basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE/ NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

NOVEMBER 2020

MARKS: 200

TIME: 3 hours

This question paper consists of 16 pages.

INSTRUCTION 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 Aluminium is preferred for the manufacturing of fizzy drink cans because it …

A allows air to pass through.
B is resistant to acids.
C is lightweight.
D is an elastic material.

1.1.2 All workshops must be equipped with fire extinguishers:

A Occupational Health and Safety Act, 1993 (Act 85 of 1993)
B Compensation for Occupational Injuries and Diseases Act, 1993 (Act 130 of 1993)
C Labour Relations Act, 1995 (Act 66 of 1995)
D Basic Conditions of Employment Act, 1997 (Act 75 of 1997)

1.1.3 Which ONE of the following is NOT an aim of standardising farm implements?

A Makes maintenance and repairs easier
B Makes implements interchangeable and easier to handle
C Prevents one tractor company from forming a monopoly
D Reduces the cost of service parts

1.1.4 The … type of power take-off (PTO) enables the operator to stop the forward movement of the tractor without stopping the PTO drive.

A static
B common
C live
D double-acting

1.1.5 Which ONE of the following is NOT allowed when using a tractor on the farm?

A Install a roll bar on the tractor.
B Allow an extra passenger on the tractor.
C Display a slow-moving vehicle sign.
D Install a reverse alarm.

1.1.6 The noise of a backup generator can be reduced by …

A shortening the exhaust pipe.
B installing a muffler in the exhaust system.
C reducing the size of the silencer box.
D switching it off during thunderstorms.

1.1.7 The mechanism on a tractor that ensures that the plough works at a constant depth:

A Stabilising chains
B Levelling box
C Sensitivity element
D PTO shaft

1.1.8 A locked differential provides equal … to each of the two wheels on an axle.

A pulling power
B thrust
C torque
D gripping power

1.1.9 A … is a positive mechanical connection between different rotating shafts which allows the shafts to work at different angles.

A pressure plate
B crankshaft
C universal joint
D top link

1.1.10 Evenly distributes the outflow from the septic tank to the drainage field:

A Distribution box
B Silencer
C Manhole
D Dividing wall (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 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 Nickel changes the band structure of stainless steel and causes a reduction in striking strength at the same time.

1.2.2 Bronze is an alloy consisting primarily of titanium, usually with tin as the main additive.

1.2.3 Bolts are used to secure wires to electric fence posts to prevent energy loss by the posts and ground.

1.2.4 Galvanised steel contains a magnesium coating that produces poisonous gas that can cause cancer when it is burnt.

1.2.5 The gas welding machine is used by robots in the automotive manufacturing industry to weld the body panels of vehicles. (5 x 2) (10)

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	Separates the ground material from the air in a hammer mill	A	brake fluid
1.3.2	Separates the chaff and the maize kernels in the combine harvester	B	canopy
1.3.3	Component that allows for the manual lubrication of moving parts on implements	C	rotor
1.3.4	A high-viscosity fluid that is used in the hydraulic system of a front-end loader	D	cyclone
1.3.5	Protects the tractor operator from sustaining serious injuries in case of a tractor roll over	E	transmission oil
		F	grease nipple
		G	screens
		H	computer

(5 x 2) (10)

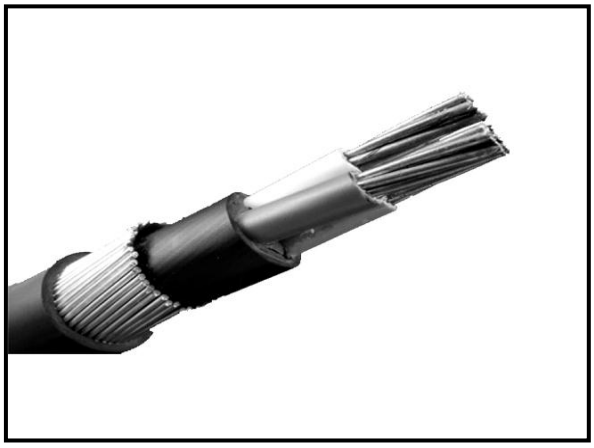
TOTAL SECTION A: 40

SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

Start this question on a NEW page.

2.1 The diagram below shows an electrical cable with insulation and copper conductors.



2.1.1 Explain why copper is suitable for the manufacturing of electrical cables. (2)

2.1.2 Discuss THREE safety requirements that must be considered when installing the electric cables and leads of electric fences. (3)

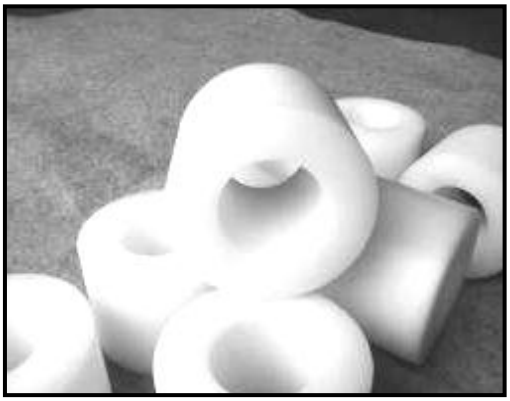
2.1.3 Lightning that strikes the electric fence line can seriously damage the energiser. Draw a labelled sketch of a lightning arrestor installed on an electric fence.

Marks will be allocated for:	
Neatness	1
Correct labels for TWO different components	2
Design	1

(4)

2.2 State THREE influences of chromium on stainless steel. (3)

2.3 The picture below shows Teflon components.



2.3.1 List FOUR chemical substances that have no effect on Teflon-coated surfaces. (4)

2.3.2 Name TWO components that can be manufactured from Teflon. (2)

2.4 The sales of a local parts manufacturer dropped because many of the customers preferred buying Vesconite bushes to steel bushes. Explain to the owner why it would be more profitable to manufacture and sell Vesconite bushes than steel bushes. (3)

2.5 New plastic safety signs must be installed in and around a farm's mechanical workshop. List THREE adhesives a farmer can use to fix these safety signs to the walls. (3)

2.6 Describe the difference between *cohesion* and *adhesion*. (2)

2.7 The picture below shows a typical ceramic insulator used in electric-fence installations.

2.7.1 Name TWO materials that can be used as insulators between the wire and the steel post of an electric fence. (2)

2.7.2 The inscription on electric fencing warning boards shall be in black letters and shall state: 'TAKE CARE – ELECTRIC FENCE'.

State THREE requirements of electric fence warning boards. (3)

2.8 Insulation material used in the roofs of buildings must adhere to certain safety requirements. Discuss FOUR of these safety requirements. (4)
[35]

QUESTION 3: ENERGY

Start this question on a NEW page.

3.1 The photograph below shows wind turbines.

List the FOUR main parts of a wind turbine. (4)

3.2 State THREE factors that determine the efficiency of an electrical solar panel. (3)

3.3 Geothermal energy is the heat energy within the Earth, often manifested in geysers, hot springs as well as volcanoes. It can therefore be very useful in generating electricity.

3.3.1 Briefly describe the procedure that must be followed to harness geothermal energy and transform it into electricity. (3)

3.3.2 State TWO main problems associated with geothermal energy. (2)

3.4 Biofuel is any plant or animal matter that can be used as a fuel. State FOUR disadvantages of this type of fuel. (4)

3.5 The picture below shows a solar geyser.

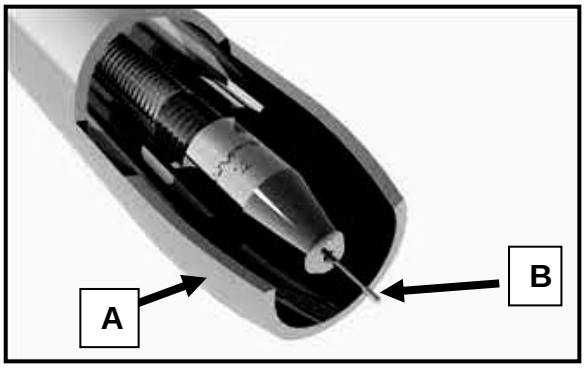
State FOUR advantages of the solar geyser over an ordinary electrical geyser. (4)

[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

Start this question on a NEW page.

4.1 The picture below shows a MIG welding torch.



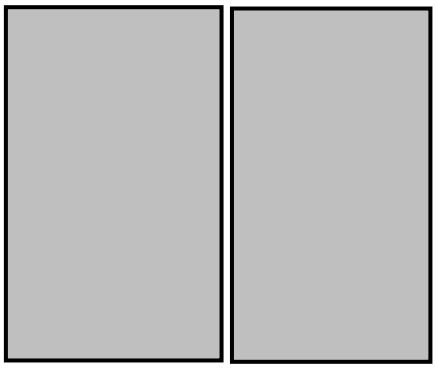
4.1.1 Identify **A** and **B**. (2)

4.1.2 Explain the function of **A** in the picture above. (2)

4.1.3 Name the material used to manufacture **B**. (1)

4.1.4 Explain the causes of the small metal balls that form when welding with a MIG welder. (2)

4.2 The diagram below shows two metal pieces that must be welded together.

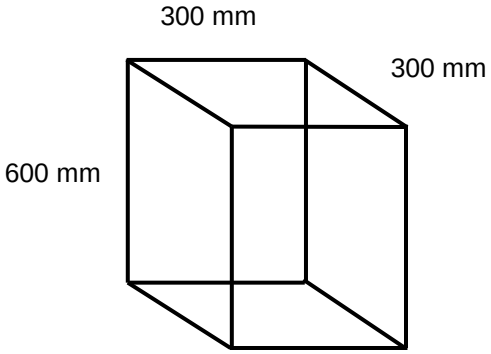


4.2.1 Briefly explain how a farmer should perform a vertical butt-weld joint on the two pieces of metal shown above. (5)

4.2.2 Name TWO types of welding runs or patterns that a farmer can use for welding. (2)

4.3 A hole has been dug for the installation of a corner post, as shown below.

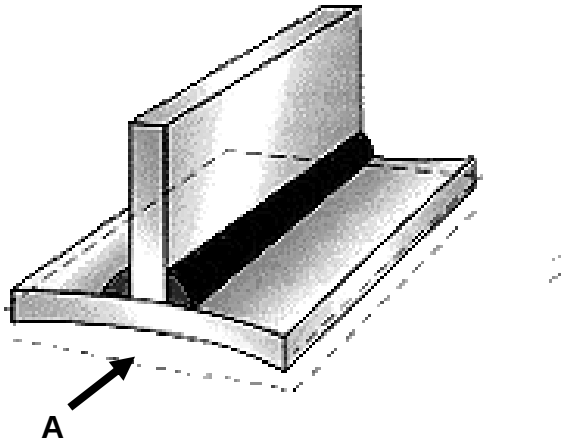
Volume of pole = 4 700 000 mm³
Volume of hole = length x breadth x height



4.3.1 Use the information above to determine the volume of the hole minus the pole. (4)

4.3.2 Suppose that the contractor wants to order premix concrete to secure the four corner posts. Calculate the volume of the concrete that must be ordered. (3)

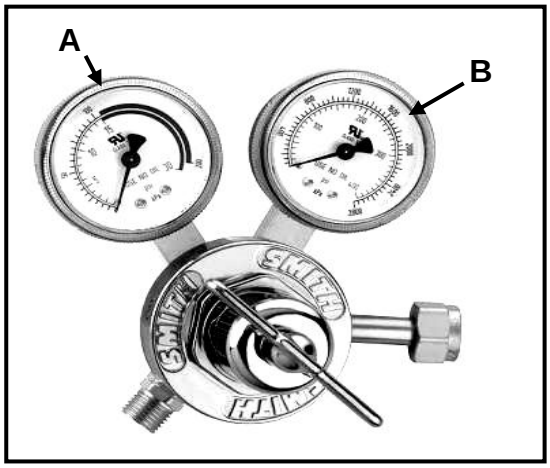
4.4 The immense heat created by the welding arc can cause metal parts to distort in various directions.



4.4.1 Identify the type of shrinking that occurs at arrow **A**. (1)

4.4.2 Name TWO ways to control the distortion that is created by the heat of welding runs. (2)

4.5 The picture below shows the gas regulator of an oxyacetylene apparatus.



4.5.1 State the functions of the two gauges, **A** and **B**. (2)

4.5.2 Describe the *oxyacetylene cutting process*. (4)

4.6 The picture below shows a plasma-cutting torch.

4.6.1 What type of metal would an operator be cutting if oxygen is being used? Give a reason for your answer. (2)

4.6.2 The plasma torch sometimes produces an arc, then it loses it again during the cutting process. Give the possible cause of this phenomenon and indicate how you can overcome it. (2)

4.6.3 Name the material that is used to manufacture the standard plasma-cutting electrodes. (1)
[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

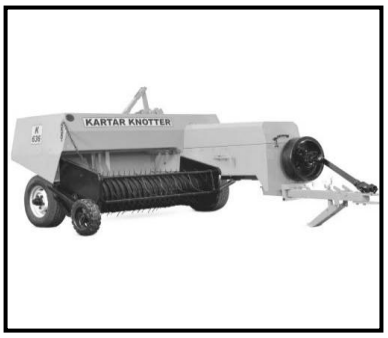
Start this question on a NEW page.

5.1 Describe how you will maintain the implement shown below.

(4)

5.2 The pictures below show two types of baling machines.

A



B

5.2.1 Redraw the table below in the ANSWER BOOK. Complete the table by comparing the two baling machines under the given headings.

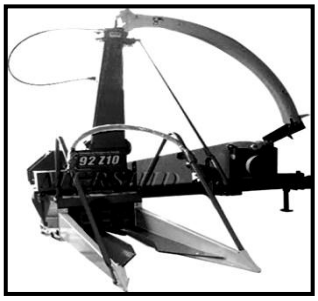
	BALING MACHINE A	**BALING MACHINE B**
Transporting of bales		
Silage wrapping		
Handling		

(6)

5.2.2 How is bale density changed in BALING MACHINE B? (2)

5.2.3 Discuss the function of the slip clutch fitted between the PTO shaft and the flywheel of BALING MACHINE B. (2)

5.3 Describe THREE safety measures that should be followed when working with the silage cutter shown below.



(3)

5.4 Discuss FIVE major problems that can occur during the harvesting of wheat when using the machine shown below.

(5)

5.5 The picture below shows a double-acting hydraulic cylinder.

5.5.1 Briefly describe how the double-acting hydraulic cylinder works. (4)

5.5.2 Which side of the double-acting hydraulic cylinder is the strongest? Motivate your answer. (2)

5.6 The picture below shows a tractor pulling a plough.

5.6.1 Describe THREE ways to positively change a tractor's mass displacement. (3)

5.6.2 What will happen if the top link between the tractor and the plough is removed? (2)

5.7 Study the pictures of the two tractors below carefully.

A

B

5.7.1 Choose the tractor, **A** or **B**, which would be most suitable for the mounting of a front-end loader system. Motivate your answer. (3)

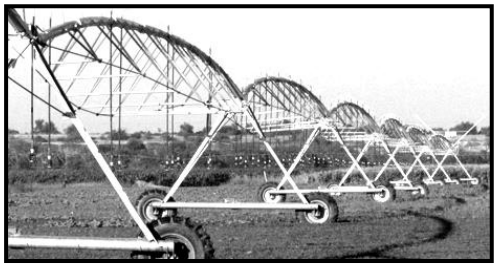
5.7.2 The power steering pumps of both the tractors are powered by a V-belt drive system. Why are V-belts preferred to flat belts? (3)

5.7.3 Why is the exhaust pipe of the tractor longer than the air-intake pipe? (1)
[40]

QUESTION 6: WATER MANAGEMENT

Start this question on a NEW page.

6.1 The picture below shows a centre-pivot irrigation system.



6.1.1 The irrigation system above requires force to drive the wheels. Name TWO of these drive methods. (2)

6.1.2 Name a method to protect the metal parts of the irrigation system against corrosion. (1)

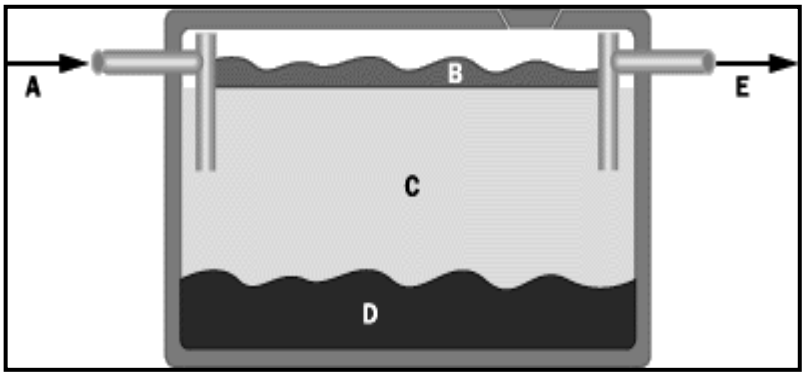
6.1.3 Give a reason why the water pressure is kept constant from the centre of the pivot to the end of the pivot. (2)

6.1.4 Name a device that a farmer can install to automatically switch the system on or off, as required. (1)

6.2 Give THREE reasons for the use of water scheduling. (3)

6.3 Name TWO types of equipment that can be used to measure crop evapotranspiration effectively. (2)

6.4 The diagram below shows a waste-water management system.



6.4.1 Identify **A**, **B**, **C**, **D** and **E** shown in the diagram above. (5)

6.4.2 Describe the main function of the bacteria that are present in the system. (1)

6.4.3 Sewerage water leaking into rivers and dams can harm humans and animals. Explain the precautionary measures that have to be taken into consideration when a septic tank is built. (4)

6.5 Identify the water drainage system shown below.

(1)

6.6 Briefly explain how water is purified by reverse osmosis. (3)

6.7 Name TWO communication systems that can be used to monitor the grazing patterns of livestock. (2)

6.8 Rearrange the following steps in the integration of data by a Geographical Information System in the correct order:

- The yield data from the monitor is recorded and stored at regular intervals.
- Geographical Information System software takes the yield data and produces yield maps.
- Install yield monitors and measuring devices on the harvesting equipment. (3)

[30]

TOTAL SECTION B: 160
GRAND TOTAL: 200