Province of the
EASTERN CAPE
EDUCATION

# NATIONAL SENIOR CERTIFICATE

## GRADE 11

## NOVEMBER 2014

# AGRICULTURAL SCIENCES P2 MEMORANDUM

**MARKS: 150**

This memorandum consists of 11 pages.

## SECTION A

### QUESTION 1.1

1.1.1 C √√

1.1.2 A √√

1.1.3 B √√

1.1.4 A √√

1.1.5 D √√

1.1.6 C √√

1.1.7 B √√

1.1.8 C √√

1.1.9 B √√

1.1.10 A √√

(10 x 2) (20)

### QUESTION 1.2

1.2.1 D √√

1.2.2 E √√

1.2.3 G √√

1.2.4 B √√

1.2.5 A √√

(5 x 2) (10)

### QUESTION 1.3

1.3.1 Autotrophs √√

1.3.2 Parthenocarpy/parthenocarpy √√

1.3.3 Scion √√

1.3.4 Evaporation pan √√

1.3.5 Flood/Furrow/Basin irrigation √√

(5 x 2) (10)

### QUESTION 1.4

1.4.1 Energy √

1.4.2 Dormancy √

1.4.3 Transpiration √

1.4.4 aquaculture √

1.4.5 xylem √

(5 x 1) (5)

**TOTAL SECTION A: 45**

 

## SECTION B

## QUESTION 2: PLANT NUTRITION

2.1 2.1.1 **Reasons for plants to have continuous water supply**

- Water transports nutrients from the soil to the roots and to the leaves/Water is the medium for nutrient transport in plants. √
- Water transports the products of photosynthesis from leaves to the plant organs where it is used or stored. √
- Water provides structural support to plants and makes plants turgid. √
- Water regulates plant temperature and cools the plant. √
- Water provides the medium for metabolic processes/for all biochemical processes. √ (Any 3) (3)

2.1.2 **Adaptations of plants to reduce excessive water loss**

- Some leaves of plants have thick cuticles √
- Some leaves have small, sunken stomata √
- Some leaves are hairy (trichomes) √
- Some leaves have small surfaces (pinnas) √ (Any 2 x 1) (2)

2.1.3 **Part of plant for water and nutrient absorption**

Root hairs √ (1)

2.1.4 **<u>Transpiration pull</u>**
Upward pulling force exerted on the water column in plants √ when water is lost during transpiration √ (2)
**<u>Osmotic flow</u>**
Movement of water through cells due to osmosis √ caused by an osmotic gradient √ (2)

2.2.1 **Processes of the dark phase of photosynthesis**

- Chemical energy is used to reduce $CO_2$ to glucose in the calvin cycle. √
- The reaction of the dark phase occur in the stroma of a chloroplast. √
- The dark phase is controlled by enzymes and therefore affected by temperature √
- $NADPH_2$ which is formed during the light phase releases
- Hydrogen atoms and ATP releases excess energy it carries. √
- The hydrogen atoms and the liberated react with $CO_2$ taken up during photosynthesis to synthesise carbohydrates. √
- Starches are synthesised through the withdrawal of water molecules from the glucose molecules. √
- Glucose molecules combine with nitrate and sulphate ions and converted through enzymes to form plant proteins. √ (Any 3 x 1) (3)

 

2.2.2 **Importance of photosynthesis to human beings**

- It converts radiant energy from the sun to chemical energy. √
- Stored sugars such as carbohydrates are used by organisms such as human beings. √
- Produces oxygen which is needed for cellular respiration by all living organisms. √
- The extraction of $CO_2$ from the atmosphere keeps the atmosphere clean and maintains a healthy environment. √
- It is the origin of fossilised fuels such as coal and petrol. √
- It traps the energy for bio fuels which are produced from plants to replace fossil fuels and limit global warming. √ (Any 3 x 1) (3)

2.2.3 **Ways to increase the rate of photosynthesis**

- Trellising to ensure that the fruit-bearing shoots have maximum exposure to sunlight for photosynthesis. √
- Pruning to avoid overshadowing and to give leaves and fruit-bearing shoots maximum exposure to sunlight for photosynthesis. √
- Spacing of crops to give leaves maximum light exposure. √
- Green-houses to allow plants to obtain maximum exposure through transparent roofs. √ (Any 2 x 1) (2)

2.3.1

| **Micro nutrients** | **Macro nutrients** |
|---|---|
| Boron √ | Potassium √ |
| Zinc √ | Nitrogen √ |

(4)

2.3.2 **Functions of boron**

- Increases the uptake of water and calcium. √
- Essential for meristerm activity and growth of the pollen tube. √
- Involved in the translocation of carbohydrates. √ (Any 1) (1)

2.3.3 **Ways of mineral nutrients uptake by plants**

- Passive ion uptake by diffusion. √
- Active ion uptake by transport carrier molecules √ (2)

 

2.4 2.4.1 **Reasons for the use of organic fertilisers**

- Organic matter helps the soil to hold water especially in sandy soil. √
- Organic matter helps extra water to drain from clayey soil. √
- Organic matter helps to cool the soil in summer and to warm it in winter/it absorbs heat during the day and emits heat in the night. √
- Organic matter stops the soil from becoming hard and compacted. √
- Organic matter helps to improve aeration in the soil. √
- Organic matter binds the soil so that it is not eroded by wind or water. √
- Organic matter nutrients have lasting effect on the soil. √
- Organic matter improves the cat ion exchange capacity of the soil. √ (Any 3 x 1) (3)

2.4.2 **Characteristics of crops used for green manuring**

- The seeds should be easily obtained. √
- The crop should grow rapidly. √
- It should have deeper root system in order to retrieve nutrients from deeper zones, thus making these available in the top soil √
- It should be a strong feeder and be able to utilise some of the slowly available reserve nutrients. √
- Legumes are generally used as they are able to fix nitrogen gas. √
- It should have a high fibre content. √ (Any 3 x 1) (3)

2.5 2.5.1 **Calculation of percentage of phosphorus in the mixture**

Nitrogen: 3
Phosphorus: 2
Potassium: 5
Total % of all 3 nutrients 45
3 + 2 + 5 = 10 √
P = 2/10 x 45 √ = 9% √ (3)

2.6 **Uses of gypsum to grain farmers**

- It decreases the bulk density of the soil making it easier to till. √
- It prevents crusting of soil and aids seed emergence √
- Gypsum prevents water logging √
- It decreases the loss of nitrogen fertiliser to the atmosphere √
- It helps plants to absorb nutrients √
- It stops water run-off and erosion √
- It improves soil structure. √
- Gypsum corrects soil acidity √
- Gypsum decreases heavy-metal toxicity in soils √
- It keeps clay particles from adhering to roots, bulbs and tubers √
- It helps earthworms to flourish and improves soil aeration √ (Any 1) (1)

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## QUESTION 3: PLANT REPRODUCTION

3.1 3.1.1 Pollination √ (1)

3.1.2 Water √
wind √ (2)

3.1.3 **Cross pollination/Pollination**
When pollen is transferred from the anther of a flower on one plant √ to the stigma of a flower on another plant √ of the same species. √

**OR**

Transfer of pollen grains from ripe anther √ to ripe stigma of a flower √ of the same species. √ (3)

3.2 3.2.1 **Insect pest in 3.2.1**

Lesser grain borer/grain borer (1)

3.2.2 **Insect-management methods to prevent stored grains infestation**

- Sanitation – clean-up of old grain and grain debris √
- Empty-bin spray with an insecticide √
- Empty-bin fumigation, primarily to control insects in the subfloor space √
- Storing only clean, dry grain √
- Treating grain with a protecting insecticide √
- Aeration to cool the grain to prevent insect feeding and reproduction √
- Regular measurement of grain temperature and sampling for insects √ (Any 3 x 1) (3)

3.2.3 **Ideal temperature for life cycle in 3.2**

25 °C – 32 °C √ (1)

3.2.4 **Implications of heavy pest infestation in stored grains**

- Severe stored grain infestation will lead to food shortages √
- Price of grain crops on the local market will go up √
- Foreign exchange of agricultural crops will decrease √
- Control of the insects will be expensive. √
- It would affect food security in the country √
- It could demotivate potential grain farmers √ (Any 3 x 1) (3)

3.3 3.3.1

| Natural methods | Artificial methods |
|---|---|
| Corms √ | Layering √ |
| Stolons √ | Budding √ |

(4)

 

3.3.2 **Advantages of vegetative propagation**

- It is necessary for crops that cannot be propagated by seeds e.g. banana and sugar cane √
- Plants propagated by asexual means are true to type √
- It is a very quick method of reproduction √
- Plants propagated by vegetative methods produce flowers and Fruits much earlier than seed produced plants √ (Any 2 x 1) (2)

3.4 3.4.1 **Important characteristics of GMO crops**

- Resistance and tolerance to diseases √
- Resistance to herbicides √
- Increased tolerance to drought and low moisture √
- Increased water use efficiency, they are able to produce more Yield with less water √
- Increased fertiliser use efficiency √
- They produce high yields √
- They are more nutritious √
- They have better keeping quality √ (Any 3 x 1) (3)

3.5 3.5.1 **One name for the group of organisms**

Bacteria √ (1)

3.5.2 **Measures to prevent the spread of bacteria in plants**

- Only use disease-free plant material such as seeds and -seedlings √
- Buy certified seeds from well-known companies √
- Sterilise water resources to make sure the water is free of diseases √
- Destroy weeds and pathogens in the top soil layers by heat treatment √
- Use chemicals like fungicides to eliminate inoculums √
- Use sterile equipment √
- Introduce good crop rotation programmes resistant crop varieties √ (Any 3 x 1) (3)

3.6.1 **Ways weeds compete with crops on a farm**

- For space √
- For sunlight √
- For soil nutrients √ (3)

3.6.2 **Other ways weeds compete with crops**

- Soil water/moisture √
- For air √ (Any 1) (1)

 

3.6.3 **Chemical weed control**
It involves the use or application of chemical substances/ herbicides √ to kill/eliminate weeds or suppress plant growth by altering their metabolic processes. √ (2)

**Mechanical weed control**
It involves removing weeds physically, √ either by hand or with tools or machinery. √ (2)
**[35]**

## QUESTION 4: OPTIMAL RESOURCES

4.1 4.1.1 **Explanation of soil survey**

It is the process of classifying soil types and their distinctive properties/differentiating soil types from one another in a given area, √ and geo-encoding such information/interpreting and implementing the information. √ (2)

4.1.2 **Aims of soil survey**

- For the suitability for a particular crop √
- Suitability for irrigation
- Suitability for animal grazing purposes √
- To prevent erosion risk √
- Identification for major agricultural land use e.g. gravel and marshy land √ (Any 2 x 1) (2)

4.1.3 **Steps to follow in the physical analysis of soil.**

- Digging soil pits √
- Determining soil profile √
- Determining physical and chemical properties √ (3)

4.2 4.2.1 **Type of farming in fig 4.2**

Precision farming √ (1)

4.2.2 **Aims of the method of the type of farming in QUESTION 4.2.1**

- To minimise inputs. √
- Maximise yields. √
- To use sustainable practices such as pest, water and nutrient management. √
- Reduces environmental risk of farming through accurate application of inputs e.g. limiting leaching. √
- For effective management √ (Any 3 x 1) (3)

 

4.3 4.3.1 **Irrigation**
It is the application of water to the soil or any growth medium √ for the purpose of benefiting the plant √ (2)

**Drainage**
It is the removal of standing or excess water √ from the surface and subsurface of a poorly drained soil. √ (2) (4)

4.3.2 **Criteria to determine the water quality for irrigation**

- Check the pH of the water and the pH of the soil √
- Determine specific electrical conductivity of water √
- Determine the sodium adsorption ratio/sodality of the water should be determined √ (3)

4.3.3 **Factors to consider when planning and applying an irrigation method**

- Quantity of water available √
- Topography of the area to irrigate √
- Infiltration tempo of the soil/texture and structure of the soil√
- Type of crop to be grown on the field √
- Method of cultivation to be used √
- Installation cost √ (Any 2 x 1) (2)

4.4 4.4.1 **Cropping system in QUESTION 4.4**

Crop rotation √ (1)

4.4.2 **Justification of cropping system in question 4.4**

- Four different crops rotate over four growing seasons. √
- Deep rooted crops like roots and tubers are followed by shallow rooted crops like alliums. √
- Legumes are included to fix atmospheric nitrogen in the soil. √
- The field is divided into four equal plots and each plot has the same plant species. √ (Any 1 x 1) (1)

4.4.3 **Factors which play a fundamental role in planning the cropping system in question 4.4**

- Consider the climatic conditions in terms of rain and temperature √
- The crop must be suited to that particular type of soil √
- Sufficient labour must be available √
- Determine the demand for the crop √
- Ensure the availability of machinery √
- Ensure competent management skills √
- Know the family for the crop selection/include legumes √

(Any 2 x 1) (2)

 

4.4.4 **Benefits of the cropping system in QUESTION 4.4**

- It helps to combat diseases, weeds and insect pests by reducing their occurrence through changing host plants. √
- Reduces reliance on synthetic chemicals thus contributing toward saving. √
- Reduces soil nutrient depletion because different crops with different roots absorb nutrients from different soil dept. √
- Maintains soil fertility e.g. legumes add nitrogen to the soil through nitrogen fixation √
- Reduces soil erosion through growing crops which provide better soil cover and root system binding soil particles. √
- Spreads the risk of total crop failure. √
- Keeps the farmer and farm assistants competent in production and management skills involving many crops. √ (Any 2 x 1) (2)

4.5 4.5.1 **Benefits of green house for production of high value cash crops**

- Optimal effectiveness in the utilisation of natural resources is achieved √
- Optimal production output is possible. √
- Better quality produce is achieved since insects/weeds and physical damage by wind can be totally eliminated. √
- Better scale of economy is achieved/can produce all year round √
- More effective √ utilisation of unsuitable agricultural land. √
- Risk of crop loss is minimal as plants are protected against natural hazards. √
- More pleasant working conditions than in open-fields. √

(Any 3 x 1) (3)

4.5.2 **Hydroponics**

The process of growing plants in liquid, with added nutrients √ but without soil. √ (2)

4.5.3 **Growth mediums that support plants in hydroponics systems**

- Pumice and perlite √
- Vermiculite √
- Expanded clay √
- Coir/peat √
- Wood fibre √
- Peat moss √
- Sawdust √
- Straw bales √
- Sand/gravel √
- Water √ (Any 2 x 1) (2)

 

4.5.4 **Factors which may restrict farmers from choosing certain species for aquaculture**

- Geographic location √
- Water supply √
- Availability of capital √
- Expertise and training √
- Availability of services √
- Market location √ (Any 2 x 1) (2)

**[35]**

**TOTAL SECTION B: 105**
**GRAND TOTAL: 150**