basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

NOVEMBER 2022

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 16 pages.

SECTION A

QUESTION 1

1.1 1.1.1 C✓✓

1.1.2 A✓✓

1.1.3 A✓✓

1.1.4 D✓✓

1.1.5 C✓✓

1.1.6 D✓✓

1.1.7 B✓✓

1.1.8 D✓✓

1.1.9 C✓✓

1.1.10 A/D✓✓

(20)

1.2 1.2.1 Heat/steam/warmth/magma ✓✓

1.2.2 moveable✓✓

1.2.3 standardisation✓✓

1.2.4 more✓✓

1.2.5 Battery/Accumulator✓✓

(10)

1.3 1.3.1 G✓✓

1.3.2 D✓✓

1.3.3 F✓✓

1.3.4 B/H ✓✓

1.3.5 A ✓✓

(10)

TOTAL SECTION A: 40

SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

2.1 **The alloy metal that is specifically used to manufacture the products and a reason why the metal is used.**

2.1.1 **Wine tanks**

Stainless steel.✓
- Resistant to air, water and many chemical acids and alkali.✓
- Resistant against corrosion.✓
- Can be welded well.✓ (Any 1) (2)

2.1.2 **Fittings for hot-water copper pipes**

Brass. ✓
- Strength ✓
- Machinability✓
- Wear resistance✓
- Hardness✓
- Corrosion resistance✓ (Any 1) (2)

2.1.3 **Hammers that can be used in explosive atmosphere**

Bronze✓
- Does not generate sparks✓
- Low friction ✓ (Any 1) (2)

2.2 **ONE example where the following materials will be used on a farm.**

2.2.1 **High-tensile steel**

- Tow bar✓
- Shafts✓
- Gears✓
- Crowbar✓ (Any 1) (1)

2.2.2 **Cast iron**

- Engine block✓
- Differential of the tractor✓
- Cast iron pots✓
- Tractor weights✓
- Brake drum✓
- Hubs for farm equipment✓ (Any 1) (1)

2.3 **Description of the annealing process of copper.**

Heat the metal to 500–550ºC.✓ Then cool it in the air or sand.✓ (2)

2.4 2.4.1 **The TWO most important aspects that must be considered when an adhesive is chosen to repair the water trough.**

- Type of the material to be joined.✓
- Conditions under which this joint will be used.✓ (2)

2.4.2 **Process of preparing the water trough before the adhesive is applied.**

Clean the surface area around the crack✓ and sand it lightly until there are no more signs of dirt, clean before applying the adhesive.✓ (2)

2.4.3 **TWO methods used to join fibreglass parts.**

- Pop rivet✓
- Bolt and nut✓
- Screws✓ (2)

2.4.4 **TWO methods of colouring a fibreglass trough.**

- Painting✓
- Dying✓ (2)

2.5 **The effect of extreme heat on the following material.**

2.5.1 **Bakelite**

- No effect.✓
- Will become extremely hot.✓
- Will discolour.✓ (Any 1) (1)

2.5.2 **Perspex**

- It will easily change shape when heated, because Perspex is not heat resistant.✓
- It will burn.✓
- It will melt✓ (Any 1) (1)

2.5.3 **Silicon**

- Silicon will melt. ✓
- Will deform.✓ (Any 1) (1)

2.6 **Description of the friction ability of Vesconite.**

- Low static and dynamic friction✓
- No friction in tough working environments whether dry or wet, lightly or heavily loaded.✓ (2)

2.7 2.7.1 **THREE design requirements prescribed for warning signs on electric fences.**

- The signs must be at least 100 mm x 200 mm.✓
- The background color of both sides must be yellow.✓
- The inscription must be black and must read 'BE AWARE– ELECTRIC FENCE'.✓
- The inscription must be clear, inscribed on both sides and have a height of at least 25 mm.✓
- At least two languages must be visible on the sign.✓ (Any 3) (3)

2.7.2 **TWO situations where an electrical fence can be used on a farm.**

- Protection✓
- Temporary fences✓
- Dangerous animals, e.g.lions✓ (2)
- Around the farm perimeter (Any 2)

2.7.3 **TWO alternative energy sources that can be used to provide energy for an electrical fence.**

- Wind✓
- Solar✓
- Hydro electric✓
- Generator✓
- Battery✓ (2)

2.8 **THREE components needed to create a fire.**

- Material that can burn✓
- Oxygen✓
- Any heat source✓ (lightning / friction, matches, lighter) (3)

2.9 **TWO reasons for using resin casting as an insulating material when joining THREE phase electrical wires.**

- Watertight✓
- Non-conductor of electricity✓
- Toughness✓
- Prevents corrosion/ rust✓ (Any 2) (2)

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QUESTION 3: ENERGY

3.1 3.1.1 **The energy source that makes use of a generator.**

Source C✓ (1)

3.1.2 **Description of the working principles of energy source B.**

- Cold water passes through glass tubes where it is heated by sun energy.✓
- 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.✓ (Any 3) (3)

Alternative geyser system.

- The sun heats up the liquid in the glass tubes✓
- That heat up the element.✓
- The copper element heats up the water.✓

3.1.3 **The device that must be connected to energy source A to change the direct current to alternating current.**

Inverter✓ (1)

3.1.4 **Identify energy source C.**

Concentrated solar/Solar plant/Sun tower✓ (1)

3.2 **TWO disadvantages of a wind turbine's blades turning too fast.**

- The blades could be damaged.✓
- The rotor experiences too much strain.✓
- The structure could collapse.✓
- Noise pollution.✓
- Bird strikes (Any 2) (2)

3.3 **THREE geographical challenges that may arise during a survey for a geothermal energy power station.**

- Is the rock soft enough to drill through?✓
- Do the rocks deep down contain sufficient heat?✓
- Will this heat be sustainable for a significant amount of time?✓
- Is the environment fit for a power plant?✓
- Volcanic activities✓
- Accessibility/Difficult to locate✓
- Availability of water (Any 3) (3)

3.4 3.4.1 **An alternative racing fuel that can be used to supplement petroleum.**

Methanol✓ (1)

3.4.2 **THREE materials used to manufacture the alternative fuel (Methanol).**

- Woody plant fibre✓
- Methane gas in landfills✓
- Coal✓
- Natural gas✓
- Fermented waste products such as sewage and manure✓ (Any 3) (3)

3.5 3.5.1 **THREE disadvantages associated with a hydroelectric power plant.**

- Limited plant locations✓
- High initial costs✓
- Carbon emission✓
- Flood risk✓
- Susceptible to earthquakes/tremors✓
- Limited water resources✓
- Affects marine life✓
- High costs✓ (Any 3) (3)

3.5.2 **TWO reasons why hydroelectric power plants are limited in South Africa.**

- Water scarcity✓
- Inadequate water flow✓
- Non-sustainable water in rivers✓
- Inadequate land gradient✓
- High costs✓ (Any 2) (2)

[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1 4.1.1 **Parts A and B.**

A- Earth clamp/Clamp✓
B- Welding/gun/torch✓ (2)

4.1.2 **The apparatus that can be attached for welding aluminium.**

Push Pull torch✓ (1)

4.1.3 **TWO gases that can be used with MIG welding.**

- Argon✓
- Helium✓
- Mixture of Co2 and Argon✓ (Any 2) (2)

4.1.4 **THREE different metals that can successfully be welded with the MIG-welding machine.**

- High alloy steel (stainless alloys) ✓
- Aluminium✓
- Mild steel✓ (3)

4.2 4.2.1 **The material used for part A.**

- Tungsten✓
- Copper mounted hafnium✓
- Zirconium✓ (Any 1) (1)

4.2.2 **Description of the plasma cutting process.**

The process involves using a tungsten electrode, ✓ and high pressure plasma✓ (which is gas in an ionized state) to generate and carry an electrical arc between a copper nozzle and work piece.✓
The electrical arc performs the cutting, but the pressurized plasma helps to keep the cut cleared by removing the dross (metal impurities generated by the cutting).✓ (Any 3) (3)

4.3 **TWO types of metals that can be cut by using the oxy-acetylene.**

- Mild steel✓
- Cast iron✓
- Stainless steel✓
- Any ferrous metals✓ (Any 2) (2)

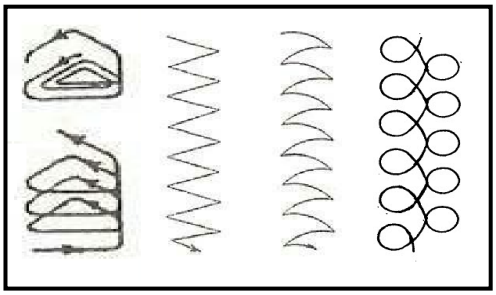
4.4 **Description of the process of shutting down an oxy-acetylene flame and bleeding the system.**

- Turn off the acetylene valve on the torch handle. This will extinguish the flame. ✓
- Turn off the oxygen valve on the torch handle.✓
- Shut/close the main cylinder valves clockwise on the top of both gas cylinders. ✓
- Now open the two valves on the torch handle to 'bleed' the system. ✓
- Turn both the oxygen and acetylene regulator handles counter-clockwise until they are loose. ✓
- Close both valves on the torch handle. ✓
- Put the handle and tips away, and return the gas cylinders and their hoses to their proper storage area. ✓ (Any 5) (5)

4.5 4.5.1 **Description of the process of vertical up arc welding.**

- A special electrode is used for vertical welding with an arc welder, makes the process easier as it 'freezes' more quickly.✓
- Amperage can be reduced slightly from the normal down hand setting.✓
- Tip of the electrode must be pointed upwards, so that the electrode forms an angle of up to 30° with the horizontal plane.✓
- Arc must be kept short and the speed must be just sufficient to prevent the molten metal from the puddle to run down.✓
- When welding up, very little lateral movements of the electrode must be made.✓ (5)

4.5.2 **Draw THREE different types of welding runs used for vertical welding.**



(Any 3 drawings) ✓✓✓ (3)

4.6 4.6.1 **Calculation of the volume of concrete needed.**
Formula: Volume= Length x width x height

2 500 mm x 1 200 mm x 250 mm✓ = 750 000 000✓mm³✓

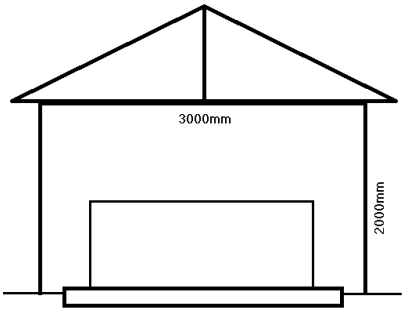
OR

2,5 m x 1,2 m x 0,25 m✓ = 0,750✓m³✓ (3)

(Allocate full marks if only the final answer is given)

4.6.2 **Design and sketch of a shelter to protect the generator from weather conditions. Show at least TWO measurements.**

Roof and construction✓✓	(2)
Poles (Uprights)✓	(1)
Measurements✓	(1)
Neatness✓	(1)



(5)
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QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 5.1.1 **TWO measures the farmer can apply to ensure that the maize will be harvested on time.**

- Making use of contractors.✓
- Working longer hours.✓
- Making use of bigger harvesting machines.✓
- Harvest until the rain start. ✓ (Any 2) (2)

5.1.2 **An alternative method that can be used, other than the combine harvester and justification.**

Hand harvesting/You can continue to harvest by hand whilst it is raining/ Use a tractor drawn harvester.✓

Justification: Combine harvester will be stuck in the field when soil is wet.✓

(Any 1) (2)

5.2 5.2.1 **THREE aspects to bear in mind when buying a new baler.**

- Price✓
- Local maintenance services✓
- Parts locally available✓
- Driving power needed for operation✓
- Type of baler✓
- Ease of operation✓ (3)
- Type of binding technique✓ (Any 3)

5.2.2 **THREE points to consider before buying a second-hand baler.**

- Reliability of the agent.✓
- Spare parts easily available.✓
- Well proven model.✓
- Guarantee from agent/seller.✓
- General wear and tear.✓

(Any 3) (3)

5.3 5.3.1 **Less space-consuming bale.**

A✓ (1)

5.3.2 **Justification for answer in QUESTION 5.3.1**

More bales can be stacked on a truck.✓
No gaps between the bales.✓ (1)
Bales are compact✓ (Any 1)

5.3.3 **The bale that can be wrapped.**

(1)

A or B✓

5.3.4 **A reason why baling process B can be used up until raining.**

Water runs down the bale/ bale can be stored outside.✓ (1)

5.3.5 **FIVE round-baler safety tips to young upcoming farmers.**

- Familiarise yourself with the operator's manual.✓
- Adequate training must take place.✓
- Ensure all safety screens are in place.✓
- Be watchful when backing up as baler is bulky and reduces vision to the rear.✓
- Avoid sharp turning.✓
- Assure no one is near the rear gate when it is being raised and lowered.✓
- Keep everyone clear of the rear of the baler during unloading.✓
- Large round bales can roll after discharge when on hilly terrain.✓
- Before servicing, cleaning, or adjusting a round baler, disengage the tractor PTO.✓
- Block the gate before working under it. Use the safety lock system for the baler.✓
- Keep the PTO properly shielded.✓
- Never allow passengers to ride on the baler during operation or transport.✓
- Be extremely cautious when operating a baler on uneven or hilly terrain.✓
- Raise the pickup to clear humps and obstacles when passing over uneven terrain.✓ (Any 5) (5)

5.4 5.4.1 **The type of belt best fitted on the pulley system and ONE reason for identifying it.**

V-belts✓

AND

- Does not easily slip off.✓
- Draw tighter around pulleys.✓
- No lubrication needed.✓
- Lasts longer.✓ (Any 1) (2)

5.4.2 **Changing the direction in which pulley A rotates.**

By twisting the belts.✓
Switch the motor to the other side.✓
Change the polarity of the motor.✓ (Any 1) (1)

5.5 5.5.1 **The different types of gears, A and B.**

A- Straight cut gear/ Spur gear✓
B- Helical gear✓ (2)

5.5.2 **Calculation and ratio of gear connection.**

Driver gear (128 teeth)
Driven gear (16 teeth)

Driver gear

Driven gear

= 128÷16 ✓
= 8 **:** 1 ✓✓ (3)

5.5.3 **ONE advantage and ONE disadvantage of each gearing system.**

GEAR	ADVANTAGE	DISADVANTAGE
Spur gear (A)	Easy to manufacture.✓ Cheaper to manufacture.✓ (Any 1)	Noisy.✓ Cannot use in synchronised gearbox.✓ Difficult to mash.✓ Subject to wear.✓ (Any 1)
Helical gear (B)	Lasts longer.✓ Easy to mash.✓ Less wear.✓ More contact point of teeth.✓ (Any 1)	Subjected to side thrust.✓ More expensive to manufacture.✓ (Any 1)

(4)

5.5.4 **The gear system to improve speed.**

A✓✓ (2)

5.6 5.6.1 **Cylinder types.**

A- Double (action) cylinder✓
B- Single (action) cylinder✓ (2)

5.6.2 **The cylinder best fitted on a front-end loader.**

A- Double action cylinder✓ (1)

5.6.3 **Explanation to support answer given in QUIESTION 5.6.2.**

It enables the operator to set the control lever in a down✓and upward thrust position.✓ (2)

5.6.4 **TWO reasons to justify the use of transmission oil in a tractor hydraulic system.**

- Not compressible✓
- Good lubrication qualities✓
- Not volatile✓
- Relatively cheap✓ (Any 2) (2)

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QUESTION 6: WATER MANAGEMENT

6.1 **Irrigation components and their function.**

6.1.1 Irrigation timer/Irrigation controller/Smart controller✓ (1)

6.1.2 An irrigation timer controls the flow of water by turning on and off.✓
Used for scheduling irrigation.✓ (Any 1) (1)

6.1.3 Electronic valve/ Solenoid valve/ Irrigation valve✓ (1)

6.1.4 An irrigation valve regulates the one-directional flow of water in an irrigation system.✓ (1)

6.1.5 Sprinkler/sprayer✓ (1)

6.1.6 An irrigation sprinkler drops water onto the land, mimicking the effects of rain.✓ (1)

6.2 6.2.1 **TWO reasons for determining the flow rate of the pump.**

- For correct calibrating of the sprayers.✓
- Effective scheduling of irrigation.✓
- To prevent the over/under utilisation of the water source. (Any 2) (2)

6.2.2 **Calculation of the flow rate.**

Flow rate = Content ÷ Time
= 10 000÷8✓
= 1 250 Litres/minute✓ (3)

6.3 **Type of device suitable to send the location.**

- GPS✓
- Cell phone✓
- Tablet
- Tablet (Any 1) (1)

6.4 6.4.1 **The irrigation system, best suitable for a land against steep slopes with motivation.**

- B✓

AND

- Prevents run off water.✓
- Pivots mainly used on level surfaces.✓
- Does not cause soil erosion.✓ (Any 2) (3)

6.4.2 **Reasons for preferring irrigation system A.**

- Not necessary to remove system.✓
- Can work with implements on land.✓
- Animals cannot damage system.✓
- Less time consuming.✓
- Less labour intensive.✓
- Remote control/management.✓
- Variable rate irrigation.✓ .. (Any 2) (2)

6.5 6.5.1 **The design error of the septic tank.**

The outlet is higher than the inlet.✓
No partition wall.✓
There will be a backflow of waste water.✓ (Any 2) (2)

6.5.2 **The importance of installing a manhole in a septic tank.**

- General maintenance✓
- Removing of solids✓
- Inspection✓
- Adding bacteria✓
- Unclogging of in/outlet✓ (Any 4) (4)

6.5.3 **Suitable drainage system to be connected to the septic tanks outlet.**

French drain✓
Pebble/stone drain✓
Drainage field✓ (Any 1) (1)

6.6 **The main cause of blockages in a town's sewage system.**

- The disposal of non-degradable materials.✓
- The lack of maintenance.✓
- Missing manhole lids.✓
- Root obstructions.✓
- Too many people using the system.✓ (Any 1) (1)

6.7 6.7.1 **The type of filter to connect with a water softener.**

A✓ (1)

6.7.2 **The filter that is installed to a micro irrigation system.**

F✓ (1)

6.7.3 **ONE example where the filter shown in C will be used.**

Micro irrigation✓
Swimming pool✓ (Any 1) (1)

6.7.4 **Correct statement.**

Filtration always takes place from the **outside**✓ to the **inside**✓ of the filter. (2)
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TOTAL SECTION B: 160
GRAND TOTAL: 200