



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**AGRICULTURAL TECHNOLOGY**

**FEBRUARY/MARCH 2017**

**MARKS: 200**

**TIME: 3 hours**

**This question paper consists of 17 pages.**

**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. Write down the question number (1.1.1–1.1.10), choose the answer and make a cross (X) over the letter (A–D) of your choice in the ANSWER BOOK.

**EXAMPLE:**

1.1.11

☐ A☐ B☐ C☒ D

- 1.1.1 Plasma cutting machines may be used to cut ... sheets.

A aluminium  
B copper  
C stainless steel  
D brass

(2)

- 1.1.2 A gas mixture used to cut thick steel with the plasma cutting machine, which is preferred because of its ability to produce high temperatures:

A Argon hydrogen  
B Oxyacetylene  
C Nitrogen oxide  
D Carbon dioxide

(2)

- 1.1.3 ONE of the following metals may be arc-welded successfully:

A Zinc  
B Brass  
C Copper  
D Mild steel

(2)

- 1.1.4 The pipe-weld joining method used most commonly when manufacturing a farm gate is the ... roll position.

A butt joint  
B open butt joint  
C spot weld  
D overlap T-joint

(2)

- 1.1.5 The function of the gas shield around the welding bead when MIG welding:

A Prevents oxidation  
B Cleans the weld bead  
C Ensures the correct temperature for welding  
D Ensures a faster welding speed

(2)

- 1.1.6 This metal CANNOT be welded with the MIG welding machine:
- A Aluminium
  - B Stainless steel
  - C Mild steel
  - D Titanium
- (2)
- 1.1.7 Using a/an ... is cost effective and an easy way to conduct aerial surveys of a farm.
- A aeroplane
  - B helicopter
  - C drone
  - D satellite
- (2)
- 1.1.8 Modernisation of farm implements implies ...
- A environmentally safe implements that leave a green footprint.
  - B industrialisation of a farm.
  - C that all implements must adhere to uniform standards.
  - D a switch to robotics and computers.
- (2)
- 1.1.9 The main function of the hopper on a hammer mill is to ...
- A facilitate the feeding process.
  - B pulverise the fodder.
  - C house the guard plates and wearing plates.
  - D determine the size of the final ground product.
- (2)
- 1.1.10 Solar power technology is environmentally friendly because no ... is released into the atmosphere.
- A hydrogen vapour
  - B water vapour
  - C pollution
  - D heat
- (2)
- 1.2 Change the UNDERLINED word(s) in each of the following statements to make the statements TRUE. Write only the word(s) next to question number (1.2.1–1.2.5) in the ANSWER BOOK, for example 1.2.6 Tractor.
- 1.2.1 The large overhead water pipe of a centre pivot is manufactured from copper.
- (2)
- 1.2.2 Wind power converts the kinetic energy present in wind into chemical energy and then into electrical energy.
- (2)
- 1.2.3 Standardisation in agriculture is less time-consuming and more cost-effective than working by hand.
- (2)
- 1.2.4 Non-stick pots and pans used for cooking are coated with bakelite.
- (2)
- 1.2.5 Bacteria in a septic tank prevent the breakdown of solids into a liquid form.
- (2)

- 1.3 Choose a word/term from COLUMN B that matches the description in COLUMN A. Write down only the letter (A–G) next to the question number (1.3.1–1.3.5) in the ANSWER BOOK, for example 1.3.6 H.

COLUMN A		COLUMN B	
1.3.1	Alloy element used in the manufacturing of stainless steel	A	annealing
1.3.2	The process whereby copper is heated to a light red colour and quenched in water	B	manganese
1.3.3	This liquid is highly flammable and must be stored safely	C	ear plugs
1.3.4	The safety device that must be used to prevent hearing loss because of noise pollution, according to safety regulations in the Occupational Health and Safety Act, 1993 (Act 85 of 1993)	D	acetone
1.3.5	Anti-corrosive substance used as a coating on metals	E	bakelite
		F	tin
		G	cotton

(5 x 2)

(10)

**TOTAL SECTION A: 40**

**SECTION B****QUESTION 2: MATERIALS AND STRUCTURES**

**Start this question on a NEW page.**

- 2.1 When certain elements are added to stainless steel they may cause changes in the properties of the stainless steel.
- 2.1.1 Name THREE influences of nickel on stainless steel. (3)
- 2.1.2 Name the final product formed when two or more pure metals are melted together. (1)
- 2.2 What happens to a metal when it is annealed? (1)
- 2.3 Give TWO reasons for removing flux residues after soft soldering. (2)
- 2.4 Give a reason why brass, which has been heated to a red hot temperature, should NOT be cooled in cold water. (1)
- 2.5 State THREE properties of tin. (3)
- 2.6 Adhesives are used daily to join materials.
- 2.6.1 Define the term *adhesion*. (1)
- 2.6.2 Name TWO important aspects that must be considered when an adhesive is chosen. (2)
- 2.7 Describe FOUR precautionary measures to consider when working with glass fibre. (4)
- 2.8 A vesconite bush is removed easily from the shaft.
- Give TWO reasons to support this statement. (2)

- 2.9 The photograph below shows an electric fence. Answer the questions that follow.



- 2.9.1 Name THREE factors which may cause interference on an electric fence. (3)
- 2.9.2 According to safety regulations, what should be installed in an electric fence where it crosses the path of pedestrians? (2)
- 2.9.3 Name THREE types of material that may be used as isolators between the wires and posts of an electric fence to prevent short circuits. (3)
- 2.9.4 State TWO types of batteries which may be used as a power supply for an electric fence. (2)
- 2.10 The wires of an electric fence must be very strong because of the enormous strain in the wires.
- 2.10.1 Name the type of wire used for erecting an electric fence. (1)
- 2.10.2 What is the minimum thickness of the wires for an electric fence? (1)
- 2.10.3 Name a cost-effective process that may be used to protect the iron components of an electric fence against corrosion. (1)
- 2.10.4 Name TWO factors which must be taken into consideration when installing a fence energiser. (2)

(2)  
[35]

**QUESTION 3: ENERGY**

**Start this question on a NEW page.**

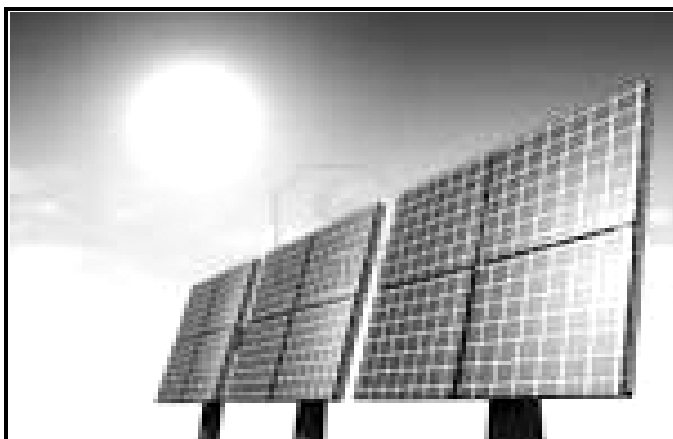
- 3.1 A photograph of a wind turbine is shown below. Answer the questions that follow.



- 3.1.1 Name THREE aspects to consider when selecting a wind turbine to generate power for an electric fence on a game farm. (3)

- 3.1.2 Describe FOUR advantages of using a wind turbine to generate electrical energy. (4)

- 3.2 Solar energy is one of the greatest sources of alternative energy, but it is also a source that is mostly underutilised.



- 3.2.1 Name TWO types of energy that are generated directly from solar energy and give an example of a device that can convert this energy effectively. (4)

- 3.2.2 Name the component that is used to change direct current (DC) generated by photovoltaic cells into alternating current (AC). (1)

- 3.2.3 What is the most common semiconducting material used to manufacture solar panels? (1)

- 3.3 Methanol is used in various fuel applications on a farm.
- 3.3.1 Name the gas that is used to manufacture methanol fuel and state a source of this gas. (2)
- 3.3.2 State TWO advantages of methanol fuel. (2)
- 3.4 A geothermal power plant uses steam from deep within the earth to generate electricity. Describe how this steam is used to generate electricity. (3)
- [20]**

**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**

**Start this question on a NEW page.**

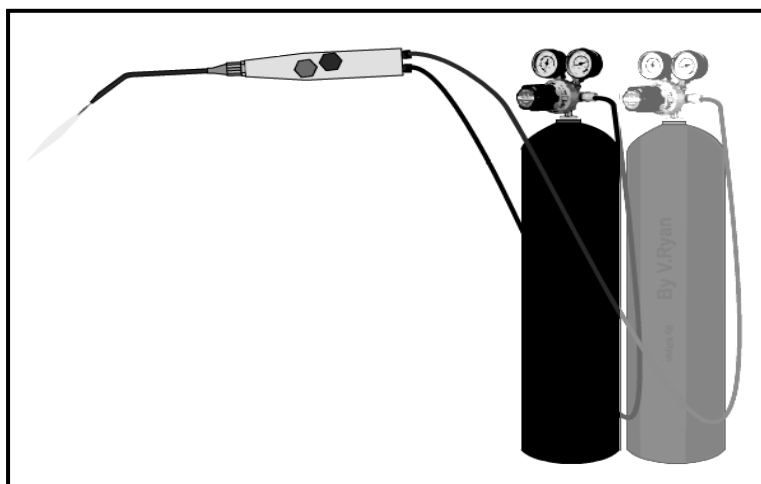
4.1 MIG welding is easy because it requires less skill than conventional arc welding.

4.1.1 Name THREE settings on the MIG welding machine that should be adjusted before starting a welding project. (3)

4.1.2 You can tell a fair amount about the quality of a MIG welding process by the way it sounds. Describe the correct sound that the MIG welding process should make. (2)

4.1.3 What is wrong with the setting of the MIG welding machine if the welding operator burns holes into the work piece? (1)

4.2 The picture below shows an oxyacetylene welding apparatus. Answer the questions that follow.



4.2.1 Explain the procedure to extinguish an oxyacetylene flame when a welding job has been completed. (5)

4.2.2 Describe the symptoms experienced when welding vapours from galvanised steel has been inhaled and give the name of this kind of poisoning. (2)

- 4.3 You have to install burglar proofing for a room in which poisonous insecticides are stored.  
The window is 800 mm high and 600 mm wide.  
The burglar proofing should consist of two vertical and three horizontal bars.  
You may only use 10 mm square bars.  
The cost of the metal is R5,00 per metre.

- 4.3.1 Make a neat, freehand drawing of the window frame and indicate the placing of the burglar proofing.

Marks will be awarded as follows:

Drawing of burglar proofing and frame	2 marks
Dimensions shown	1 mark
Spacing of the bars	1 mark

(4)

- 4.3.2 Calculate the cost of the materials that will be used to manufacture the burglar proofing. (Show ALL calculations.)

(3)

- 4.4 Discuss the overhead arc-welding technique when the metal trusses of a shed are being welded.

(5)

- 4.5 Name THREE circumstances when the horizontal square butt welding joint will be used.

(3)

- 4.6 A plasma jet creates high amounts of ultraviolet radiation that may harm the eyes.

- 4.6.1 What is the correct source of information to consult to choose the correct eye protection for plasma cutting?

(1)

- 4.6.2 Give THREE advantages of a plasma cutting machine compared to an oxyacetylene cutting set.

(3)

- 4.7 Plasma cutting machines have built-in regulators with air filters to remove moisture or other contaminants.

Explain the results if the air filters of the plasma cutting machine become saturated with moisture.

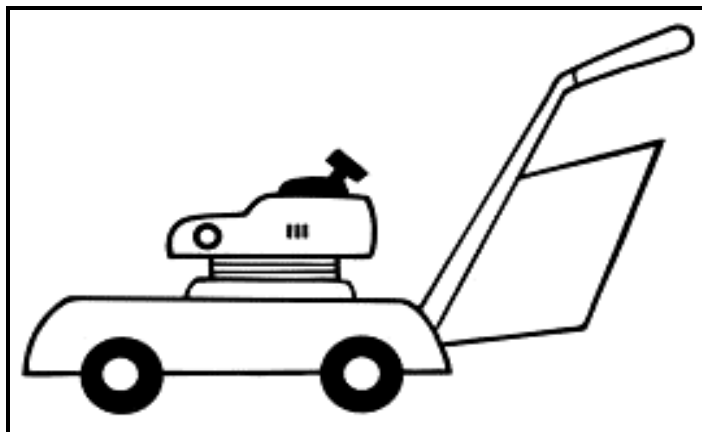
(3)

**[35]**

**QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT**

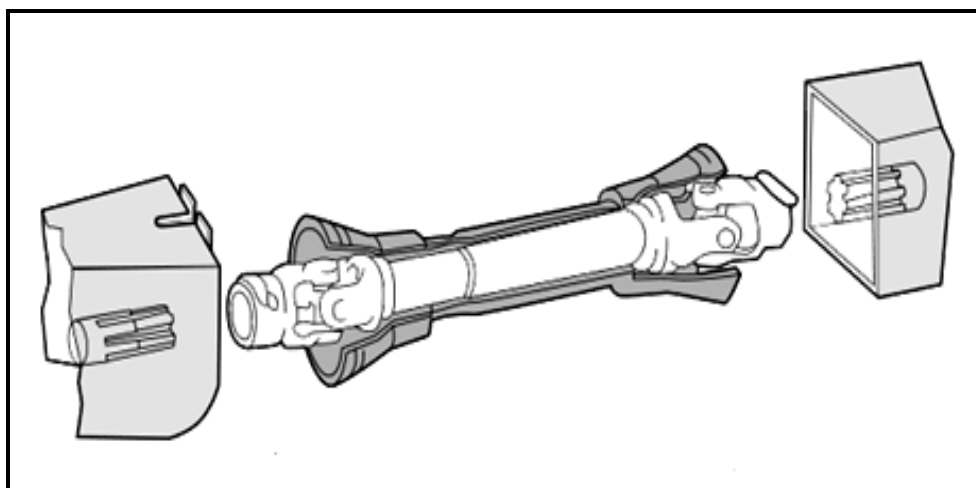
**Start this question on a NEW page.**

- 5.1 Describe FIVE safety measures applicable when using a push lawn mower.



(5)

- 5.2 A power take-off shaft is shown below. Answer the questions that follow.



- 5.2.1 Name the device that allows the power take-off shaft to operate at an angle.

(1)

- 5.2.2 Safety screens must always be used when working with a power take-off shaft so that people are not injured when it is being operated.

State TWO requirements that these safety screens should comply with.

(2)

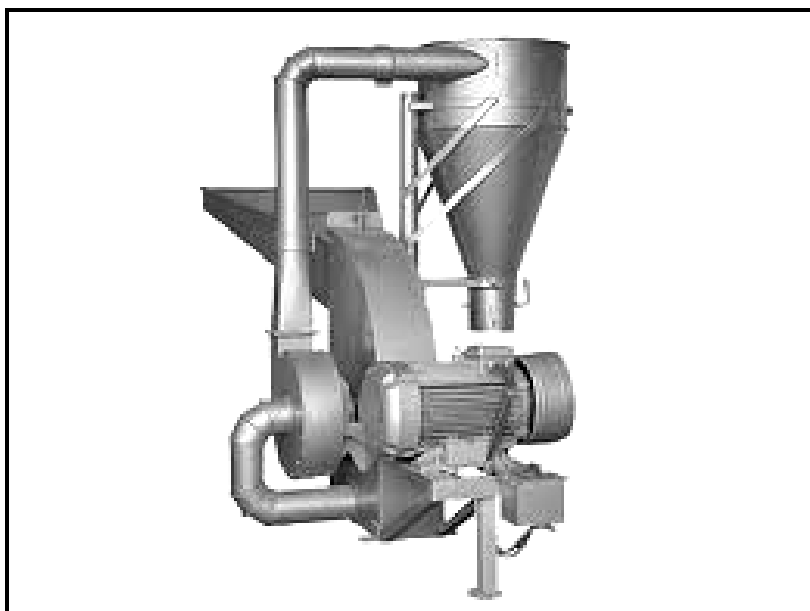
5.3 A combine harvester is shown below. Answer the questions that follow.



5.3.1 Why would a combine harvester break the maize kernels during the threshing process? (2)

5.3.2 Why would the maize kernels and the chaff be blown out the back of the harvester? (2)

5.4 The photograph below shows a hammer mill used on a farm to pulverise feed.



Name the part of the hammer mill responsible for EACH of the following actions:

5.4.1 Pulverising feed (1)

5.4.2 Determining the size of the final ground product (1)

5.4.3 Separating the ground material effectively from the air (1)

- 5.5 Describe the procedure that must be followed when the silage cutter shown below is prepared for use.



(5)

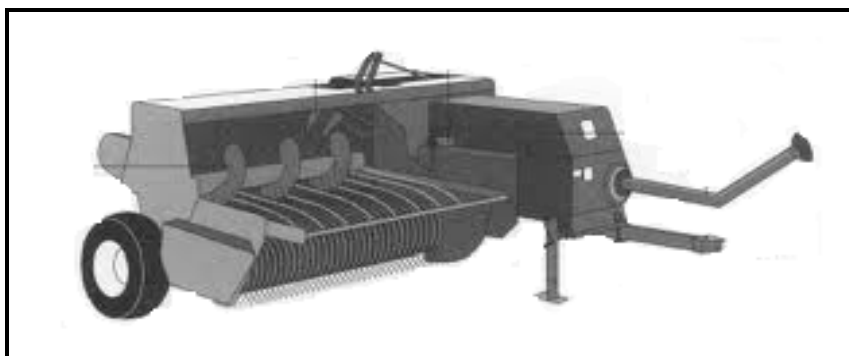
- 5.6 Safety is very important when working with the front-end loader shown below.



Name the preventative measures that the operator must take to prevent the following injuries:

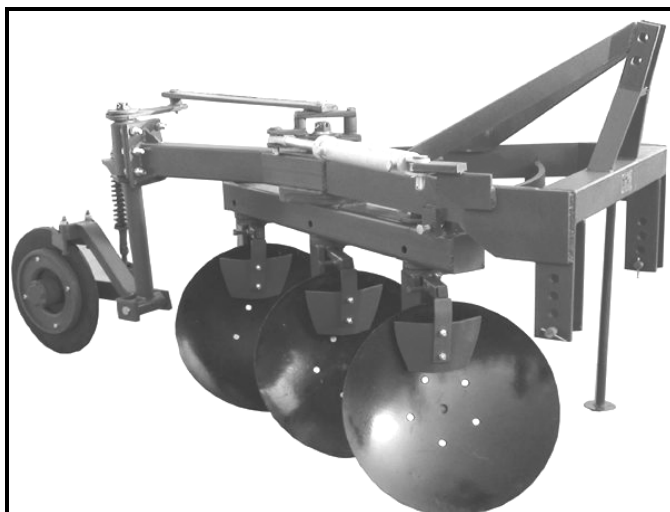
- 5.6.1 The driver is injured by a falling bale (1)
- 5.6.2 Bystanders are injured by a bale falling from the loader (1)
- 5.6.3 The front-end loader falls on its side while it is moving up a steep slope (1)

- 5.7 A ram-type baling machine is shown below. Answer the questions that follow.



- 5.7.1 Name TWO safety mechanisms used on the ram-type baling machine. (2)
- 5.7.2 Describe the function of the auger in the ram-type baling machine. (3)

5.8 Name the parts that are used to connect the implement below to the tractor.

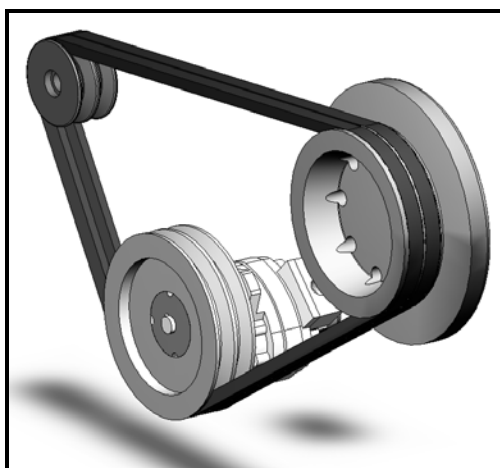


(3)

5.9 Name the THREE shafts found in the manual gearbox of a tractor.

(3)

5.10 Compare the two types of drive belts shown below by redrawing and completing the table in the ANSWER BOOK.



**V-belt**



**Flat belt**

	V-BELT	FLAT BELT
<b>Alignment</b>	5.10.1	5.10.2
<b>Speed</b>	5.10.3	5.10.4
<b>Lubrication</b>	5.10.5	5.10.6

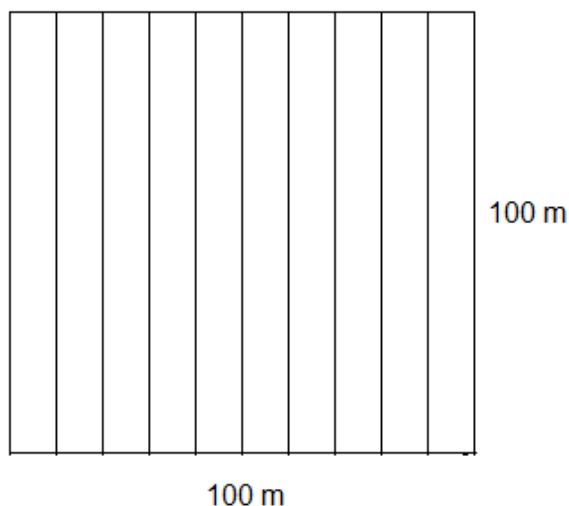
(6)  
[40]

**QUESTION 6: WATER MANAGEMENT**

**Start this question on a NEW page.**

- 6.1 South Africa is a country where water shortages occur frequently. Farmers must use more efficient irrigation systems to conserve water.

A farmer wants to water one hectare of land with drip irrigation. A sketch of the one-hectare field with a closed network of pipes is shown below.



- 6.1.1 Calculate the length and cost of the pipes you will need for the field. The pipes are 100 m long each and will be connected and evenly spread across the field. The price of the pipes that will be used is R6,50 per metre. (3)
- 6.1.2 Calculate the total cost of the T-joints and elbows that you will need if there are 19 T-joints at R8,00 per T-joint and 4 elbows at R6,50 per elbow. (3)
- 6.2 Explain the function of a one-way irrigation valve. (3)
- 6.3 State FOUR advantages of sprinkler irrigation over flood irrigation. (4)
- 6.4 Briefly describe the safety feature built into the centre pivot irrigation system to prevent the centre pivot from falling when a wheel gets stuck. (3)
- 6.5 Give THREE important reasons why a farmer would prefer drip irrigation to an overhead irrigation system. (4)
- 6.6 Name TWO types of equipment that may be used to determine evaporation levels in a specific field. (2)
- 6.7 Name THREE types of irrigation systems that may be used by farmers to irrigate large fields. (3)

- 6.8 State the main problem commonly experienced by farmers who irrigate fields from rivers. (1)
- 6.9 Name the kind of capital represented by EACH of the following:
- 6.9.1 Irrigation pipeline between the water source and the centre pivot (1)
- 6.9.2 Irrigation system water filters (1)
- 6.9.3 Wages of the labourers (1)
- 6.9.4 Tractor (1)
- [30]**
- TOTAL SECTION B: 160**
- GRAND TOTAL: 200**