



# **basic education**

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

## **SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS**

**AGRICULTURAL TECHNOLOGY**

**MAY/JUNE 2024**

**MARKING GUIDELINES**

**MARKS: 200**

**These marking guidelines consist of 17 pages.**

**SECTION A****QUESTION 1**

- |     |        |            |      |
|-----|--------|------------|------|
| 1.1 | 1.1.1  | D✓✓        |      |
|     | 1.1.2  | A✓✓        |      |
|     | 1.1.3  | D✓✓        |      |
|     | 1.1.4  | C✓✓        |      |
|     | 1.1.5  | C✓✓        |      |
|     | 1.1.6  | C✓✓        |      |
|     | 1.1.7  | C✓✓        |      |
|     | 1.1.8  | A✓✓        |      |
|     | 1.1.9  | C✓✓        |      |
|     | 1.1.10 | A✓✓        | (20) |
| 1.2 | 1.2.1  | Tin. ✓✓    |      |
|     | 1.2.2  | water. ✓✓  |      |
|     | 1.2.3  | flame. ✓✓  |      |
|     | 1.2.4  | Teflon. ✓✓ |      |
|     | 1.2.5  | Nickel. ✓✓ | (10) |
| 1.3 | 1.3.1  | G✓✓        |      |
|     | 1.3.2  | D✓✓        |      |
|     | 1.3.3  | B✓✓        |      |
|     | 1.3.4  | E✓✓        |      |
|     | 1.3.5  | C✓✓        | (10) |

**TOTAL SECTION A: 40**

## **SECTION B**

## QUESTION 2: MATERIALS AND STRUCTURES

- 2.1      2.1.1 Why chromium is a suitable alloy for the manufacturing of milk tanks.

  - Increases resistance against corrosion. ✓
  - Promotes the hardening of steel.✓
  - Improves strength.✓
  - Improves resistance to the formation of scale.✓
  - Improves tensile strength.✓
  - Most chromium steels can be welded well.✓

(Any 3) (3)

2.1.2 An alloy element, other than chromium, that can be added to stainless steel to ensure resistance to air, water and many acids and alkali.

Nickel.✓ (1)

2.2      2.2.1 A reason why copper is not a suitable material for the manufacturing of pipefittings.

Copper is too soft/Copper is likely to bend.✓ (1)

2.2.2 The name of the alloy element that is used with copper to form durable brass pipefittings.

Zinc.✓ (1)

2.2.3 THREE properties of brass.

  - Strength✓
  - Ductility✓
  - Wear resistance✓
  - Hardness✓
  - Conductivity✓
  - Corrosion resistance✓
  - Antimicrobial✓

(Any 3) (3)

## 2.3 THREE common uses of tin.

- Tin is used as a coating on the surface of other metals to prevent corrosion.✓
- 'Tin' cans.✓
- Alloys of tin: Soft solder, pewter, bronze and phosphor bronze.✓
- Tin chloride is used as a penetrant in dyeing textiles and for increasing the weight of silk.✓
- Stannous fluoride is used in some toothpastes.✓
- Tin foil.✓

(Any 3) (3)

## 2.4 2.4.1 TWO important aspects that must be considered when choosing a specific adhesive for a repairing task.

- Type of material to be joined.✓
- Conditions under which this joint will be used.✓

(2)

## 2.4.2 Discussion of heat resistance as a property of an adhesive.

The adhesive itself should not distort✓, melt✓ or burn✓ when heated.✓

(Any 2)

(2)

## 2.4.3 Explanation of the difference between duration of usability and duration of cohesion in adhesives.

Duration of usability:

Period of time during which the mixed adhesive remains usable before setting.✓

Duration of cohesion:

The period of time that an adhesive will stick after having been applied.✓

(2)

## 2.5 2.5.1 FOUR characteristics of fibre glass which makes it a suitable material for the manufacturing of small boats.

- Lightness.✓
- Watertight.✓
- Can be casted into any shape.✓
- Easy to colour.✓
- Colour fast.✓
- Can be sawn, drilled, and filled.✓
- Toughness.✓
- Easy repaired when break.✓

(Any 4) (4)

- 2.5.2 FOUR precautionary measures that must be taken by the person working with fibreglass.
- Catalyst and accelerator should always be stored separately.✓
  - Remove all resin catalyst and accelerator from skin.✓
  - Wear gloves if skin is sensitive.✓
  - Use acetone in well-ventilated room.✓
  - Handle resin casting carefully, they are brittle.✓
  - Fibreglass matting has small pieces of fibre that can penetrate the skin.✓
  - Do not breathe in glass fibre or get it in your eyes.✓ (Any 4) (4)
- 2.6 A few types of material used on farms.
- 2.6.1 Vesconite✓ (1)
- 2.6.2 Magazines for guns✓, Teflon tape✓, Teflon coated cooking pans✓, Teflon tape for sealing fittings✓, Car wash products✓, O-rings✓, Oil and water seals✓, Teflon Taps✓, fittings✓, non-return valves✓ and Flanges✓, Pipe saddles.✓ (Any 2) (2)
- 2.6.3 Bronze is an alloy consisting primarily of copper, usually with tin✓ as the main additive. It is hard and tough.✓ (2)
- 2.7 2.7.1 Name of part A.  
Earth spike.✓ (1)
- 2.7.2 Identification of the device shown in the illustration that produces the electricity for the electric fence.  
Energiser.✓ (1)
- 2.7.3 Function of part B.  
Insulators are used to fasten electrified wire to fence posts without losing energy through the posts.✓ (1)
- 2.7.4 The material from which part B is manufactured.  
Ceramic,✓ Plastic,✓ PVC.✓ (Any 1) (1)  
[35]

**QUESTION 3: ENERGY**

- 3.1      3.1.1     TWO instances where a small wind turbine can be useful on a farm.
- Electrical water pump.✓
  - Small home/caravan/ boat.✓
  - Auxiliary power for security gate/CCTV/Lights.✓
  - To charge batteries.✓
- (Any 2)      (2)
- 3.1.2    TWO disadvantages of wind turbines.
- Insufficient wind in the area.✓
  - Effectiveness of wind turbines.✓
  - Noise pollution.✓
  - Competition with other alternative energy sources.✓
  - High initial cost.✓
- (Any 2)      (2)
- 3.1.3    The importance of a large wing area in relation to the generation of electrical energy.  
The larger the wing area of the blades,✓the more wind energy is harnessed to rotate the turbine.✓
- (2)
- 3.1.4    The device installed in the head of the wind turbine to decrease torque and increase input shaft speed to the generator.  
Gearbox.✓
- (1)
- 3.2      3.2.1    Identification of the type of alternative energy system.  
Photovoltaic/Solar energy✓
- (1)
- 3.2.2    A suitable material for the coating on the panels and ONE property of this coating.  
Material: Shatterproof glass/Teflon/Silicon /Ceramic.✓  
Property: Self-cleaning/ Lightweight/ Non-pollutant/ Anti-reflective/ improved efficiency.✓
- (2)
- 3.2.3    A component that can be installed in the system to prevent overcharging of the batteries.  
Regulator/Charge controller.✓
- (1)

3.3 Correct sequence of the geothermal power station.

<b>STEPS</b>	<b>GENERATION SEQUENCE</b>
1	Cold water is pumped into the borehole.✓
2	Underground heat source heats up the water.✓
3	Steam is transferred to a turbine & generator unit.✓
4	Generated electrical energy is sent to the national grid.✓
5	A condenser cools the steam and water is formed.✓

(5)

3.4 Description of the term “*biofuel*” and one example of such a fuel.

Biofuel or bioorganic fuel is any plant or animal matter ✓ that can be combusted and used as a fuel. ✓

(3)

Methane gas, ✓ Methanol, ✓ Ethanol ✓

(Any 1)

(1)

[20]

**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**

4.1      4.1.1     Identification the part on the MIG welding apparatus that are used by the welding operator to activate the electrical charge to the workpiece.

Trigger/switch on the MIG welding gun.✓

(1)

4.1.2    Description of the MIG welding process.

- The MIG welding machine sends a current through the continuously fed positive wire to the welding area when the operator presses the trigger on the welding torch.✓
- The electric arc creates a short circuit between the wire and work-piece.✓
- The heat produced by the short circuit, melts the metal and allows them to mix.✓
- An inert shielding gas protects the welding area from oxygen contamination.✓
- Once the heat is removed, the metal begins to cool and solidify, and forms a piece of fused metal.✓

(5)

4.1.3    The composition of the MIG welding shielding gas.

Argon,✓ Helium,✓ CO<sup>2</sup>✓

(3)

4.1.4    FOUR problems that will prevent the welding wire not to feed through the torch gun when welding.

- Blocked/defective contact tip.✓
- Loose/broken wire drive/rollers.✓
- Entangled wire in delivery pipe.✓
- Broken torch trigger switch.✓
- Rusted wire jammed on spool.✓
- Wrong size of wire/rollers.✓
- Damaged/blocked/coiled torch liner.✓

(Any 4) (4)

4.1.5    Identification of the welding defect.

**Defect:** Undercutting.✓

**Causes:** Speed too fast,✓ current too high,✓ poor technique.✓

(Any 3) (3)

4.2 Description of the procedure that must be followed in preparing galvanized metal for the welding process.

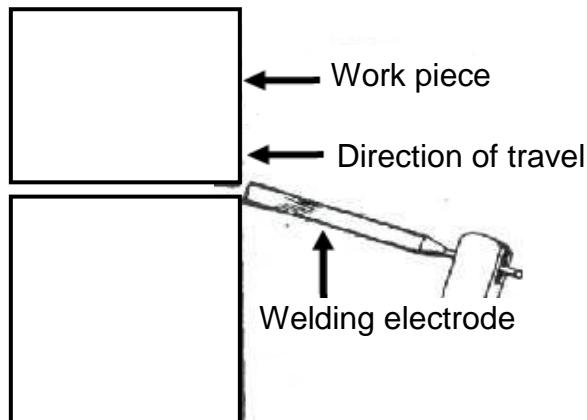
- This galvanized coating makes it difficult to be welded and must be removed prior to welding.✓
- Wear a gas mask to protect the welding operator against poisonous gas fumes.✓

(2)

4.3 Labelled drawing of a horizontal square butt weld.

Marks will be allocated for the following:

Design	1
Angle of electrode	1
Direction of travel	1
Neatness	1
Labelling	1



(5)

4.4 THREE pipe welding positions.

- Horizontal fixed position.✓
- Horizontal movable position.✓
- Vertical position.✓

(3)

4.5      4.5.1     Metals that should not be cut with the apparatus with a motivation.

- Aluminium, copper.✓ Their high thermal conductivity causes them to melt away too quick, leaving a very porous cut.✓

**OR**

- Stainless steel.✓ – The presence of nickel and molybdenum makes it difficult because it creates an oxide film on the base metal.✓

(2)

4.5.2    When the torch is moved too fast when cutting a thick metal plate.

- The molten puddle will stick to one another.✓
- The flame will not penetrate the plate.✓
- The cut will form slag.✓

(3)

4.6.1    The material that is used for manufacturing the plasma cutter combustion cap.

- Porcelain✓
- Ceramic✓

(Any 1) (1)

4.6.2    THREE properties of the Porcelain/Ceramic.

- Heat resistant.✓  
Durable.✓  
Does not conduct electricity.✓

(3)

[35]

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

5.1      5.1.1     Identification of the power source of each of the mowers.

- A- Electric.✓
- B- Petrol.✓

(2)

5.1.2    TWO maintenance tasks to be performed on mower B.

- Safety screens/equipment should be inspected and in place.✓
- Check oil and fuel level.✓
- Replace broken/worn parts.✓
- Service according to manufactures specification.✓
- Clean the mower after each use.✓

(Any 2) (2)

5.1.3    TWO safety tips when working with lawn mowers.

- Read and understand the operator's manual and become familiar with the machine.✓
- Remove all debris from lawns before mowing.✓
- Use recommended PPE including close-fitting clothing when operating a lawn mower.✓
- Disengage the blade before starting.✓
- Keep all guards and safety shields in place.✓
- Never disengage any safety interlock switches.✓
- Never refuel the mower when the engine is hot or running.✓
- Store gasoline in an approved container with proper label.✓
- Turn off the motor before cleaning the area under the deck.✓
- Disconnect the spark or electric plug before troubleshooting or repairing the mower.✓
- Perform routine maintenance according to the schedule recommended by the manufacturer.✓
- Keep a running mower away from bystanders and pets.✓

(Any 2) (2)

5.2 5.2.1 Identification of the safety hazards.

- A No safety screen in place.✓
- B Damaged safety screen.✓
- C Worker climbing over PTO-driving shaft/Bystanders that can be injured.✓
- D Hands near moving parts/No safety screens.✓

(4)

5.2.2 When setting up a hammer mill, it needs to be on a level surface.  
Motivation for the statement.

Yes✓

- Ensures the mass of moving parts are spread equally over bearings. ✓
- Cyclone hang level on the blower pipe. ✓
- Looks neat. ✓
- Minimize vibration. ✓

(Any 2 + 1) (3)

5.2.3 A PTO-driving shaft can reach a rotational speed of up to 2800 r/min (revolutions per minute). Calculation on revolutions per second.

$2800 \text{ r/min} \div 60 \text{ minutes} = 46.66 \text{ r/sec}$  (revolutions per second). (3)

5.3 Matching of the correct use of parts.

- 5.3.1 D.✓
- 5.3.2 E.✓
- 5.3.3 B.✓
- 5.3.4 C.✓
- 5.3.5 A.✓

(5)

5.4      5.4.1     A table with TWO advantages and TWO disadvantages of each type of baler.

<b>BALE TYPE:</b>	<b>ADVANTAGES:</b>	<b>DISADVANTAGES:</b>
Round bales	<ul style="list-style-type: none"> <li>• Roofed storage not necessary.✓</li> <li>• One-man operation.✓</li> <li>• Packing of bales less time consuming.✓</li> </ul> (Any 2)	<ul style="list-style-type: none"> <li>• Not easily transported.✓</li> <li>• Must be handled mechanically.✓</li> <li>• No automatic packing machines.✓</li> <li>• Relatively vast storage area. ✓</li> <li>• Easily roll down steep hills.✓</li> </ul> (Any 2)
Rectangular bales	<ul style="list-style-type: none"> <li>• Bales stored easily.✓</li> <li>• Easier to pack on the trailer.✓</li> <li>• Storage space optimally utilized.✓</li> <li>• Easily handled by hand.✓</li> </ul> (Any 2)	<ul style="list-style-type: none"> <li>• Must be stored under roof.✓</li> <li>• Higher labour needs.✓</li> <li>• Time consuming during stacking of bales.✓</li> </ul> (Any 2)

(8)

5.4.2    TWO methods that can be used to load large bales onto a trailer.

- Front end bale loader/Fork loader.✓
- Mechanical devices/Conveyer belt.✓
- Loader on the three point mechanism.✓

(2)

5.4.3    TWO safety measures need to be followed when bales are transported to the shed.

- Only one person on the tractor. ✓
- No one allowed to sit on bales during transport. ✓
- Do not over speed. ✓
- Use a lower gear when going downhill, since the tractor brakes alone may not be able to stop the load. ✓
- When going uphill, also use a low gear, so that you will not have to hold the load with the tractor brakes while changing gears up the slope. ✓
- Do not attempt to change gears during descend, begin descend in a low gear. ✓
- Never operate a hay trailer on the highway that is not equipped with brakes. ✓
- Hand signals should be used and understood by both the operator and those assisting. ✓

(Any 2) (2)

- 5.1      5.5.1     The part that enables the lifting arms to start moving.  
Control lever. ✓ (1)
- 5.5.2     Name of the part labelled as A.  
Automatic depth control mechanism/ sensitivity element spring. ✓ (1)
- 5.5.3     Explanation of what will happen to the plough if the top-link is not connected and the tractor starts moving forward.  
The back of the plough will tend to lift up out of the soil✓ or the front of the tractor will tend to lift up.✓ (2)
- 5.6     Identification of the type of hydraulic cylinder used in the pictures.  
5.6.1     Single action hydraulic cylinder✓  
5.6.2     Double action hydraulic cylinder ✓  
5.6.3     Single action hydraulic cylinder ✓ (3)  
[40]

**QUESTION 6: WATER MANAGEMENT**

- 6.1      6.1.1     TWO advantages of using this irrigation system.
- Time saving. ✓
  - Can irrigate large lands. ✓
  - One-man operation. ✓
- (Any 2) (2)
- 6.1.2    TWO communication devices that a farmer can use to effectively control the system.
- Cell phone✓
  - Tablet✓
  - Computer✓
  - Laptop✓
- (Any 2) (2)
- 6.1.3    TWO tips a farmer must consider before choosing the type of fertiliser to apply through a centre pivot irrigation system.
- Fertiliser with a high acid content must be avoided. ✓
  - Fertiliser with large particles must be avoided. ✓
- (2)
- 6.2      6.2.1     When a farmer would prefer pump A over pump B.
- No electrical power required to operate the pump.✓
  - Can pump larger volumes of water.✓
  - It can be moved easily/mobile.✓
  - No electrical installation needed.✓
  - No shocking hazards.✓
- (Any 3) (3)
- 6.2.2    THREE factors to consider when choosing a new pump for an irrigation field.
- Type of pump.✓
  - Estimated flow ( $\ell/\text{min}$ ).✓
  - Pressure requirements.✓
  - Research available for pump models.✓
  - Capacity of the pump.✓
  - Durability of the pump.✓
  - Availability of electricity.✓
- (Any 3) (3)

6.2.3 THREE reasons why PVC pipes are preferred over steel pipes to supply water to an irrigation system.

- PVC does not rust.✓
  - PVC is lightweight.✓
  - PVC is flexible.✓
  - Easy to join.✓
  - Available in long lengths.✓
  - Easy to work with.✓
  - Cheaper.✓
- (Any 3)

(3)

6.2.4 Calculation of the time it will take to empty the water source.

$$\text{Formula: Flow rate} = \frac{\text{Volume of water}}{\text{Time}}$$

$$\begin{aligned}\text{Time} &= \frac{\text{Volume of water}}{\text{Flow rate}} \\ &= \frac{72\ 000}{120} \\ &= 600 \checkmark \text{ l/min.}\end{aligned}$$

(4)

6.3 TWO types of drainage system that can be used to remove excess water around the buildings of a dairy farm.

- Channel drain.✓
- Slope drain.✓
- Drainage ditch.✓

(Any 2) (2)

6.4 TWO different water purification methods that can be used to purify brackish water.

- Distillation.✓
- Reverse osmosis.✓

(Any 2) (2)

6.5 6.5.1 Explanation of the construction and working of the distribution field that is connected to the septic tank.

- A system that consist of a narrow trench, partially filled with a bed of washed gravel or crushed stone, into which perforated or open joint pipe is placed.✓
- The discharge from the septic tank is distributed through these pipes into the trench and surrounding soil.✓
- The subsurface absorption field must be properly sized and constructed.✓

(3)

- 6.5.2 Why a distribution field should NOT be built near drinking water installations or boreholes.
- Septic tank water is contaminated with harmful chemicals.✓
  - It will contaminate the water with deadly pathogens/bacteria.✓
- 6.6 TWO instances where V.R.T (Variable Rate Technology) can be used in precision farming.
- Precision planting.✓
  - Application of Fertilizers/Lime.✓
  - Water application Irrigation systems.✓
  - Application of Pesticides/Herbicides.✓
- (Any 2) (2) [30]

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