

Answer: D -- the abomasum, the 'true stomach' where digestive enzymes and acids break down food, is where true (chemical) digestion begins.

(a)(iii)

Answer: A pig has a simple, single-chambered (monogastric) stomach, unlike the four-chambered compound stomach of the ruminant shown in the diagram; as a result, a pig cannot digest fibrous, cellulose-rich feed as efficiently as a ruminant can.

(a)(iv)

Answer: A goat (or sheep) has a similar four-chambered ruminant digestive system.

(b)

Answer: A maintenance ration is the amount of feed given to an animal that is just enough to maintain its body weight and basic body functions, without supporting any growth, production or reproduction.

(c)

Answer: Two ways to prevent and control tick-borne disease: regularly dip or spray animals with an acaricide, and practise rotational grazing/pasture management to reduce the tick population in grazing areas.

(d)(i)

Answer: Around August 2014.

(d)(ii)

Answer: A cow's gestation period is approximately 9 months (about 280 days); counting 9 months forward from 1st November 2013 gives approximately August 2014.

Question 6. FARM STRUCTURES. Study the diagram of a storage structure raised on four posts, each fitted with a cone-shaped guard labelled A, with a small window in the walled storage compartment above. (a)(i) Identify the storage structure shown in the diagram. [1] (ii) Name the part labelled A. [1] (b) State some features in the diagram which make it unsuitable for grain storage. [2] (c) Name one improved structure suitable for grain storage. [1] (d) List three characteristics of a structure suitable for grain storage. [3] (e) Describe what a farmer should do to the storeroom before storing the next grain. [2]

(a)(i)

Answer: A traditional granary (maize crib), raised on posts above the ground.

(a)(ii)

Answer: Rat guards (cone/disc-shaped metal guards fitted to each post to stop rodents climbing up into the granary).

(b)

Answer: Features making it unsuitable for grain storage: it has an open window/opening that lets in rain, pests and rodents, and it may not be properly sealed against moisture and air, allowing grain to spoil or be attacked by pests.

(c)

Answer: A metal silo (an improved, sealed, pest- and moisture-proof storage structure).

(d)

Answer: Three characteristics of a structure suitable for grain storage: well ventilated (to prevent moisture build-up), rodent- and pest-proof, and waterproof/damp-proof (raised off the ground or built with a damp-proof course).

(e)

Answer: Before storing the next grain, the farmer should thoroughly clean out all old grain debris and residues from the storeroom, and fumigate or spray the empty storeroom to kill off any remaining pests before the new grain is brought in.

Question 7. FARM MACHINERY. The diagram shows an animal-drawn plough, with parts labelled F (a bar connecting the handles to the plough bottom), G (the handles), H (a curved plate that turns the soil), I (a pointed blade at the front), J (a joint near the base of H), and K (a small wheel at the front of the frame). (a) What is the name of the farm implement? [1] (b) Name the parts of the farm implement labelled with letters F, G and H. [3] (c) Explain the functions of I, J, and K. [3] (d) Give three activities a farmer should carry out to prepare an animal drawn implement for storage. [3]

(a)

Answer: An animal-drawn (ox-drawn) mouldboard plough.

(b)

Answer: F = the beam (the main frame connecting the handles to the plough bottom); G = the handles (held by the operator to guide and control the plough); H = the mouldboard (the curved

plate that lifts and turns over the furrow slice of soil).

(c)

Answer: I = the share (the pointed blade that cuts into and lifts the soil ahead of the mouldboard); J = the frog/heel (which joins and strengthens the share and mouldboard onto the plough body); K = the furrow wheel (which runs along the furrow and helps control/regulate the depth of ploughing).

(d)

Answer: Three activities to prepare an animal-drawn implement for storage: clean off all soil, mud and crop debris from the implement; oil or grease all moving metal parts (e.g. the share, mouldboard and wheel) to prevent rusting; and store the implement under a roof/shed, away from rain and direct weather exposure.

Question 8. FARM MANAGEMENT. (a) Name two resources a farmer requires for production. [2] (b) A farmer got K1000 from the bank to buy fertilizer. What type of credit did he get? [1] (c) What are the main reasons why a farmer must keep records at a farm for production? [2] (d) A farmer obtained a loan of K2000 to be paid at a rate of 20% for two years. Calculate the simple interest the farmer will pay in two years. [2] (e) What do the following terms mean? (i) Opportunity cost [1] (ii) Enterprise [1] (f) Name one of the laws a farmer should observe when producing crops in terms of inputs. [1]

(a)

Answer: Two resources a farmer requires for production: land and labour (capital is a third common answer).

(b)

Answer: Short-term credit (production/input credit), since it was borrowed to buy a seasonal input (fertilizer) for a single growing season.

(c)

Answer: Main reasons for keeping farm records: to monitor the farm's profitability/performance and identify problem areas, and to help with planning and decision-making, as well as serving as proof of farm activity when applying for loans or credit.

(d)

Answer: Simple Interest = Principal x Rate x Time / 100 = 2000 x 20 x 2 / 100 = K800.

(e)(i)

Answer: Opportunity cost is the value of the next-best alternative that is given up when a farmer chooses one option over another.

(e)(ii)

Answer: An enterprise is a specific farming activity or venture (e.g. growing a particular crop or keeping a particular type of livestock) run as part of the overall farm business.

(f)

Answer: The Seeds Act (judgment call: the law regulating the quality, testing and certification of seed used in crop production).



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