basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

AGRICULTURAL TECHNOLOGY

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MARKING GUIDELINES

MARKS: 200

This marking guideline consists of 15 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	C✓✓	
	1.1.2	C✓✓	
	1.1.3	B✓✓	
	1.1.4	D✓✓	
	1.1.5	B✓✓	
	1.1.6	A✓✓	
	1.1.7	C✓✓	
	1.1.8	C✓✓	
	1.1.9	A✓✓	
	1.1.10	A✓✓	(20)
1.2	1.2.1	Centre pivot✓✓	
	1.2.2	Universal joint/ Hooke's joint✓✓	
	1.2.3	Sieves✓✓	
	1.2.4	GPS✓✓	
	1.2.5	Galvanizing/✓✓	(10)
1.3	1.3.1	B✓✓	
	1.3.2	G✓✓	
	1.3.3	C✓✓	
	1.3.4	D✓✓	
	1.3.5	F✓✓	(10)

TOTAL SECTION A: 40

SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

Start this question on a NEW page.

2.1 2.1.1 **Alloy element that can be added to stainless steel to give it a fair amount of toughness.**

Nickel/ Chromium✓ (1)

2.1.2 **Percentage of copper and zinc in this alloy.**

- 67% copper✓
- 33% zinc✓ (2)

2.1.3 **Explanation of internal stress relieving in brass.**

- Heat the component to a temperature of 250–300 °C✓
- Keep the component heated for 30 minutes to 1 hour✓
- Leave on the side of the furnace to cool down slowly✓
- Quench cracks may be caused if the component is too hot and cooled down too fast✓
- Gives fairness/controlled cooling (4)

2.1.4 **Circumstances where bronze hammers can be used AND explanation.**

Explosive atmospheres or in the presence of flammable vapours✓ because bronze when struck against a hard surface will not generate sparks.✓ (2)

2.1.5 **Explanation why bronze wool is preferred to steel wool for woodworking applications.**

Steel wool will discolour oak/ Does not rust.✓ (1)

2.2 2.2.1 **TWO properties of an adhesive.**

- Water resistant✓
- Non-conductive to electricity✓
- Elastic✓
- Heat resistant✓
- Chemical resistant. ✓ (Any 2) (2)

2.2.2 **TWO ways to improve the cohesion properties of silicon.**

- Apply adhesive to both surfaces.✓
- Too thick a layer of adhesive will result in a weak joint.✓
- Apply a thin base coat if the surface is very porous.✓
- Apply only a thin layer of adhesive.✓ (Any 2) (2)

2.3 2.3.1 **TWO reasons for using fiberglass instead of metal for the manufacturing of the cab.**

- Lightness✓
- Water tight✓
- Non-conductive of electricity✓
- Can be formed into any shape✓
- Easy to colour✓
- Colour fast✓
- Can be sawn, drilled, and filled✓
- Toughness✓
- Brittle when struck✓
- Easily repaired when broken✓ (Any 2) (2)

2.3.2 **TWO precautionary measures to follow when working with fibreglass.**

- Remove resin catalyst and accelerator from skin.✓
- Wear gloves if skin is sensitive.✓
- Use acetone in a well-ventilated room.✓
- Handle resin casting carefully, they are brittle.✓
- Glass fibre matting has small pieces that penetrate the skin.✓
- Do not breathe in glass fibre or get it in your eyes.✓
- Catalyst and accelerator should be stored separately to prevent explosions.✓ (Any 2) (2)

2.3.3 **Steps to follow when repairing the crack on the cab.**

- Clean the surface.✓
- Sand the surface.✓
- Apply the resin and hardening agent.✓ (3)

2.4 2.4.1 **TWO reasons for the use of Vesconite rather than white metal when manufacturing bushes**.

- Vesconite has a higher design load limit than white metal.✓
- Vesconite has higher fatigue strength.✓
- Vesconite has a much longer wear life.✓
- Low friction.✓
- Self-lubrication.✓ (Any 2) (2)

2.4.2 **Explanation of why Vesconite is safe to use in the manufacturing industry.**

- Vesconite does not contain any asbestos.✓
- Contains no lead.✓
- No hazardous fibres or substances.✓ (3)

2.4.3 **TWO electrical properties of Teflon.**

- The best sealant.✓
- Its dissipation factor is low, and yet Teflon has high dielectric strength.✓ (2)

2.4.4 **THREE reasons why Vesconite is the best material for the manufacturing of bushes.**

- It is ideal for many marine applications.✓
- It does not swell and seize.✓
- It remains hard.✓
- It does not delaminate.✓
- It has low friction.✓
- It does not corrode.✓
- Bushes can easily be removed.✓
- Does not contain any asbestos (healthy)✓/Safer to work with.
- Easy to machine.✓ (Any 3) (3)

2.5 2.5.1 **Component shown in the picture.**

Isolator✓ (1)

2.5.2 **TWO suitable materials for manufacturing an isolator.**

- Plastic✓
- Porcelain✓ (2)

2.5.3 **ONE property of the material identified in QUESTION 2.5.2.**

Non-conductive to electricity✓ (1)
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QUESTION 3: ENERGY

3.1 3.1.1 **TWO factors to consider before installing a wind turbine.**

- Surrounding environment.✓
- Efficiency.✓
- Cost.✓
- Adequate wind.✓ (Any 2) (2)

3.1.2 **TWO advantages and TWO disadvantages of wind turbines.**

Advantages	Disadvantages
• No fuel costs.✓ • Low maintenance costs.✓ • No clean-up costs.✓ • No carbon tax costs.✓ • No air pollution.✓ • Wind is a renewable energy source.✓ • Wind energy is much less expensive than other sources of energy.✓ • Wind turbines are a great resource to generate energy in remote locations.✓ (Any 2)	• High initial cost.✓ • Winds unreliability factor.✓ • In many areas, the winds strength is too low.✓ • Wind turbines generally produce allot less electricity than the average fossil fuelled power station/ Environmental impact✓ • Costly to surrounding wildlife during the build process.✓ • The noise pollution.✓ • Protests and/or petitions usually confront any proposed wind farm development.✓ (Any 2)

(4)

3.1.3 **The use of wind energy during windless days and motivation.**

Yes✓, by making use of batteries.✓ (2)

3.2 **The manufacturing process of biodiesel.**

Making use of vegetable oils✓, algae or animal fats, involves the base-catalysed transesterification of fatty acids with methanol or ethanol to give the corresponding methyl esters or ethyl esters.✓ (2)

TWO plants from which ethanol can be made.

3.3 Maize✓, sorghum✓, potatoes✓, wheat✓, sugar-cane✓, cornstalks✓, fruit✓or vegetable waste.✓ (Any 2) (2)

3.4 3.4.1 **Explanation of solar power.**

Electricity generated from the levels of natural energy contained within the sun's rays.✓ This solar energy is commonly known as solar radiation, and contains a significant amount of energy we are able to harness.✓ The sun's rays contain photons which means they are able to carry an electrical charge.✓ (Any 2) (2)

3.4.2 **The working of the solar hot-water system.**

- The sun heats the water in the glass tubes; the heated water rises to the highest point in the system/ Thermosiphon action.✓
- The heated water enters the geyser through a closed copper pipe network that runs through the geyser.✓
- The hot water inside the copper pipes heats up the cold water inside the geyser.✓
- The cooled water flows downwards back to the solar tubes where it is reheated.✓ (4)

3.4.3 **TWO reasons why solar hot-water system is regarded as a popular choice to heat water.**

- Environmentally friendly energy source/No pollution.✓
- Installation is relatively cheap and simple.✓
- Solar power is limitless.✓
- Transition losses are limited.✓
- Does not use a lot of space.✓ (Any 2) (2)

[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1 4.1.1 **TWO surfaces that the earth clamp can be attached to, to complete the circuit.**

Either be clipped directly to the piece of metal✓or onto a metal welding table.✓ (2)

4.1.2 **TWO causes of a lack of contact between the welding clamp and the work piece.**

- Loose wiring.✓
- Dirty metal.✓
- Paint.✓
- Grease or oil.✓
- Rust.✓ (Any 2) (2)

4.1.3 **Factors to remember when welding thinner metals with the MIG welding machine.**

Lower the power/current setting✓to prevent melting through the metal.✓ (2)

4.2 **Pipe-welding positions A and B.**

A - Horizontal movable position.✓
B - Vertical position.✓ (2)

4.3 **Description of the overhead arc welding position.**

Set an arc as short as possible✓and weld a number of runs without any lateral movement.✓ When molten metal starts dripping, the amperage should be reduced slightly.✓ Move electrode slightly faster✓and hold electrode in same position as in relation to base metal.✓ (Any 4) (4)

4.4 4.4.1 **Identification and description of the welding process.**
Hard-facing✓ (1)

4.4.2 **THREE steps that must followed before the welding process starts.**

Area to be covered must be free of corrosion, grease or foreign substances by grinding it away.✓ Do not work at too high amperage.✓ Use a longer arc.✓ Use a special welding electrode.✓
(Any 3) (3)

4.5 4.5.1 **TWO factors that cause metal to distort during the welding process.**

- Amount of welding.✓
- Number of welding runs.✓
- Degree of resistance.✓
- Original state or condition of parts that must be welded.✓
- Welding procedure.✓
- Heat input.✓
- Restraint.✓ (Any 2) (2)

4.5.2 **TWO ways in which welding heat distortion can be controlled.**

- Pre-setting.✓
- Welding of patch work.✓
- Clamping.✓
- Spot welding.✓ (Any 2) (2)

4.6 4.6.1 **THREE safety regulations being ignored by the operator.**

- Not wearing safety glasses.✓
- Not wearing safety gloves.✓
- Gas cylinders not fixed.✓
- Liquid spilled on floor.✓
- Fire hose next to working table.✓
- Working table on liquid cans.✓
- Working bench not cleared.✓ (Any 3) (3)
  (Accept any visible safety rules violation.)

4.6.2 **The possible outcome if one of the gas cylinders were to topple over.**

- Someone might get hurt or die if the cylinder were to land on them.✓
- Main valve might break off and cause the cylinder to become missile like and cause extreme damage.✓ (2)

4.6.3 **TWO types of metal that can be cut with an oxy-acetylene welding set.**

- Mild steel.✓
- Cast iron.✓
- Stainless steel.✓ (Any 2) (2)

4.7 4.7.1 **Name of the process.**

Galvanizing of metal.✓ (1)

4.7.2 **Reason why it is NOT recommended to weld directly on the zinc coating.**

It gives off poisonous smoke.✓ (1)

4.8 4.8.1 **Identification of plasma cutting machines A and B.**

A - Manual plasma cutting machine.✓
B - Automatic / computer generated plasma cutting machine/ CNC.✓ (2)

4.8.2 **TWO factors to consider when choosing the correct plasma cutting machine.**

- Analyse the minimum and maximum thickness of the metal to be cut.✓
- The type of cutting to be performed / fixed or moveable work.✓
- The voltage must be high enough to emit the correct amount of power for the work to be completed.✓ (Any 2) (2)

4.8.3 **What to keep in mind when operating a plasma cutting machine in the overhead cutting position.**

Molten metal tends to drip down ✓and might cause serious burns to the body.✓ (2)
[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

Start this question on a NEW page.

5.1 5.1.1 **TWO advantages of using a round baling machine on a farm.**

- One-man operation✓
- Low rope consumption✓
- Simplistic working✓
- Can continue baling until rain starts✓
- Roofed storage not necessary✓ (Any 2) (2)

5.1.2 **FOUR procedures to follow when a baler is being prepared after not being used for a long time.**

- All grease points must be well greased.✓
- The correct tension must be set for all belts or chains.✓
- Check that all parts are functioning correctly by operating it slowly.✓
- Replace all worn parts immediately.✓
- Service according to manufacturer's specifications.✓
- Lift up all dust release guards.✓
- Check that binding timing is set correctly.✓
- Check that machines magazine has sufficient rope.✓
- Manufacturers specifications. ✓ (Any 4) (4)

5.1.3 **TWO types of expenses of a round baler and give ONE example of each.**

Fixed expenses.✓ (1)

- Depreciation.✓
- Interest on invested capital.✓
- Incidental expenses.✓
- Financing cost✓
- Licensing. ✓ (Any 1) (1)

Running expenses.✓ (1)

- Repairs.✓
- Grease.✓
- Labour.✓
- Supervising expenses.✓ (Any 1) (1)

5.1.4 **TWO functions of a shear bolt used in the drive system of a baling machine.**

- Prevents heavy objects from being taken into the baler.✓
- Protects the pick-up if it is impeded by anything.✓
- Protects the auger if it becomes overloaded.✓ (Any 2) (2)

5.1.5 **THREE safety measures that should be considered when attaching the drive shaft of the baling machine to the power take-off shaft of the tractor**.

- Check that the shaft is as deep as possible and locked in place.✓
- Check that the driving shaft guard is present.✓
- Ensure that the tractor, PTO shaft and driving shaft of implement are aligned.✓
- All grease points greased.✓
- Engine of tractor must be switched off.✓
- PTO shaft disengaged.✓
- No damaged parts.✓
- No vibrations in shaft.✓ (Any 3) (3)

5.2 5.2.1 **FOUR safety hazards to consider when working with the cutting machine.**

- Flying debris/object can cause injuries/damage.✓
- PTO must be guarded to prevent injuries.✓
- Do not operate the machine on a steep slope.✓
- Machine must be adjusted to the correct height.✓ (3)

5.2.2 **TWO advantages of installing a bearing on the drive system of a cutting machine.**

- Bearings increase efficiency.✓
- Bearings reduce friction and wear.✓
- Allows extended use at high speeds.✓
- Avoids overheating and premature failure of a drive system.✓ (Any 2) (2)

5.3 5.3.1 **THREE points that must be considered by a farmer before purchasing a hammer mill.**

- Sturdy construction.✓
- Replaceable wearing parts.✓
- Rotor housing should close tightly.✓
- Size of the hopper feed aperture/opening✓ (Any 3) (3)

5.3.2 **FOUR points to consider when installing a hammer mill.**

- It must be installed in such a way that it can be handled with ease.✓
- Placed in a well-ventilated area.✓
- Fodder must be offloaded next to the hopper.✓
- Mill should be placed near the feed mixer✓ (4)

5.3.3 **ONE function for each of the following components of a hammer mill.**

(a) **Hopper** - Facilitate the proses of feeding.✓ (1)
(b) **Cyclone** - Separate the grounded material effectively from the air.✓ (1)

5.4 **Calculation of the paint required.**

Paint required = 9 m² / 3 m²✓ (covering capability per litre)
= 3 litres needed✓
= 2 coats✓ X 3 litres per coat✓
= 6 litres of paint✓ (5)

5.5 **Solutions for the different problems associated with the hitching of an implement.**

5.5.1 Add counter-weights at the front of tractor.✓ (1)

5.5.2 Adjust the levelling box.✓ (1)

5.5.3 Extend the top link of the tractor.✓ (1)

5.6 **THREE factors that have an influence on the depth control system of a tractor.**

- Ploughing depth.✓
- Soil resistance.✓
- Forward speed of the tractor.✓
- Draft control sensitivity.✓ (Any 3) (3)

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QUESTION 6: WATER MANAGEMENT

Start this question on a NEW page.

6.1 6.1.1 **FOUR reasons for the use of irrigation sprinklers instead of flood irrigation.**

- When water supply is low.✓
- A high steep gradient leads to erosion.✓
- Infiltration tempo not constant.✓
- Type of soil.✓
- Type of crop.✓
- Water efficiency. ✓
- Labour saving. ✓
- Fertigation.✓ (Any 4) (4)

6.1.2 **FOUR primary parts of sprinkler irrigation system.**

- Valves.✓
- Filter.✓
- Pump.✓
- Pipes.✓
- Sprinklers.✓
- Pressure regulator (Any 4) (4)

6.1.3 **THREE types of irrigation systems that use sprinklers.**

- Centre pivot Irrigation system.✓
- Travelling sprinkler gun or hose reel irrigation machine.✓
- Lateral move (side roll, wheel line) irrigation.✓
- Portable 'Hand move' sprinkler system.✓ (Any 3) (3)

6.2 6.2.1 **Reason why a farmer uses drainage systems in a field.**

Drainage systems remove excess or free water from the upper layers of waterlogged soil/Subsurface drainage✓ (1)

6.2.2 **FOUR types of drains used to drain excess water from fields.**

- French drain.✓
- Channel drain.✓
- Slope drains.✓
- Drainage ditch.✓ (Any 4) (4)

6.3 6.3.1 **Function of the sieve A on the outlet side of the septic tank.**

- Prevents any solids to go out of the outlet.✓
- Prevents foreign objects entering the septic tank from the outlet side.✓ (2)

6.3.2 **Description of the working of a septic tank from the moment the water enters the inlet side of the tank to the moment the water exits the outlet side.**

- Sewage is broken down by anaerobic bacteria in the first tank.✓
- Very little solids remain when the watery sewerage flows to the second tank.✓
- Only liquid sewage remains and drains away through the outlet pipe or stone trench✓ (3)

6.4 **Table regarding different irrigation systems.**

6.4.1 Centre pivot irrigation✓ (1)

6.4.2 PVC pipes with plastic or brass sprinklers✓ (1)

6.4.3 Sprinklers can irrigate areas such as small farms, parks and pastures✓ (1)

6.4.4 Lateral wheel line irrigation✓ (1)

6.5 **The functions for EACH part of an irrigation system.**

6.5.1 **Sand filter**

Prevents blockage of sprinkler nozzles / filters the water.✓ (1)

6.5.2 **Irrigation timer**

To control the irrigation system.✓ (1)

6.5.3 **Neutron moisture probe**

Measure the moisture content in the soil.✓ (1)

6.5.4 **Solenoid valve**

Controlling the water flowing through the system.✓ (1)

6.5.5 **One-way valve**

Prevent water from flowing back to the pipe.✓ (1)
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TOTAL SECTION B: 160
GRAND TOTAL: 200

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