CHRISTIAN SOCIAL SERVICES COMMISSION (CSSC)

NORTHERN ZONE JOINT EXAMINATIONS SYNDICATE (NZ-JES)

FORM SIX PRE-NATIONAL EXAMINATIONS 2026

134/1 AGRICULTURAL SCIENCE 1

MARKING SCHEME

1.(a) (i) Screening a soil sample through a 2.0mm sieve to remove soil fraction not belonging to the particle – size distribution
(ii) Destroying organic matter by treating with hydrogen peroxide
(ii) Removing other cementing material such as calcium carbonate and oxide of iron and aluminium by acid treatment
(iv) Dispersing completely the remaining matter into primary particles by churning or shaking after adding some dispersing agent like sodium oxalate or sodium hexametaphosphate
(v) Determining the proportion of various separates in the dispersed material by a specified method. (05 marks)
(b) (i) Solar radiation
(ii) Conduction of heat from the atmosphere
(iii) condensation and evaporation
(iv) Rainfall
(v) Insulation
(vi) Vegetation
(vii) Thermal capacity
(viii) Thermal conductivity and diffusivity
(ix) Biological activities
(x) Radiation from the soil and soluble salt. (any five points 05 marks)

2.(a) Conditions necessary for surface irrigation

i. The soil must be heavy, must not be too erosive.
ii. The topography must be uniform and not too steep.
iii. Depth of soil should be deep and not shallow.
iv. Soil must not be too permeable or impermeable.
v. Sufficient surface water.
vi. The rate of evaporation should be minimal. ***Any 5 points =5 marks***

(b) (i) Field condition in which there is much fibrous growth of weeds
(ii) Stony field condition
(iii) Fields with stumps and a lot of roots
(iv) Field with hard soils
(v) Field with sticky soils ***Any 5 points =5 marks***

3.(a) Safety precaution

i. Should be carried with the blade down
ii. They should never be tossed from one worker to another
iii. When not in use sharp tools should be stored in a sturdy box or tool rack
iv. Worker should wear protective equipment
v. Choose the right tool for the right job **@point 1 mark X 5 = 5marks**

(b) (i) The house should be free from dampness which cause discomfort and promote diseases. Dampness eventually leads to poor production or poor growth rate as the birds spend more energy to keep warm.

(ii) The poultry house should be secured from cold draught which exposes the birds to disease.

(iii) In the deep litter system, there should be a minimum dust from the litter which might lead to breathing problems.

(iv) The house should be constructed in a free draining area and the roof is leak proof to prevent water entering the house.

(v) For layers, safe laying nests should be provided to prevent pecking and egg eating

(vi) Dusting should be done regularly to control external parasite.(**5 points =5 marks)**

4.a)

i. Maintenance of their health through the provision of nutritious and adequate feeds as well as provision of vaccines, control of parasites and treatment when they become sick.
ii. Do not overload the animal. Study their ability to perform different tasks.
iii. Protect the animals from injuries caused by yoke, harnessing, and long hooves.
iv. Animals should work during the cool time of the day.

v. Do not harass the animals during work.
vi. After work, give the animals some time to rest before grazing.
vii. Animals forming the pair should be of equal size to equally distribute the load.
(Any six points 01 mark @ = 06 Marks).

b).

i. Friction of engine parts
ii. Blockage of fins in radiator
iii. Lose of fan belt
iv. Overworking of the engine.
v. Overloading of the engine. **(Any four points 01 mark @ = 04 Marks)**

5. a) Five ways to which control method prevent the development of salt-affected soil.
i. Retardation of evaporation to prevent salt movement from underground to the top soil by mulching
ii. Avoidance of excessive irrigation so as not to rise the ground water table.
iii. Leaching and draining of harmful salts out of the root zone.
iv. Avoidance of water for irrigation if it contains considerable amount of soluble salt or sodium.
v) Prevention of leakage and seepage from canals and lateral channel so us to avoid a raise of the groundwater table. **(01 Mark @ = 05 Marks)**

(b) (i) Categories of salt-affected soil basing on electrical conductivity, percentage exchangeable sodium and soil pH.
i. Saline soil some time referred to **white alkali** because of the appearance of white crust on the soil surface after the evaporation of water. Saline soil are mostly chloride and sulphate of calcium, magnesium and sodium
ii. Alkali soil contains appreciable amount of sodium carbonate ($NaCO3$) which hydrolyses to $NaOH$. They also called **black alkali** because the surface appear black or brown due to the reaction of organic matter with sodium hydroxide which breaks down the organic matter.
iii. Saline-alkali soils contain appreciable amounts of salt as wee as exchangeable sodium. This is transitional category between saline and alkali soils. **(01 mark @ = 03 marks)**

(ii) Processes that lead to the development of salt-affected soil;
i)Salinization, a natural process of undue accumulation of neutral soluble salts resulting in the formation of saline soils **(01 Mark)**
ii)Alkalization, a natural process of undue accumulation of exchangeable sodium resulting in the development of alkali soils. **(01 mark)**

6.(a) The soil is not a single constituent because it is composed of several components as explained below;
i) **Inorganic particles (Mineral);** the largest component of soil is the mineral portion, which makes up approximately 45% of the volume. Soil minerals are derived from two principal mineral types. Primary minerals, such as those found in sand and silt, are those soil materials that are similar to the parent

material from which they formed. They are often round or irregular in shape. Secondary minerals, on the other hand, result from the weathering of the primary minerals, which releases important ions and forms more stable mineral forms such as silicate clay.

ii) **Water;** Water is the second basic component of soil. Water can make up approximately 25% of the soil volume. Soil water availability is the capacity of a particular soil to hold water that is available for plant use.

iii) **Organic matter;** Organic matter is the next basic component that is found in soils at levels of approximately 5%. Organic matter is derived from dead plants and animals and as such has a high capacity to hold onto and/or provide the essential elements and water for plant growth.

iv) **Air (Gases);** Gases or air is the next basic component of soil. Because air can occupy the same spaces as water, it can make up approximately 25% of the soil volume. Oxygen is essential for root and microbe respiration, which helps support plant growth. Carbon dioxide and nitrogen also are important for belowground plant functions such as for nitrogen-fixing bacteria. If soils remain waterlogged, (where gas is displaced by excess water), it can prevent root gas exchange leading to plant death, which is a common concern after floods.

v) **Organisms;** Microorganisms are the final basic element of soils, and they are found in the soil in very high numbers but make up much less than 1% of the soil volume. The largest of the organisms are earthworms and nematodes and the smallest are bacteria, actinomycetes, algae, and fungi. Microorganisms are the primary decomposers of raw organic matter. **(1 mark @ = 05 marks)**

b) Chemistry is involved in soil formation through chemical weathering process such as;

i) **Hydration;** Chemical combination of water molecules with a particular substance or mineral leading to a change in structure; Soil forming minerals in rocks do not contain any water and they undergo hydration when exposed to humid conditions. Up on hydration there is swelling and increase in volume of minerals. The minerals lose their luster and become soft. It is one of the most common processes in nature and works with secondary minerals, such as aluminium oxide and iron oxide minerals and gypsum.

Example:

$2Fe_2O_3 + 3HOH \rightarrow 2Fe_2O_3.3H_2O$

(Haematite) (Red) (Limonite) (Yellow)

$Al_2O_3 + 3HOH \rightarrow Al_2O_3.3H_2O$

(Anhydrite) (Gypsum)

$3(MgO.FeO.SiO_2$(Olivine)$+2H_2 \rightarrow 3MgO.2SiO_2.2H_2O + SiO_2 + 3H_2O$ (Serpentine)

ii) **Hydrolysis;** Most important process in chemical weathering; It is due to the dissociation of H_2O into H^+ and OH^- ions which chemically combine with minerals and bring about changes, such as exchange, decomposition of crystalline structure and formation of new compounds. Water acts as a weak acid on silicate minerals.

$KAlSi_3O_8 + H_2O \rightarrow HAlSi_3O_8 + KOH$

iii) **Solution;** some substances present in the rocks are directly soluble in water. The soluble substances are removed by the continuous action of water and the rock no longer remains solid and form holes, rills or rough surface and ultimately falls into pieces or decomposes. The action inconsiderably increased when the water is acidified by the dissolution of organic and inorganic acids e.g. halites, NaCl

$NaCl + H_2O \rightarrow Na^+ + Cl^-, H_2O$ (dissolved ions with water)

iv)**Carbonation:** Carbon dioxide when dissolved in water it forms carbonic acid.

$2H_2O + CO_2 \rightarrow H_2CO_3$

This carbonic acid attacks many rocks and minerals and brings them into solution. The carbonated water has an etching effect up on some rocks, especially lime stone. The removal of cement that holds sand particles together leads to their disintegration.

v) **Oxidation;** The process of addition and combination of oxygen to minerals; the absorption is usually from O_2dissolved in soil water and that present in atmosphere. The oxidation is more active in the presence of moisture and results in hydrated oxides e.g. minerals containing Fe and Mg.

$4FeO$ (Ferrous oxide) + $O_2 \rightarrow 2Fe_2O_3$ (Ferric oxide)

$4Fe_3O_4$ (Magnetite) + $O_2 \rightarrow 6Fe_2O_3$ (Haematite)

7.(a) Price fluctuation control measures

i. Use of subsides
ii. Use of buffer stock fund
iii. Use of stabilization fund operated by marketing board
iv. Use of international commodity agreement **(1.5 @ = 6 marks)**

(b) With the low market price for the crop in the last season, the producers will produce low products this year this result in low output in the following year. The low output causes high prices of the commodity so that the cycle repeat again. **(4 marks)**

8.(a) in absence of international trade the following could be happening

i. No protection to primary product exporter countries against excessive production.
ii. Very low prices of the primary products due to excessive production.
iii. Unstable world prices (high price uncertainties)
iv. No overall output levels of a particular product in the world

(i) Terms of trade; Refers to the rate between the price of exports and that of the imports. **(01 mark)**

(ii) Foreign reserve; Refers to the total value of reserves expressed in Dollars Gold or special Drawing Right. These act as reserve from which the international payment is made. **(01 mark)**

(iii)Balance of payment**;** Refers to the ration of the valve of exports and the valve of imports**. (01 mark)**

iv) Quota share**; it is** A limit on the quantity of good that may be imported during period it is established by a government of physical limit on the quantity of good that can be imported over a given period. **(01 mark)**

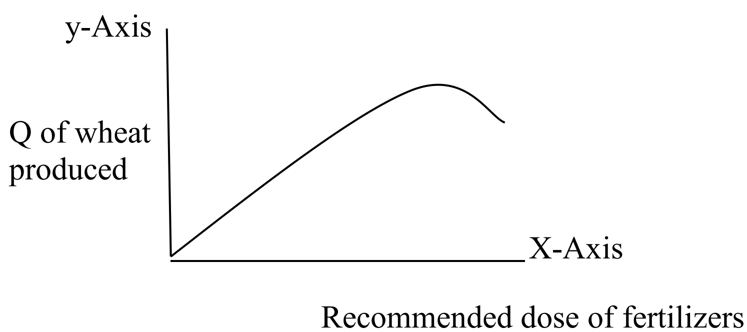
9. (a) Production function can be expressed in three ways which are; **(01 @ = 03 marks)**

i)Mathematical expression; $Y1= f(X1/X2,X3,X3……Xn)$

ii) Tabular way

Input (X) kg	Output (Y) kg
0	600
100	700
200	1000
300	1200

iii) Graphical function



b) Given $y=3x+2x2$, $py=20$/=, $px=100$/=

From the product factor economic relationship

$Px= (Dy1/Dx1)\ py1$ **(1 marks)**

$Dy1/Dx1=MPP$

$Px=(MPP)py$

$MPP=dy/dx=3+2x$ **(01 mark)**

$Px=py(3+2x)$

$100=20(3+2x)$

$20x=40$

$X=2$ **(01 mark)**

Therefore the optimum level using input x = 2 units where $px=(MPP)py$ **(01 marks)**

10.

(i) What to produce?

(ii) How to produce?

(iii) How much to produce?

(iv) When to produce?

(v) Where to buy (inputs) and sell (outputs)?

@ point with explanations 2 marks X 5 = 10 marks.