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# basic education

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

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**AGRICULTURAL TECHNOLOGY**

**NOVEMBER 2024**

**MARKS: 200**

**TIME: 3 hours**

**This question paper consists of 15 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 Show ALL calculations.
- 1.7 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 device used for determining the grazing pattern of a farm animal:
- A Two-way radio
  - B GPS
  - C VRT
  - D RFID
- 1.1.2 A water purification method that sends water through two different liquids, separated by a permeable film, that allows water to pass through on a molecular level:
- A Sand filter
  - B Water softener
  - C Carbon filter
  - D Reverse osmosis
- 1.1.3 Insufficient ... will cause splattering of little metal balls during the welding process and will discolour the welding joint into colours of brown and green.
- A wire speed
  - B shielding gas
  - C amperage
  - D heat
- 1.1.4 ONE of the following is NOT part of the three-point hitch mechanism of a tractor:
- A Levelling box
  - B Lifting arms
  - C PTO shaft
  - D Stabilising chains
- 1.1.5 Movable capital includes implements and ...
- A fuel.
  - B boreholes.
  - C farm tools.
  - D repairs.

1.1.6 The function of the automatic depth-control mechanism of a tractor is to adjust the ...

- A rear end of the plough.
- B ploughing depth according to the soil conditions.
- C angle of the implement in relation to the tractor's movement.
- D cross angle of the implement in relation to the tractor.

1.1.7 ... is any plant or animal matter that is combustible and which can be used as an alternative fuel.

- A Biofuel
- B Coal
- C Fossil fuel
- D Petroleum

1.1.8 The process of joining brass:

- A Silver soldering
- B Brazing
- C Plasma joining
- D MIG welding

1.1.9 ONE of the following must be considered when choosing an adhesive for application in conditions where extreme heat plays a major role:

- A Heat resistance
- B Flammability
- C Combustibility
- D All the above-mentioned

1.1.10 ... is used as a non-stick material for manufacturing windshield wiper blades.

- A Bakelite
- B Teflon
- C Vesconite
- D PVC

(10 x 2) (20)

- 1.2 Change the underlined word in the following to make the statements TRUE. Write only the appropriate 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 A spur gear runs at an angle across the outer circumference of the gear.
- 1.2.2 Hydro energy is extracted from deep under the Earth's surface and is regarded as one of the most sustainable energy sources.
- 1.2.3 The side of a hydraulic cylinder, which contains the piston, creates a much weaker pushing force than the opposite side.
- 1.2.4 Electrical fences should not be erected diagonally under overhead power lines.
- 1.2.5 A streak of lightning always finds the longest path to the ground.

(5 x 2) (10)

- 1.3 Choose a word/term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–I) 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	A device that produces electrical energy through photovoltaic technology	A	standardisation
		B	wind turbines
1.3.2	An example of pneumatic equipment used in a farm workshop	C	inverter
		D	alternator
1.3.3	A device that changes direct current to alternating current	E	solar panels
		F	mechanisation
1.3.4	A device used to store energy generated by a wind turbine	G	compressor
1.3.5	Makes it possible for spares to be purchased from any agent instead of a specific one	H	battery
		I	anemometer

(5 x 2) (10)

**TOTAL SECTION A: 40**

**SECTION B****QUESTION 2: MATERIALS AND STRUCTURES****Start this question on a NEW page.**

2.1 Various alloy elements have a positive influence on stainless steel.

Choose the influence on stainless steel (COLUMN B) that matches the alloy element (COLUMN A). Write only the letter (A–E) next to the question numbers (2.1.1 to 2.1.3) in the ANSWER BOOK, e.g. 2.1.4 F.

<b>COLUMN A ALLOY ELEMENT</b>	<b>COLUMN B INFLUENCE ON STAINLESS STEEL</b>
2.1.1 Manganese	A promotes the hardening of steel
2.1.2 Nickel	B enhances magnetism
2.1.3 Chromium	C decreases strengths
	D gives a fair amount of toughness at low temperatures
	E gives steel a coarser structure

(3 x 1) (3)

2.2 Complete the following table by choosing a word/phrase from the list below. Write only the word/phrase next to the question numbers (2.2.1 to 2.2.6) in the ANSWER BOOK. Each word/phrase may be used only ONCE.

hammer; soft; bronze; surface coating for food cans; copper; silver white metal
--

<b>NAME OF NON-FERROUS METAL</b>	<b>PROPERTY</b>	<b>USE</b>
2.2.1	2.2.2	Electrical conductors
2.2.3	Does not generate a spark when struck against a hard surface	2.2.4
Tin	2.2.5	2.2.6

(6)

2.3 State TWO important factors that should be considered when choosing an adhesive for a specific application.

(2)

2.4 The picture below shows a damaged fibreglass boat hull.



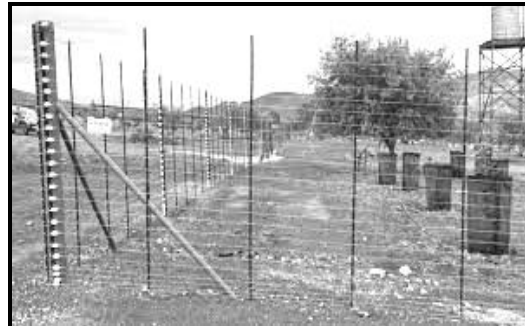
- 2.4.1 Give a reason why fibreglass is used to repair damaged boat hulls. (1)
- 2.4.2 List THREE items needed for personal protection that must be used when working with fibreglass. (3)
- 2.4.3 Name a cleaning agent that can be used to safely remove resin or catalyst from your skin when working with fibreglass. (1)

2.5 Give ONE use of Vesconite for EACH of the applications by choosing a term from the list below. Write only the term next to the question numbers (2.5.1 to 2.5.4) in the ANSWER BOOK. Each term may be used only ONCE.

centre-pivot bush; lifting arm bush; metal-to-metal bush; shackle pin bush
--

- 2.5.1 Tractors (1)
- 2.5.2 Wind pump (1)
- 2.5.3 Tractor trailers (1)
- 2.5.4 Irrigation equipment (1)

2.6 The pictures below show different types of electric farm fences.

**A****B**

2.6.1 Identify the type of electric fence shown in picture **A** and in picture **B**. (2)

2.6.2 State an advantage of the electric fence in picture **A**. (1)

2.6.3 Explain why barbed or razor wire should never be used in the construction of an electric fence. (2)

2.7 Complete the table below about specifications of electric fences. Write only the correct answer next to the question numbers (2.7.1 to 2.7.3) in the ANSWER BOOK.

<b>PRESCRIBED VOLTAGE</b>	<b>CLEARANCE BETWEEN ELECTRIC FENCE AND OVERHEAD POWER LINE</b>
2.7.1	3 metre clearance
Between 1 000 and 33 000 volts	2.7.2
2.7.3	8 metre clearance

(3)

2.8 Design a neatly labelled warning sign that should be placed on an electric fence to warn people of imminent danger. Include the required sign and measurements on the warning sign, as stipulated by the OHS Act.

Use the following criteria:

Measurements indicating the actual size of the sign	2 marks
Labelling/Inscription	2 marks
Correct drawing on the warning plate	1 mark

(5)

2.9 The energiser's earth system should be at least 5 metres away from the main supply unit. Do you agree with this statement? Motivate your answer. (2)

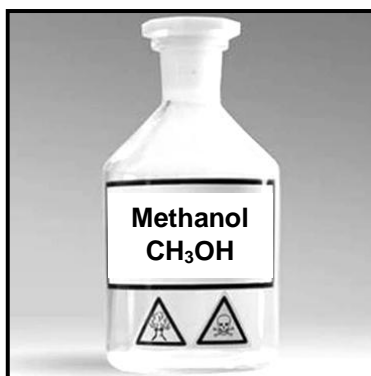
**[35]**

**QUESTION 3: ENERGY****Start this question on a NEW page.**

- 3.1 Name FOUR different renewable alternative energy sources that can be used on a farm to compensate for load-shedding. (4)
- 3.2 The picture below shows a wind turbine.



- 3.2.1 Name a device that is installed on a wind turbine to direct the turbine into the incoming wind. (1)
- 3.2.2 State THREE important requirements to consider before choosing a wind turbine to generate electricity on a farm. (3)
- 3.2.3 State TWO factors that might cause wind turbine failure. (2)
- 3.3 Tabulate TWO advantages and TWO disadvantages of solar energy. (4)
- 3.4 The picture below shows methanol.

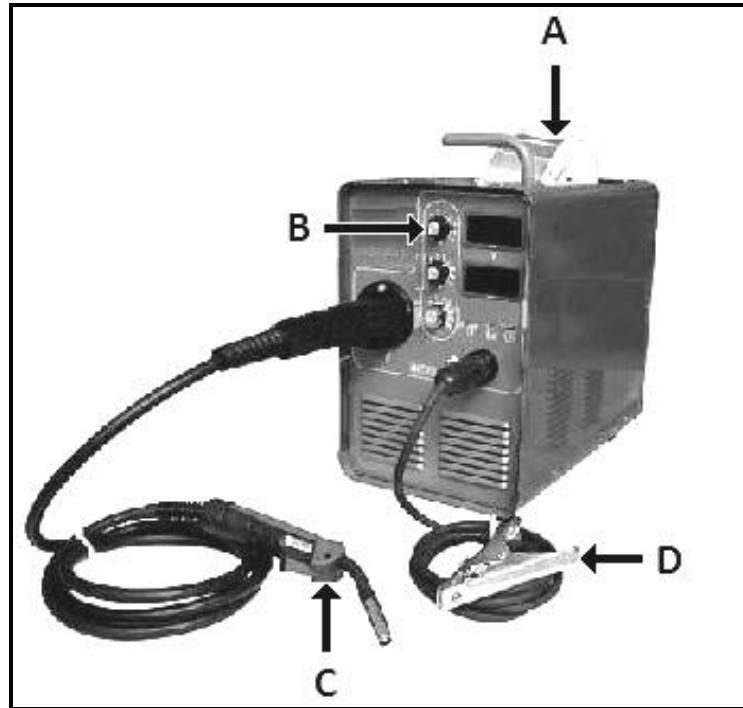


- 3.4.1 Name a fuel that methanol can easily be transformed into. (1)
- 3.4.2 Name TWO natural sources available on a farm that can be used to make methanol. (2)
- 3.5 Describe the manufacturing process of biodiesel. (3)
- [20]**

**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**

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

4.1 The picture below shows a MIG welding machine.



- 4.1.1 What does EACH of the letters in the abbreviation *MIG* represent? (3)
- 4.1.2 Name parts **A** to **D** of the MIG welding machine in the picture above. (4)
- 4.1.3 Explain the role that gas plays in the MIG welding process. (2)
- 4.1.4 Explain the purpose of spot welding. (2)
- 4.2 Explain the effect that gravity has on the vertical up arc welding process and name TWO methods that can be used to control this effect. (3)
- 4.3 What is the welding process called where worn parts of a grader blade are built up with a wear-resistant metal? (1)
- 4.4 Describe the process of preparing a broken cast-iron part before the welding process starts. (5)
- 4.5 State TWO types of wear that metals can be subjected to. (2)

4.6 State the effect of EACH of the following actions when cutting with the oxyacetylene cutting apparatus:

4.6.1 Moving the cutting torch too fast (1)

4.6.2 Moving the cutting torch too slow (1)

4.7 The picture below shows a plasma-cutting machine.



4.7.1 State TWO factors that must be considered before buying a plasma-cutting machine. (2)

4.7.2 Name TWO gases that can be used in the plasma-cutting process to remove the molten metal. (2)

4.7.3 Explain the *plasma-cutting process*. (4)

4.7.4 State THREE safety measures that must be kept in mind when working with a plasma-cutting machine. (3)  
[35]

**QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT****Start this question on a NEW page.**

5.1 The picture below shows a baling machine that is used to make round bales.



- 5.1.1 Name the type of bale-forming system that is used in the picture above. (1)
- 5.1.2 Describe the bale-forming process inside the baling chamber of this type of baling machine. (5)
- 5.1.3 Name THREE tasks that should be performed when doing maintenance on this type of baling machine. (3)
- 5.1.4 Round bales have the potential to roll down a hill. Explain TWO safety precautions that must be kept in mind when ejecting round bales against a slope. (2)

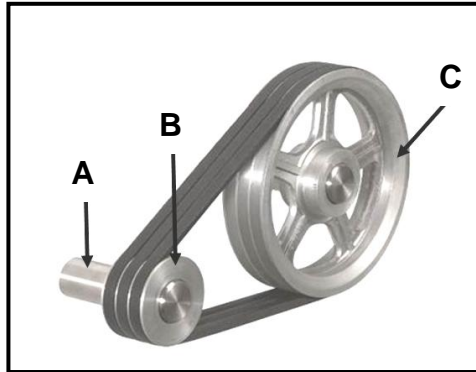
5.2 Complete the table below by comparing the friction clutch to the hydraulic clutch. Write only the correct answer next to the question numbers (5.2.1 to 5.2.4) in the ANSWER BOOK.

	FRICITION CLUTCH	HYDRAULIC CLUTCH
APPLICATION	5.2.1	5.2.3
LOAD CAPACITY	5.2.2	5.2.4

- 5.3 Give FOUR examples of irresponsible human behaviour that can cause tractor rollovers. (4)
- 5.4 Explain the consequences of the following installation errors:
- 5.4.1 The mass of moving parts is not spread equally over the bearings of a hammer mill (2)
- 5.4.2 The cyclone of the hammer mill does not hang level (2)

5.5 Name the type of hydraulic cylinder that is installed in the power steering system of a tractor. Motivate your answer. (2)

5.6 The diagram below shows a V-belt pulley system.

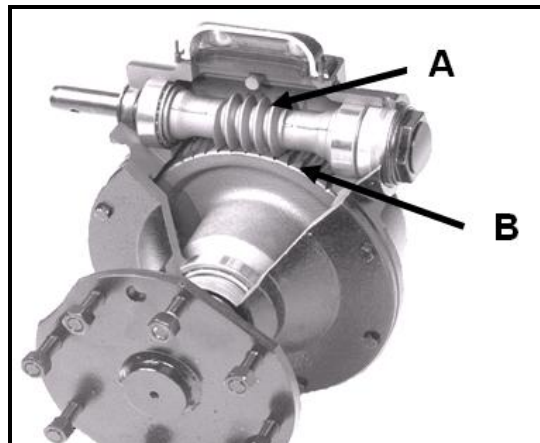


5.6.1 Name a device that must be installed between parts **A** and **B** to enable them to turn as a unit. (1)

5.6.2 Calculate the speed ratio of the pulley system, if pulley **B** rotates at a speed of 1 200 r/min and pulley **C** at a speed of 600 r/min. Show ALL calculations. (4)

5.6.3 State THREE disadvantages of V-belts. (3)

5.7 The picture below shows a gearbox installed on a centre-pivot irrigation system.



5.7.1 Identify the types of gears labelled **A** and **B**. (2)

5.7.2 State TWO functions of this type of gear assembly. (2)

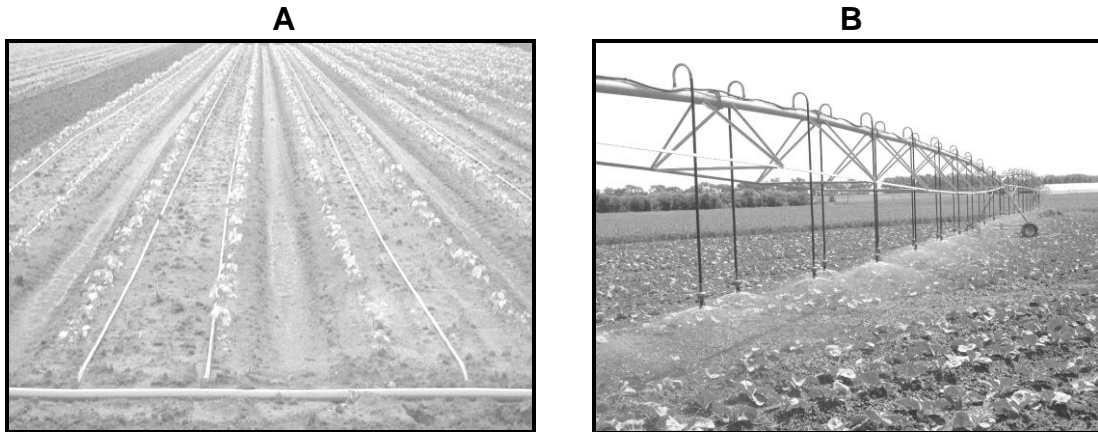
5.7.3 Indicate which substance is used inside this gearbox to reduce wear and friction. (1)

5.8 State TWO advantages of mechanisation in modern agriculture. (2)

**[40]**

**QUESTION 6: WATER MANAGEMENT****Start this question on a NEW page.**

- 6.1 Study the pictures of two different irrigation systems below and answer the questions that follow.



- 6.1.1 Identify the type of irrigation system in picture **A**. (1)
- 6.1.2 Name a type of filter system that can be installed in an irrigation system to prevent blockage of the sprayer nozzles. (1)
- 6.1.3 Give **THREE** reasons why a farmer would prefer irrigation system **A** instead of irrigation system **B**. (3)
- 6.1.4 Explain the function of the down pipes connected to the goosenecks on irrigation system **B**. (2)
- 6.2 State **TWO** advantages of an irrigation timer that is installed in an irrigation system. (2)
- 6.3 Explain the design of a septic tank as used in a household sewage system. (5)
- 6.4 Design a distribution field used to evenly distribute the wastewater from a septic tank to the absorption field.

The drawing must include the following:

Distribution box	1 mark
Measurements	1 mark
Labels	1 mark
Direction of flow	1 mark
Pipe system	1 mark

(5)

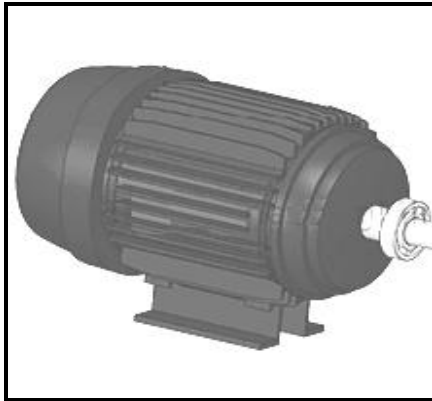
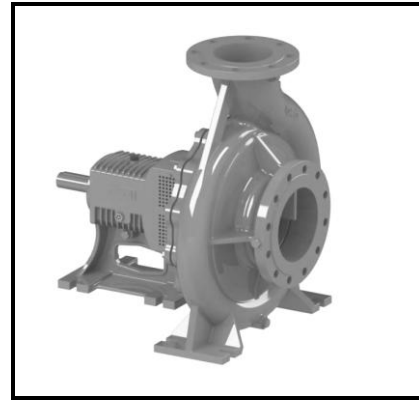
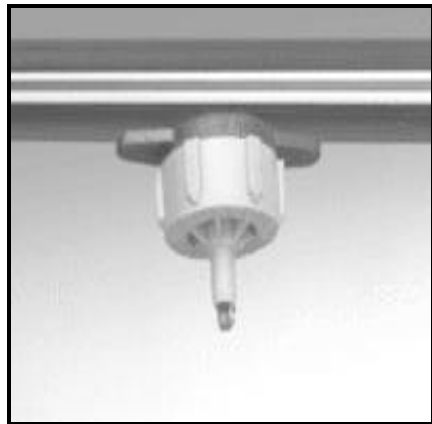
- 6.5 A farmworker uses a water pump to fill a water tank. The water tank has a capacity of 10 000 litres. It takes 1 hour 20 minutes to fill the tank.

Use the following formula to calculate the flow rate of the water through the system.

$$\text{Formula: Flow rate} = \frac{\text{Content}}{\text{Time}}$$

(3)

- 6.6 The pictures below show various components found in an irrigation system.

**A****B****C****D**

- 6.6.1 Name TWO different systems that can be used to connect the motor in picture **A** to the centrifugal pump in picture **B**. (2)

- 6.6.2 Picture **C** shows a dripper that is used in a drip irrigation system. Name FOUR disadvantages of this type of irrigation system. (4)

- 6.6.3 Picture **D** shows an inline water filter that uses a sieve to filter impurities from the water. Name TWO other water filtration methods that can be used to filter irrigation water. (2)

**[30]**

**TOTAL SECTION B: 160**  
**GRAND TOTAL: 200**