

MARKING SCHEME

- 1.(a) (i) The cylinder is an airtight chamber with one end closed by the cylinder head and other by the piston. Combustion occur here. Each cylinder undergoes the inlet, compression, power and exhaust strokes. The greater number of cylinders, the more power is produced.
- (ii) The piston-is necessary for good compression. It also conducts away excess heat and prevent leakage of fuel.
 - (iii) The connecting rod - transmits power during the power stroke from the piston to the crankshaft.
 - (iv) The crankshaft - provide power to the belt pulley and the wheels.
 - (v) Cylinder head - covers the top of the cylinder (s) and houses other components such as valves
 - (vi) Crankcase - Covers the bottom of the cylinder and holds the engine lubricating oil and other compon5
 - (vii) Camshaft - operate valves
 - (viii) Flywheel - Help keep engine running by it's inertia, during idal stroke.
 - (ix) Inlet and exhaust valves-Inlet receive fuel (petrol engine) or air (diesel engine) exhaust release burnt gases.
 - (x) Engine block--it's where all components are directly or indirectly attached.

Any five points (05 marks)

- (b) (i) Lubricants cool the engine by conducting away excess heat
- (ii) They reduce friction between moving parts allowing maximum performance.
 - (iii) Lubricants are needed to seal the compression between the cylinder and piston
 - (iv) Rusting is prevented by the application of lubricant
 - (v) Harmful deposit from the engine, such as dust and soot, are trapped by oil.
 - (vi) Reduce engine noise

Any five points (05 marks)

2. (a) (i) The moisture including rain, floods, dampness and ground water
- (ii) Dust and dirt
 - (iii)Direct sunshine and excessive heat especially with respect to tractors, fuel tanks, rubber and leather parts
 - (iv)Fire and fire- causing element such as inflammable liquids and chemicals
 - (v) Theft and loss of tools and equipments
 - (vi)Rodents and other pests
- (any five points 05 marks)**

- (b) (i) It help to control the spread of pest and diseases such as worms and ticks and the disease they transmit
- (ii) They assist in controlling grazing, hence preventing overgrazing. Strip grazing is easier with fencing
- (iii) They help to avoid boundary disputes
- (iv) Living fences (hedges) act as windbreaker
- (v) They keep out intruders and wild animals from the farm
- (vi) They facilitate mixed farming, enabling a farmer to grow crops without the interference of livestock
- (vii) Fences can confine a particular class of animal in one area example calves can be separated from adults; health animal can be separate from those which are sick and bull can be kept separately from the heifer
- (viii) Farm management and planning is made easy.

Any five points (05marks)

3.(a) Features of Sprinkler Irrigation

- (i) Water Efficiency: Sprinklers distribute water uniformly, minimizing wastage compared to traditional methods.
- (ii) Coverage: Suitable for both small and large farms, providing coverage for irregularly shaped fields.
- (iii) Flexibility: Can be adjusted for different crops and field conditions.
- (iv) Automation Options: Systems can be automated, reducing labor requirements.
- (v) Uniform Distribution: Provides consistent water supply, which is beneficial for crop growth.
- (vi) Compatibility: Can work with various water sources, such as boreholes and rivers.

Any five (5) points =(05 marks)

(b) key benefits of crop protect:

- (i) Enhanced Crop Yield and Quality: Protect crops from pests and diseases, leading to increased yields and better-quality produce.
- (ii) Weed Control: Implements such as weeders help control weed growth, reducing competition for nutrients, water, and sunlight.
- (iii) Reduced Crop Losses: Protect crops during critical growth stages, minimizing losses caused by external threats.
- (iv) Efficient Chemical Application: Sprayers and dusters ensure even and efficient application of pesticides, herbicides, and fungicides, reducing chemical wastage.
- (v) Time and Labor Savings: Mechanized tools and implements speed up protection tasks, reducing manual labor efforts.
- (vi) Cost-Effectiveness: Preventative protection measures reduce the need for costly remedial actions after pest or disease outbreaks.
- (vii) Environmental and Health Safety: Precision implements help minimize the use of chemicals, contributing to safer environmental and health practices.

Any five (5) points (5 marks)

4. (a) The content and composition of the soil air is determined to a large extent by relationships between soil air and water. The soil air occupies pore space not filled up of water. **(02 marks)**

(b) Factors affecting air composition

- (i) Soil Texture: Soils with finer textures (clay) have smaller pore spaces, leading to lower air content compared to sandy soils, which have larger pores and better aeration.
- (ii) Soil Structure: Well-aggregated soils with good structure allow better air circulation. Compacted or poorly structured soils restrict airflow, reducing oxygen levels and increasing carbon dioxide buildup.
- (iii) Soil Moisture Content: High moisture content fills pore spaces with water, reducing the volume of air in the soil. Dry soils have more air-filled pores, enhancing aeration.
- (iv) Soil Organic Matter: Organic matter decomposition by microorganisms consumes oxygen and Releases carbon dioxide. Soils rich in organic matter may have higher microbial activity, affecting the gas composition.
- (v) Soil Temperature: Higher temperatures increase microbial activity and root respiration, leading to greater oxygen consumption and carbon dioxide production.
- (vi) Plant Root Activity: Active plant roots consume oxygen and release carbon dioxide. The intensity of root respiration depends on the plant type and growth stage.
- (vii) Soil Aeration and Drainage: Poorly drained soils often become waterlogged, limiting oxygen diffusion and increasing carbon dioxide levels. Proper drainage promotes better air exchange between the soil and the atmosphere.

Any six points (06marks)

(c) Particle Diameter (mm) Coarse soil 2 – 0.2, Fine sand 0.2 – 0.02, Silt 0.02 – 0.002, Clay 0.002 **(02 marks)**

5. (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

(iii) 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

(v) Churning or shaking after adding some dispersing agent like sodium oxalate or sodium hexameta phosphate 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 (5) points (05 marks)

6. (a) (i) High moisture content – most of manure (except chicken manure) contain 50–80% water. By contrast, all commercial fertilizer except the liquid form example liquor ammonia are dry.
- (ii) Variability in composition – all farm manure is extremely variable in their composition while all commercial fertilizer except a few have definite chemical composition with a minimum guarantee of nutrient element contents
- (iii) Low analysis - the nutrient element content, particularly the variable form in farm manure are usually low by comparison to that in artificial fertilizer on an equal weight basis. As a result, manure is needed to be applied at a high rate to supply nutrient for optimum crop productions.
- (iv) Unbalance nutrient composition – although farm manure contains almost all the plant nutrients, the element is rather unbalanced in relation to each other's. with high application rate, such unbalanced nutrient content may not render optimum crop production
- (v) Residue effect - the extent effect will depend on the quantity and nature of farm manure applied. **(05 marks)**

(b) Ways of improving soil fertility:

- (i) Soil fertilization. This involves the addition of mineral or organic fertilisers;
- (ii) Control soil erosion and runoff through contour ploughing, construction of terraces, strip cropping and the use of cover crops;
- (iii) Employing crop rotation, fallowing and reduced or zero tillage practices; and
- (iv) Employment of good agronomic practices such as timely weeding helps to minimize the wastage of plant nutrients which may be taken by weeds.
- (v) Avoidance of burning of vegetation helps to population sustain microbial and protection of organic matter.

1mark @= 05 marks)

7. (a) **characteristics of colloidal particles**

- (i) Surface area – the small size, the colloidal particles expose enormous surface, for chemical reactions and water retention
- (ii) electric charge and ion exchange – the colloidal particles carry net positive or negative charges, hence they have the capability to hold and exchange ions on their surface.
- (iii) Flocculation – the colloidal particles may be flocculated (make flock) by adding any solution containing ions of opposite charge or in some instance by heating
- (iv) Tyndall effect – the individual colloidal particle in a colloidal dispersion can be demonstrated by passing a strong beam of light through it due to their property of scattering light.
- (v) Brownian effect – The colloidal particle in a dispersion are always in a random motion. The motion of individual particles continuously changes direction as a result of random collisions with the molecules of the dispersion medium, other particles and the walls of the container.
- (vi) Dialysis – the process of separating colloidal particles from dissolved salt through a semi- permeable membrane is termed dialysis. The membrane retains the colloidal particles during dialysis while salt and other impurities dialyse out.
- (vii) Plasticity- capacity of being molded without breaking
- (viii) Cohesion – The attraction of particle for each other
- (ix) swelling upon wetting and shrinking and cracking upon drying.

Any four points (04 marks)

(b) Data given

Cation exchange capacity=24meq/100g

$$\sum EB(5.0+10.0+1.0+1.50+0.50)meq/100g = 18meq/100g$$

From; PBS= $\sum EB/CEC \times 100$

$$PBS= 18meq/100g \div 24meq/100g \times 100\%$$

$$PBS= 75\%$$

Percentage base saturation = **75% (3 marks)**

(ii) Quantity in gram of calcium present in 100g of oven dry soil.

From;

Equivalent weight = atomic weight of ca / valency of Ca

$$Eq\ wt = 40g \div 2 = 20g$$

NOTE: 1eq = 1000meq

$$1000meq = 20g\ of\ Ca$$

$$1meq. = ?$$

$$20g \times 1meq / 1000meq = \mathbf{0.02g}$$

Therefore: 1meq. = 0.02g of calcium

$$10meq\ of\ Ca = ?$$

$$0.02g \times 10meq / 1meq = \mathbf{0.2g}$$

\therefore 0.2 g of calcium (03 marks)

8. (a) Product relationship

- (i) Joint product – are those which if a given quantity of one is produced, the quantity of the other product is fixed by nature. Example beef and hides, cotton and cotton seed
- (ii) Complementary product – this occur if an increase in the production of one of the product causes an increase in the total production of the other product
- (iii) Competitive product – this occur when one of the product can be increased by decreasing the output of the other product, the two products are said to be competitive.
- (iv) Supplementary product – this occur when the production of one product can be increased without increasing or decreasing the production of the other.

1 mark @ = **04 mmarks.**

(b) (i) Equimarginal return state that resources should be diverted from the production of one product (Y1) to the production of another (Y2) until the additional value of Y2 is just equal to the loss in value Y1, that is where $\Delta Y_1 \cdot PY_2 = \Delta Y_2 \cdot PY_1$.

The ration $\Delta Y_1 / \Delta Y_2$ and is called the marginal rate of substitution between Y1 and Y2. It shows the rate which the two product substitution in the production process.

THE ratio $\Delta Y_1 / \Delta Y_2$ show the relationship between price of the two product in the market.

(03 marks)

(ii) The maximum net revenue is obtained if the farmer should operate in the range where the two products are competitive and where their marginal rate of substitution is equal to their price i.e where: $\Delta Y_1 / \Delta Y_2 = \Delta p_{y_2} / \Delta p_{y_1}$

If a farmer produced more than two products, maximum revenue is obtained where $\Delta Y_1 \cdot PY_1 = \Delta Y_2 \cdot PY_2 = \Delta Y_3 \cdot PY_3 = \Delta Y_4 \cdot PY_4 = \dots \Delta Y_n \cdot PY_n$ **(03 marks)**

9. (a) Causes of fluctuation

- (i) Biological nature of agricultural production - this is because the yield of agricultural product depends of environmental factor such as weather and also most of agricultural crops and animal have a long incubation period.
- (ii) Most of agricultural production equipment is fixed in nature – This causes the elasticity of supply of agricultural commodities to be low and this causes farm price to fluctuate
- (iii) The demand for agricultural products has low elasticity of income – as the result the demand for agricultural commodities does not change easily or immediately when price fall or income rise.
- (iv) Most agricultural products cannot be stored easily – as the result they are difficult or expensive to store .**(04 marks)**

(b) Advantage of price control and stabilisation

- (ii) It ensures a fair price to the producers and therefore provide an incentive for them to increase production
- (iii) It removes price uncertainty that is caused by price fluctuation
- (iv) The stored commodities act as a relief reserve during the time of famine.

(c) Disadvantage of price control and stabilization

- (i) It may be bad to consumer especially if price of food tends to rise while wages remain at the same level.
- (ii) If the fixed price for certain good is lower than the equilibrium price of that good, price control may encourage the development of black market for that goods.
- (iii) Where input price is controlled and are set at a high level, they may lead to high production cost
- (iv) Controlled price may lead to wastage and dumping of agricultural commodities.
(06 marks)

10. (a) (i) Replacement of one enterprise by another enterprise.

(ii) Expansion or introduction of a supplementary enterprise **(03 marks)**

(b) Four questions to be answered by partial budgeting are: -

- (i) What amount of revenue will be lost by getting rid of one enterprise?
- (ii) What extra costs will be incurred by substituting one enterprise by another?
- (iii)What extra revenue will be obtained from the new enterprise?
- (iv)What amount of the cost will be saved by making the change?**(04 marks)**

Two questions to be answered when expanding or introducing a supplementary*

- (i) What extra costs will be incurred as a result of the expansion or introduction?
- (ii) What extra revenue will be obtained as a result of the expansion or introduction?
(03 marks)