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)

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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 aparatus 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^2✓ (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)

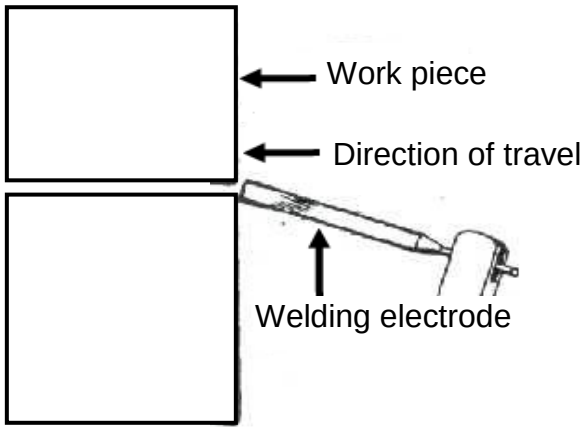
4.2 Description of the procedure that must be followed in preparing galvanized metal for the welding process.

- 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)
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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 trouble-shooting 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 r/min ÷ 60 minutes✓ = 46.66✓ 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.

BALE TYPE:	**ADVANTAGES:**	**DISADVANTAGES:**
Round bales	• Roofed storage not necessary.✓ • One-man operation.✓ • Packing of bales less time consuming.✓ (Any 2)	• Not easily transported.✓ • Must be handled mechanically.✓ • No automatic packing machines.✓ • Relatively vast storage area. ✓ • Easily roll down steep hills.✓ (Any 2)
Rectangular bales	• Bales stored easily.✓ • Easier to pack on the trailer.✓ • Storage space optimally utilized.✓ • Easily handled by hand.✓ (Any 2)	• Must be stored under roof.✓ • Higher labour needs.✓ • Time consuming during stacking of bales.✓ (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 (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 = $\frac{\text{Volume of water}}{\text{Time}}$

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

= $\frac{72\ 000}{120}$ ✓

= 600 ✓ ℓ/min.✓

(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