basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRT.1

AGRICULTURAL TECHNOLOGY

NOVEMBER 2021

MARKS: 200

TIME: 3 hours

This question paper consists of 14 pages.

AFTERNOON SESSION

INSTRUCTIONS AND INFORMATION

1. GENERAL INSTRUCTIONS AND INFORMATION

    1.1 This question paper consists of TWO sections, namely SECTION A and SECTION B.

    1.2 BOTH sections are COMPULSORY.

    1.3 Answer ALL the questions in the ANSWER BOOK.

    1.4 Number the answers correctly according to the numbering system used in this question paper.

    1.5 You may use a non-programmable calculator.

    1.6 Write neatly and legibly.

2. SECTION A: SHORT QUESTIONS

    2.1 This section consists of THREE questions.

    2.2 Follow the instructions when answering the questions.

3. SECTION B: STRUCTURED LONG QUESTIONS

    3.1 This section consists of FIVE questions.

    3.2 Start EACH question on a NEW page.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

1.1.1 A part where lubricants are applied to a bearing preventing it from seizing on the shaft:

A Air valve
B Nozzle
C Grease nipple
D Fuel injector

1.1.2 Electricity, heat, light and noise are examples of … hazards.

A chemical
B ergonomic
C biological
D physical

1.1.3 … is not sold as a stand-alone motor fuel, although in its pure form it is commonly used as racing fuel.

A Ethanol
B Methanol
C Natural gas
D Methane gas

1.1.4 A travelling sprinkler gun uses a … pipe that winds around a steel drum while the sprinkler travels across a field to water the crop.

A copper
B steel
C polyethylene
D stainless steel

1.1.5 ... irrigation applies water directly to the roots of a plant.

A Drip
B Centre-pivot
C Mist
D Travelling sprinkler gun

1.1.6 Farm implements and tractor spares must comply with certain requirements, e.g. interchangeability. This is known as …

A mechanisation.
B reliability.
C control mechanisms.
D standardisation.

1.1.7 A … water purification system can be installed on the water delivery system of a farmhouse to remove impurities from borehole water.

A reverse osmosis
B faucet
C jug
D ultraviolet

1.1.8 Round bales weigh between …

A 1 000 kg and 3 500 kg.
B 1 500 kg and 4 000 kg.
C 20 kg and 50 kg.
D 200 kg and 1 500 kg.

1.1.9 A … separates the grounded material effectively from the air in the hammer mill.

A fan
B screen
C cyclone
D hopper

1.1.10 Which ONE of the following CANNOT cause a power take-off shaft to fail when providing drive to a baler?

A A work angle less than 20 degrees
B Activation of the limited slip clutch
C Unlubricated universal joints
D Excessive vibration (10 x 2) (20)

1.2 Change the UNDERLINED word(s) in each of the following statements to make them TRUE. Write only the word(s) next to the question numbers (1.2.1 to 1.2.5) in the ANSWER BOOK, e.g. 1.2.6 Tractor.

1.2.1 A speedometer is installed on a harvester to measure the quantity of the harvested crop. (2)

1.2.2 Manganese is the only alloy element that does not attribute to the corrosive resistant property of stainless steel. (2)

1.2.3 A system of pulleys, belts and chains keeps the weight of the cylindrical bale constant while it is turning. (2)

1.2.4 Compressed air is used as a hydraulic fluid in the bottle jack of a car. (2)

1.2.5 Oxygen is a poisonous gas released by a motor vehicle. (2)

1.3 Choose a word/term from COLUMN B that matches the description in COLUMN A. Write only the letter (A–H) next to the question numbers (1.3.1 to 1.3.5) in the ANSWER BOOK, e.g. 1.3.6 J.

COLUMN A		COLUMN B	
1.3.1	An instrument used to measure the rate of evapotranspiration in a crop	A	feel method
1.3.2	A method used to measure the moisture content of soil	B	evaporation pan
1.3.3	A mechanical connection that allows two connected shafts to rotate at an angle	C	standardisation
1.3.4	Prefers technological advancement above the use of animal-drawn implements	D	mechanisation
1.3.5	Is built into the drive system of a vehicle and restricts autonomous movement of the wheels when engaged	E	differential lock
		F	rain meter
		G	universal joint
		H	slip clutch

(5 x 2) (10)

TOTAL SECTION A: 40

SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

Start this question on a NEW page.

2.1 Name the metal used to manufacture the coiled spring below.

(1)

2.2 List THREE properties of Vesconite that makes it possible for use in marine applications. (3)

2.3 Teflon is one of the most versatile and familiar products of chemical engineering.

2.3.1 List THREE commercial uses of Teflon. (3)

2.3.2 What is the critical melting point of Teflon? (1)

2.4 Name FOUR properties of copper that make it ideal for the manufacturing of electrical wires. (4)

2.5 Name FOUR properties of brass products that make it more suitable for use than steel products. (4)

2.6 Give TWO circumstances where bronze hammers are used instead of hammers made of steel. (2)

2.7 Answer the question below on types of adhesives and the use of products.

Write only the answers next to the question numbers (2.7.1 to 2.7.4) in the ANSWER BOOK.

TYPE OF ADHESIVE	USE OF PRODUCT
Silicon	2.7.1
PVC Weld	2.7.2
Resorcinol	2.7.3
No More Nails	2.7.4

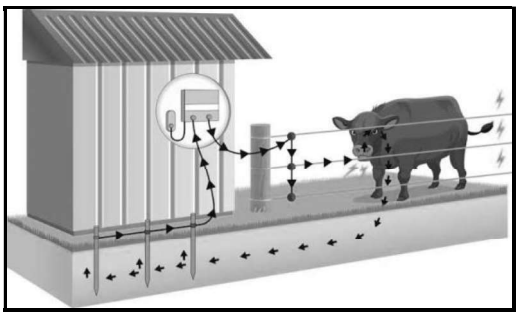
(4)

2.8 Glass fibre has properties that make it unique to be used on the farm in various applications.

2.8.1 Describe the *resin* that is used in the making of glass fibre products. (2)

2.8.2 Give THREE reasons why glass fibre is preferred as a construction material for the manufacturing of small boats. (3)

2.9 An electrical fence is a very effective method for safeguarding animals and is used in various temporary and permanent applications on the farm.



2.9.1 Describe the working of the earth return system of an electric fence. (2)

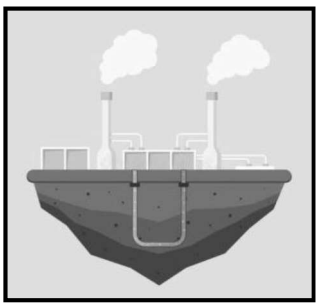
2.9.2 State TWO possible causes of a voltage drop in the electric fence circuit. (2)

2.9.3 Discuss the procedure that must be followed when testing the earth system of an electric fence. (4)
[35]

QUESTION 3: ENERGY

Start this question on a NEW page.

3.1 The picture below shows a renewable energy source that is used to generate electricity on a large scale.



3.1.1 Identify the source of the energy in the picture above. (1)

3.1.2 Name THREE important factors that could play a role in the initial exploration phase of the energy source. (3)

3.2 The picture below shows a modern wind turbine.

3.2.1 Describe the process of generating electricity with a wind turbine. (4)

3.2.2 What happens when the pitch of the blades of a wind turbine is adjusted? (1)

3.2.3 Why is it necessary to change the pitch of the blades on a regular basis? (2)

3.2.4 State THREE disadvantages of wind energy. (3)

3.3 Give FOUR reasons why photovoltaic energy panel systems are suitable for use in deep rural areas where electricity is not available. (4)

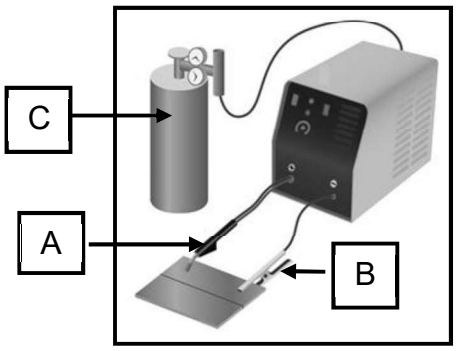
3.4 Name TWO types of plants that can be used as a source to manufacture biodiesel. (2)

[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

Start this question on a NEW page.

4.1 The picture below shows a typical MIG welding machine.



4.1.1 Identify **A** and **B**. (2)

4.1.2 Name the TWO gases that are provided as a mixture in the cylinder at **C**. (2)

4.1.3 What is the function of the heat that is produced by the electric arc? (1)

4.1.4 What is the purpose of the gas shielding the weld bead? (2)

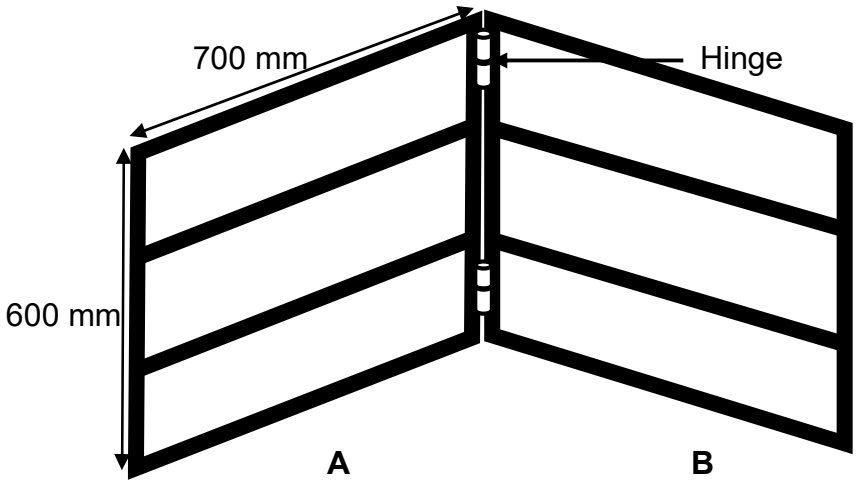
4.1.5 Name TWO non-ferrous metals that can be successfully welded with this machine. (2)

4.2 Describe the function of a push-pull torch as found on an MIG welding machine. (2)

4.3 What precautionary measures could be taken to overcome the problem of dripping metal when welding in the vertical up welding position? (5)

4.4 Read the scenario below.

A farmer installed an automated sheep handling facility that uses various computers, scanners and gate controllers. The two gates (**A** and **B**) need to be manufactured from 25 mm galvanised steel pipe with two hinges.



4.4.1 Calculate the total cost for the materials needed if two hinges cost R24,00 and 1 metre of 25 mm round tubing costs R11,40.
Show ALL calculations. (6)

4.4.2 What is the total area of ONE gate? (2)

4.4.3 Name the THREE types of pipe welding positions. (3)

4.5 Describe the concept *hard facing* as done on the teeth of the ripper. (2)

4.6 Give TWO reasons for the distortion of metal plates that can occur in welded joints. (2)

4.7 Compare the *plasma cutting process* to the *oxyacetylene cutting process.*

Write only the answers next to the question numbers (4.7.1 to 4.7.4) in the ANSWER BOOK.

	PLASMA CUTTING	OXYACETYLENE CUTTING
Speed	4.7.1	4.7.2
Gases used	4.7.3	Oxygen and acetylene
Radiation	Very high	4.7.4

(4)
[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

Start this question on a NEW page.

5.1 The picture below shows a ram type of baler.

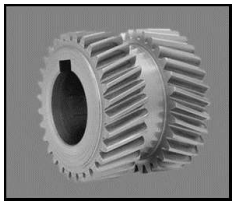
5.1.1 Explain what is meant by the *timing* of this baler. (2)

5.1.2 State THREE requirements of the screens used to safeguard you from the dangerous mechanisms of implements. (3)

5.1.3 Name FOUR safety mechanisms on the ram type baling machine. (4)

5.2 Give FOUR safety precautions when working with a combine harvesting machine. (4)

5.3 The picture below shows a type of drive gear.



5.3.1 Identify the type of gear. (1)

5.3.2 Name ONE disadvantage of this type of gear. (1)

5.4 The picture below shows a hammer mill that is used to pulverise feed for animals.

5.4.1 Name FOUR factors that must be considered when a new hammer mill is bought. (4)

5.4.2 State THREE advantages of installing a hammer mill on a level surface. (3)

5.4.3 Name THREE factors to be considered when attaching the hammer mill to the power take-off shaft of the tractor. (3)

5.5 The picture below shows a three-point lifting device.

5.5.1 Name TWO advantages of using this device to move heavy hay bales. (2)

5.5.2 Identify the THREE components on a tractor's three-point mechanism that are used to connect this implement. (3)

5.6 Describe the working of an automatic depth control mechanism as found on a tractor. (4)

5.7 The picture below shows a bearing on a centrifugal irrigation pump.

5.7.1 Why is it necessary to install bearings in the drive mechanism of a pump? (2)

5.7.2 Name ONE task that should be performed during the maintenance of this type of bearing. (1)

5.8 List THREE types of gearboxes that can be used in tractors. (3)
[40]

QUESTION 6: WATER MANAGEMENT

Start this question on a NEW page.

6.1 The pictures below show three components of a centre-pivot irrigation system. Name the different components and give ONE function of each.

	NAME OF COMPONENT	FUNCTION OF COMPONENT
	6.1.1	6.1.2
	6.1.3	6.1.4
	6.1.5	6.1.6

(6)

6.2 The picture below shows a drone that can be used on a farm for various agricultural purposes.

6.2.1 How can a drone help a farmer to increase crop yield on a piece of irrigation land? (3)

6.2.2 Name the system that is installed on the drone to pin point exact location. (1)

6.3 Identify THREE types of sensors that provide input data to the irrigation controller of an irrigation system. (3)

6.4 Name a device that can be installed on the water delivery pipe of an irrigation system to measure the exact quantity of water that is delivered to the crop. (1)

6.5 Why is it advisable for a farmer to consider the automation of an irrigation system? (4)

6.6 Describe the working of a farmhouse septic tank system from the moment that waste has been flushed down the toilet. (5)

6.7 Name TWO common materials used to manufacture rainwater gutters and down pipes found on farm buildings. (2)

6.8 Describe the distillation process used to purify battery water. (3)

6.9 Answer the question below regarding technological systems and the application thereof.

Write only the answers next to the question numbers (6.9.1 to 6.9.2) in the ANSWER BOOK.

TECHNOLOGICAL SYSTEM	APPLICATION
Geographical Information System	6.9.1
Variable Rate Technology	6.9.2

(2)
[30]

TOTAL SECTION B: 160
GRAND TOTAL: 200