



# basic education

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

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

**AGRICULTURAL TECHNOLOGY**

**2022**

**MARKING GUIDELINES**

**MARKS: 200**

**These marking guidelines consist of 15 pages.**

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

1.1 1.1.1 A✓✓

1.1.2 C✓✓

1.1.3 D✓✓

1.1.4 B✓✓

1.1.5 A✓✓

1.1.6 C✓✓

1.1.7 B✓✓

1.1.8 D✓✓

1.1.9 C✓✓

1.1.10 A✓✓

(20)

1.2 1.2.1 Red ✓✓

1.2.2 Hard facing ✓✓

1.2.3 Noise pollution ✓✓

1.2.4 GPS ✓✓

1.2.5 Rectangular bales ✓✓

(10)

1.3 1.3.1 E✓✓

1.3.2 G✓✓

1.3.3 C✓✓

1.3.4 F✓✓

1.3.5 D✓✓

(10)

**TOTAL SECTION A: 40**

**SECTION B****QUESTION 2: MATERIALS AND STRUCTURES**

- 2.1 THREE possible factors that when choosing a suitable adhesive for this specific application.
- Inflammability. ✓
  - Duration of cohesion. ✓
  - Duration of usability. ✓
  - Heat resistance. (temperature) ✓
  - Water resistance/ Oil resistance. ✓
  - Elasticity. ✓
  - Load capacity. ✓
- (Any 3) (3)
- 2.2 Advantages of using a water trough made from glass fibre over a trough made of steel.
- Lightness. ✓
  - Can be formed into any shape. ✓
  - Can easily be sawn, drilled, and filed. ✓
  - Toughness. ✓
  - Easy repaired when broken. ✓
  - Does not rust, corrode or erode. ✓
- (Any 3) (3)
- 2.3 FOUR chemical substances that does not have any effect on Teflon.
- Adhesives./ Glue. ✓
  - Asphalt/tar. ✓
  - Dyes./ Poisons ✓
  - Greases. ✓
  - Gasses. ✓
  - Latex. ✓
  - Lacquers/ Fuels. ✓
  - Paint. ✓
  - Acids. ✓
- (Any 4) (4)
- 2.4 2.4.1 ONE reason for using Vesconite in dry applications and explanation for each answer.
- Reason: Vesconite do not need any lubricant. ✓
- Explanation: Made of internal lubricated polymers. ✓
- (2)
- 2.4.2 TWO circumstances where Vesconite can be effectively used on a tractor to replace existing metal bushes.
- Front-axle swivel bushes. ✓
  - Steering linkage bushes. ✓
  - Gear lever bushes. ✓
  - Three point lift bushes. ✓
- (2)

- 2.5 2.5.1 THREE factors that must be taken into consideration when identifying tin for the manufacturing of food cans.
- Soft.✓
  - Malleable metal.✓
  - Can be highly polished.✓
  - Resists oxygen and water but dissolves in acids and bases (prevent rust).✓
- (Any 3) (3)
- 2.5.2 TWO commercial uses of tin other than the application in the food canning industry.
- Metal coating.✓
  - Alloy element of bronze.✓
  - Alloy element of soft soldering.✓
  - Cool drink cans. ✓
- (Any 2) (2)
- 2.6 TWO properties of bronze bushes that makes it better suited for the use on implements.
- Bronze resists corrosion.✓
  - Resists metal fatigue more than steel.✓
  - Better conductor of heat.✓
  - Low friction properties.✓
- (Any 2) (2)
- 2.7 THREE influences of manganese on stainless steel.
- It combats corrosion.✓
  - Gives steel a coarser structure.✓
  - Changes the band structure, causing a reduction in striking strength.✓
  - Increases tensile strength.✓
  - Reduces the critical cooling tempo.✓
  - Improves hardening.✓
  - Increases resistance against wear.✓
  - Reduces magnetism.✓
- (Any 3) (3)
- 2.8 Justification of the use of brass over copper in the manufacturing of water couplings.
- Strength.✓
  - Machinability.✓
  - Wear resistance.✓
  - Hardness.✓
- (Any 2) (2)

- 2.9 2.9.1 Identify component **A and B** in the diagram.
- A - Energiser.✓  
B - Earth spike.✓ (2)
- 2.9.2 The maximum voltage allowed by legislation that can be applied in the system.
- 10 000 volt.✓ (1)
- 2.9.3 Description of the daily tasks that must be carried out to maintain an electric fence.
- Clear any vegetation from the fence line.✓
  - Check for damaged or broken wires.✓
  - Damaged isolators or loose connections.✓
  - Regular testing of the energiser's pulse.✓ (Any 2) (2)
- 2.9.4 FOUR soil conditions that can have a negative effect on the earth efficiency of an electrical fence.
- Peat.✓
  - Sandy soil.✓
  - Gravel.✓
  - Very dry soil.✓
  - Snow or frozen ground.✓ (Any 4) (4)
- [35]**

**QUESTION 3: ENERGY**

3.1 3.1.1 THREE important factors that must be considered when installing a wind turbine.

- Select suitable environment. ✓
- Size of the turbine. ✓
- Availability of substantial wind strength. ✓
- Absence of mountains and hills. ✓
- Turbine capacity. ✓
- Hire a professional to do a survey on the surrounding area. ✓ (Any 3) (3)

3.1.2 Explanation of TWO benefits of wind turbines.

- Decades of free electricity after initial-cost recovery. ✓
- Increased property values. ✓
- Reliable electricity generation. ✓
- Relief from high prices of other forms of electricity. ✓
- Personal energy independence. ✓
- Supports clean energy. ✓
- Fight global warming. ✓
- Renewable energy. ✓
- No fuel costs. ✓ (Any 2) (2)

3.2 3.2.1 The semi-conductive material used for the manufacturing of the photovoltaic solar panel.

Silicon. ✓ (1)

3.2.2 Explanation of the process of generating electrical energy in a solar panel.

- The solar panels are made of a semi-conductive material that contains electrons. ✓
- When photons (contained within the sun's rays) hit the solar cells, the electrons absorb this solar energy. ✓
- Transforming them into conduction electrons. ✓
- Electrons are able to become free, and carry an electric charge through a circuit to a destination. ✓ (4)

3.3 The advantages of a geothermal power station above a coal power station.

- A geothermal system does not create any pollution. ✓
- The cost of the land to build a geothermal power plant on is usually less expensive. ✓
- Geothermal plants take up very little room. ✓
- You may receive tax cuts, and/or no environmental bills. ✓
- No fuel is used to generate the power. ✓
- No costs for purchasing, transporting, or cleaning up of fuels. ✓ (Any 4) (4)

## 3.4 FOUR benefits of biofuels.

- Biofuel offers a cheaper solution to our energy needs.✓
- Bio-fuels are made from plant and animal waste.✓
- Biodegradable.✓
- Do not harm the environment.✓
- Does not require any radical changes to switch to the use of biofuels.✓
- Renewable sources of energy.✓
- Inexpensive to produce.✓
- Help prevent engine knocking.✓

(Any 4) (4)

## 3.5 TWO resources for the manufacturing of methanol.

- Woody plant fibre.✓
- Coal.✓
- Natural gas.✓
- Fermented waste products such as sewage and manure.✓

(Any 2) (2)  
**[20]**

**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**

- 4.1 4.1.1 Identification of part A.  
Cutting Nozzle.✓ (1)
- 4.1.2 Identifying the problem indicated by arrow B that can occur when thick materials are being cut with the plasma-cutting machine.  
The angle of cut will not be square/90°.✓ (1)
- 4.1.3 Addressing the problem identified in QUESTION 4.1.2.  
• A machine can be used to grind the face square.✓  
• The welding nozzle can be tilted at an angle to compensate for the problem.✓ (Any 1) (1)
- 4.1.4 TWO types of gasses that are commonly used in the plasma-cutting process.  
• Regular air✓  
• Argon✓  
• Nitrogen✓  
• Oxygen✓ (Any 2) (2)
- 4.2 4.2.1 TWO gasses used during the oxy-acetylene cutting process.  
Acetylene✓ and oxygen. ✓ (2)
- 4.2.2 Advantages of the oxy-acetylene apparatus over the plasma cutter.  
• No need for electricity.✓  
• Can be used to heat up work pieces. ✓  
• Portable.✓  
• No electrical components.✓  
• Rust has no influence on the cutting process.✓  
• Easy to operate. ✓ (Any 3) (3)

4.2.3 Important safety measures to note when working with the oxy-acetylene cutting apparatus.

- If a cylinder falls over and breaks the main valve off, the cylinder will become a missile and cause extreme damage. ✓
- Wear a leather apron or similar protective clothing and welding gloves when using an oxy-acetylene cutting torch. ✓
- Always use proper oxy-acetylene cutting goggles. ✓
- Never point the flame towards another person or any flammable material. ✓
- Always light the oxyacetylene cutting torch with a striker. ✓
- Wherever possible, use a heat shield behind the component you are heating. ✓
- After heating a piece of metal, label it as 'HOT' with a piece of chalk so that others will not attempt to pick it up. ✓
- Make sure there are no leaks on pipes and connections. ✓
- Make sure all valves are closed after use. ✓

(3)

(Any 3)

4.3 4.3.1 Describing the process to replace a worn welding tip.

- Remove the welding shield cup. ✓
- Unscrew the damaged welding tip. ✓
- Screw the new tip on. ✓
- Replace the welding cup. ✓

(4)

4.3.2 Explanation of the use of anti-spatter spray during the MIG welding process.

- Prevent the sprout from clogging with welding metal. ✓
- Prevent the filler wire/welding electrode from sticking to the contact tip. ✓

(2)

4.3.3 FOUR reasons for the welding wire not running smoothly through the welding hose.

- Bended welding feeder hose. ✓
- Damage to the feeding mechanism. ✓
- Corroded welding electrode/wire. ✓
- Damaged tip. ✓

(4)

4.4 Preventative measures:

4.4.1 Spot weld. ✓

4.4.2 Pre-setting. ✓

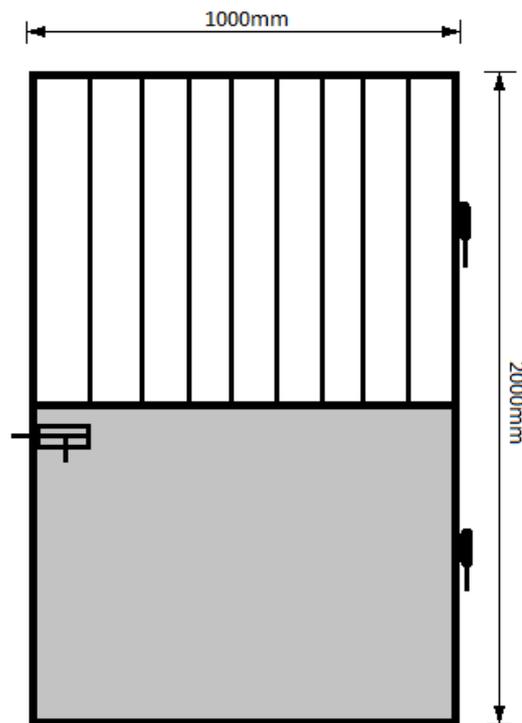
4.4.3 Clamping. ✓

(3)

4.5 Design drawing of a door for a horse stable.

Marks will be allocated for the following:

Design	(1)✓
Hinges and latch	(2)✓✓
Dimensions	(2)✓✓
Neatness	(1)✓



(6)

4.6 Explanation of using an inverter welder powered by a generator rather than using a MIG welder.

- Lightweight.✓
- Compact.✓
- No need for gas cylinder.✓
- Inverter can work in windy conditions.✓

(Any 3)

(3)  
[35]

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

- 5.1 5.1.1 FIVE basic implements that can be used in the harvesting of the crop.
- Tractor.✓
  - Cutting machine.✓
  - Hay rake.✓
  - Baling machine.✓
  - Wrapping machine.✓
  - Front-end loader.✓
- (Any 5) (5)
- 5.1.2 THREE advantages of using machinery in the harvesting process.
- Single operation.✓
  - Less time consuming.✓
  - Labour saving.✓
  - Very reliable method.✓
  - Economical.✓
- (3)
- 5.1.3 Another method that can be used to cut lucerne.
- Using a sickle.✓
- (1)
- 5.1.4 ONE safety device that is installed on a baling machine
- Shear bolt.✓
  - Slip clutch.✓
  - Tension springs.✓
- (Any 1) (1)
- 5.2 5.2.1 Calculation of the running cost of a combine harvester.
- (Show ALL calculations.)
- $$R8\ 100-00 + R1\ 200-00 + R1\ 500-00 + R3\ 000-00 + R8\ 000-00 = R21\ 800-00✓✓$$
- (2)
- 5.2.2 Calculating the VAT (15%) of the total running cost.
- $$R21\ 800-00 \times 15\% = R3\ 270-00✓✓$$
- (2)

- 5.3 5.3.1 Label for the graph.  
Depreciation.✓ (1)
- 5.3.2 Determine the right time to sell the tractor by analysing the data from the graph and TWO reasons for the answer.
- During year 4.✓
  - **Motivation**
  - One year left on maintenance plan.✓
  - Higher value than selling during year 6.✓ (3)
- 5.3.3 THREE actions a farmer can take to minimize excessive depreciation in the value of second-hand implements.
- Repair/Replace broken or worn parts.✓
  - Store properly.✓
  - Service according to user manual.✓
  - Use implement according to specifications.✓ (Any 3) (3)
- 5.4 5.4.1 Identification of the components labelled **A**, **B** and **C** and TWO functions of each.
- A. Top link.✓
- To adjust the angle of the implement in relation to the tractors movement.✓
  - Serves as top connection of the three-point mechanism to the implement.✓
- B. Hydraulic pump.✓
- Provides pressure to the hydraulic system of the tractor.✓
  - Provides pressure to the hydraulic system of the implement.✓
- C. PTO drive shaft.✓
- Transmits driving power from tractor to the implement.✓
  - Provide angular movement between the tractor and implement.✓ (9)
- 5.4.2 THREE important safety precautions applicable to component **C**.
- Never climb over the driving shaft when in motion. ✓
  - Safety screen must be in place.✓
  - Safety screen must not rotate with the shaft.✓
  - Screen must be highly visible.✓
  - Never work on an implement when driving shaft is in motion.✓ (Any 3) (3)

5.5 5.5.1 Identification of the components labelled **A**, **B** and **C**.

<b>A</b>	Flywheel.✓
<b>B</b>	Clutch plate.✓
<b>C</b>	Pressure plate.✓

(3)

## 5.5.2 FOUR reasons for equipping a tractor with a clutch.

- Engine drive needs to be disengaged when gears are changed.✓
- Drive should be disengaged when the tractor is started.✓
- The clutch is disengaged to allow engine speed to increase and then engaged to give greater torque.✓
- Allows the operator to stop the tractor, belt pulley or PTO shaft without stopping the engine.✓

(4)  
[40]

**QUESTION 6: WATER MANAGEMENT**

- 6.1 6.1.1 Explanation of the structure's ability to carry the heavy load of the irrigation system.
- Sustained by triangulation/truss method.✓
  - Arched design.✓
  - Steel cables/rods hold the trusses.✓
- (Any 2) (2)
- 6.1.2 ONE possible cause of sprinkler nozzle blockage and provide a solution to the problem.
- Sand/fertilizer particles.✓
  - Plant matter.✓
  - Organisms in water. (Algae, tadpoles etc.)✓
  - This can be prevented by installing a filter in the system.✓
- (Any 2) (2)
- 6.1.3 THREE factors to consider when selecting a water pump for the centre pivot system.
- Water source.✓
  - Type of pump.✓
  - Size.✓
  - Pressure requirements.✓
  - Available pump models.✓
  - Power source needed to run the pump.✓
- (Any 3) (3)
- 6.2 The process when an irrigation farmer sets the correct frequency and duration of water application to a crop to maximise plant growth.
- Irrigation scheduling/timing.✓ (1)
- 6.3 6.3.1 Identify component **A** and its function.
- Manhole/Drain cover.✓
  - It is to provide access for cleaning and inspection.✓
- (2)
- 6.3.2 Requirements that must be followed to keep septic system functional.
- Use only toilet paper.✓
  - Do not flush down non-degradable materials into the tank. (Cigarettes, plastics, rubber)✓
  - No disinfectants, bleaches, oils should be flushed down the system.✓
  - Inspect manhole regularly.✓
  - Empty the tank when required.✓
- (Any 4) (4)

- 6.4 6.4.1 Explanation of the technical lay out of the drainage system.
- It contains perforated pipes.✓
  - The pipes are buried under gravel or pebbles.✓
  - The water drains through the surface gravel and seeps into the pipe's perforations before flowing out at the end of the pipe.✓
  - Pipes are installed at a slight angle or slope to facilitate the flow of water away from the waterlogged area.✓ (Any 3) (3)
- 6.4.2 A system that can quickly move large amounts of water from water logged fields.
- Channel drain.✓
  - Slope drain.✓
  - Herringbone.✓ (Any 1) (1)
- 6.4.3 A few aspects that can cause problems if there is no drainage system installed around the perimeter of a building.
- Water leaks into the house.✓
  - Moisture rises into the walls.✓
  - Standing water attracts pests.✓
  - Erosion around the foundation.✓ (Any 3) (3)
- 6.5 6.5.1 Identification of timer A.
- Mechanical timer.✓ (1)
- 6.5.2 TWO disadvantages of timer B.
- Difficult to set up/operate.✓
  - Battery needs to be replaced regularly.✓
  - Electronic parts need to be properly sealed.✓ (Any 2) (2)
- 6.5.3 The timer that has a multiple programming function.
- Timer B.✓ (1)
- 6.6 THREE advantages of using the faucet water filtration system.
- Does not require the boiling of water.✓
  - Quick process of purifying water.✓
  - Filters are easy accessible on the kitchen top.✓
  - Can be switched on and off.✓
  - Cartridges are fairly inexpensive and easy to change.✓ (Any 3) (3)
- 6.7 A monitoring system for each scenario in the table below.

Scenario	Monitoring system
Precisely control the rate of application of fertilizer.	6.7.1 Variable-rate Technology.✓
Determine areas of under growth.	6.7.2 Geographic Information System/Drone/Thermal imaging.Yield monitor.✓

(2)  
[30]**TOTAL SECTION B: 160**  
**GRAND TOTAL: 200**