



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.

STEPS	GENERATION SEQUENCE
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,✓ CO²✓ (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.

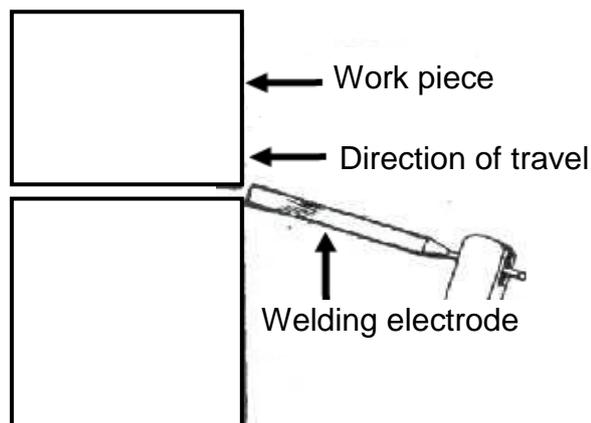
- This galvanized coating makes it difficult to be welded and must be removed prior to welding.✓
- Wear a gas mask to protect the welding operator against poisonous gas fumes.✓

(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.
- $2800 \text{ r/min} \div 60 \text{ minutes} \checkmark = 46.66 \checkmark \text{ r/sec} \checkmark$ (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.

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

(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 (ℓ/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.

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

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

(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.✓ (2)

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