



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

NOVEMBER 2017

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 13 pages.

SECTION A**QUESTION 1**

1.1	1.1.1	C✓✓	(2)
	1.1.2	A✓✓	(2)
	1.1.3	B✓✓	(2)
	1.1.4	A✓✓	(2)
	1.1.5	B✓✓	(2)
	1.1.6	D✓✓	(2)
	1.1.7	A✓✓	(2)
	1.1.8	C✓✓	(2)
	1.1.9	A✓✓	(2)
	1.1.10	B✓✓	(2)
		(10 x 2)	(20)
1.2	1.2.1	heated/ heat ✓✓	(2)
	1.2.2	heat/steam/thermal✓✓	(2)
	1.2.3	inverter✓✓	(2)
	1.2.4	movable✓✓	(2)
	1.2.5	reduces/decreases/prevent/stop ✓✓	(2)
		(5 x 2)	(10)
1.3	1.3.1	H✓✓	(2)
	1.3.2	G✓✓	(2)
	1.3.3	F✓✓	(2)
	1.3.4	A✓✓	(2)
	1.3.5	D✓✓	(2)
		(5 x 2)	(10)
TOTAL SECTION A:			40

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

2.1 2.1.1 **The minimum size of the warning sign for an electric fence.**

100 mm✓ x 200 mm✓ (2)

2.1.2 **The minimum distance between two separate electric fences with different energizers.**

2 m✓ (1)

2.1.3 **The depth that the earth electrode must penetrate into the soil when a high output energizer is used.**

1 m✓ (1)

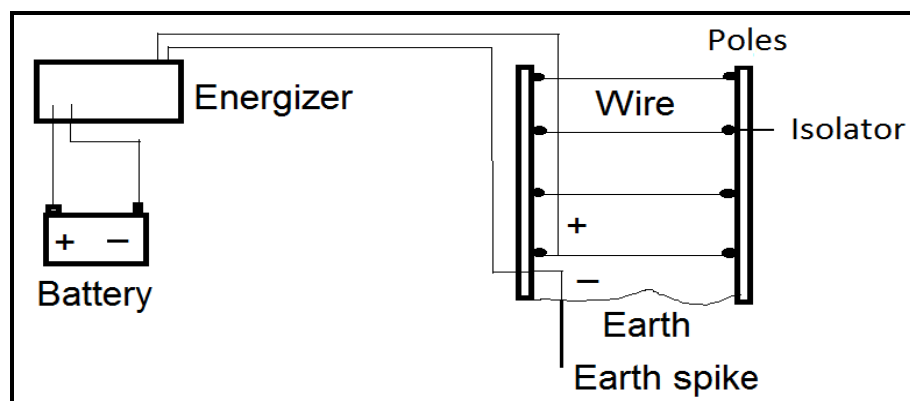
2.1.4 **Signs that show that an isolator is cracked.**

- It will make sparks✓ and thereby cause interference.✓
 - Visually see.✓
- (2)

2.1.5 **A method of protecting electric fence wires against rust.**

Galvanizing/copper coating✓ (1)

2.1.6 **A neat, labelled freehand drawing of an electric fence with all the various components.**



- One label✓
- Correct layout✓
- Components
 - Battery✓
 - Energiser✓
 - Poles✓
 - Wiring(+ and -)✓
 - Isolator✓
 - Earth spikes✓

(Any 4 components) (6)

- 2.2 2.2.1 **FOUR precautionary measures that must be followed when working with glass fibre.**
- Catalyst and accelerator should always be stored separately. (To avoid explosion)✓
 - 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.✓
 - Glass fibre matting has small pieces of fibre that can penetrate the skin.✓
 - Wear a mask to prevent breathing in glass fibre.✓
 - Wear eye protection.✓
- (Any 4) (4)
- 2.2.2 **THREE uses of glass fibre products on a farm.**
- Lawnmower body✓
 - Tractor and other machine cover parts✓
 - Drinking troughs✓
 - Feeding troughs✓
 - Water proofing✓
- (Any 3) (3)
- 2.3 2.3.1 **The term 'flammability' of an adhesive.**
- The adhesive must comply with the same properties if it is used to join synthetic materials where it is subjected to open flames or heat.✓✓ (2)
- 2.3.2 **Recommendations that will improve the cohesion properties of an adhesive.**
- Apply a thin base coat if the surface is very porous.✓
 - Apply only a thin layer of adhesive.✓
 - Apply adhesive to both surfaces.✓
 - Too thick layer of adhesive will result in a weak joint.✓
- (Any 2) (2)
- 2.4 2.4.1 **TWO applications of Vesconite on a farm.**
- Bushes✓
 - Wear strips✓
- (2)
- 2.4.2 **The melting point of Teflon.**
- 327 °C✓ (1)
- 2.4.3 **The reason for easily removing a Vesconite bush from a shaft or housing.**
- Vesconite is not subjected to electrolytic corrosion like traditional metallic bush materials.✓
 - Self lubricant.✓
- (Any 1) (1)

2.5 2.5.1 **A method of reducing magnetism in stainless steel if you also require tensile strength.**

Add chromium✓ or manganese to the stainless steel.✓

(Any 1) (1)

2.5.2 **THREE influences that nickel have on stainless steel.**

- It improves the amount of toughness.✓
- It gives steel a fair amount of toughness at low temperatures.✓
- Nickel helps to increase the hardening ability of steel.✓
- Steel which is alloyed with chromium and nickel is resistant to air, water and many chemical acids and alkali.✓

(Any 3) (3)

2.6 2.6.1 **The metal that is added to copper to form bronze.**

Tin✓

(1)

2.6.2 **TWO uses of phosphor bronze as a copper alloy.**

- Phosphor bronze is particularly suited to precision-grade bearings.✓
- Springs.✓

(2)

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QUESTION 3: ENERGY

- 3.1 3.1.1 **THREE environmental factors that must be considered before purchasing a wind turbine for use on a farm.**
- Surrounding topography.✓
 - Average wind speed.✓
 - Reliability factor of the prevailing wind.✓
 - Influence on animal life in the proximity of the wind turbine.✓
 - Enough space.✓
- (Any 3) (3)
- 3.1.2 **FOUR advantages of using wind energy to generate electricity on a farm.**
- Wind power has no fuel costs✓
 - Low maintenance costs✓
 - No taxation on carbon pollution.(emissions free)✓
 - Less expensive than other sources of alternative energy✓
 - Not any pollution✓
 - Renewable energy✓
- (Any 4) (4)
- 3.1.3 **This device can be installed in the wind turbine to increase the speed of the input shaft that drives the generator.**
- Gearbox✓ (1)
- 3.2 **FIVE technical factors that can prevent a photo voltaic system from functioning effectively.**
- Some electrons can be lost rendering the solar cell ineffective.✓
 - Electrons release heat which heats up the panel and interfere with the working of other solar activity.✓
 - The number of solar panels determines the efficiency of the system.✓
 - Cheaper components in the system can cause less productivity.✓
 - Solar cells should always be facing the direction of the sun.✓
 - The older a solar cell gets the more ineffective it gets.✓
 - Nearer to the equator, you will receive a slightly better output with a given cell.✓
 - Maintenance.✓
- (Any 5) (5)
- 3.3 **Function and working of an inverter in a 12 V system when you want to work with a 220 V electric drilling machine.**
- Inverter must increase the voltage from 12V✓ to 220V.✓
 - Inverter must change the direct current✓ to alternating current.✓
- (4)
- 3.4 **THREE plants that can be used to manufacture biodiesel.**
- Sunflower seed✓
 - Soya beans✓
 - Canola✓
 - Algae✓
 - Maize
 - Sugar
- (Any 3) (3)

[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

- 4.1 4.1.1 **TWO types of gases that can be used when cutting with the plasma-cutting machine.**
- Argon✓
 - Helium✓
 - Nitrogen✓
 - Oxygen✓
 - Regular air✓
- (Any 2) (2)
- 4.1.2 **The polarity of the plasma cutting machine earth clamp.**
- Positive✓ (1)
- 4.1.3 **TWO important personal safety items that must be worn for protection when performing plasma cutting.**
- Fireproof gloves✓
 - Face shield/goggles/safety glasses✓
 - Feet/Leg covers✓
 - Arm/Body covers✓
- (Any 2) (2)
- 4.2 4.2.1 **THREE types of metals that can be cut with an oxyacetylene cutting set.**
- Mild steel✓
 - Cast iron✓
 - Stainless steel✓
- (3)
- 4.2.2 **The procedures that must be followed to successfully weld with the oxyacetylene apparatus in the overhead welding position.**
- Process of lighting (1 mark)✓**
- Require a reduced melting pool, big enough to create the wanted penetration.✓
 - Done by reducing the size of the flame.✓
 - Use a slightly thicker welding rod.✓
 - Force of the flame will help to keep the molten metal positioned.✓
- (4)
- 4.3 4.3.1 **The type of shrinking that occurs at A and B.**
- A: Lateral shrinking✓
- B: Angular shrinking✓ (2)

4.3.2 THREE factors that can influence the shrinking of welding joints.

- Welding procedure✓
- Amount of welding✓
- Number of welding runs✓
- Degree of resistance✓
- Original state or condition of parts that must be welded✓

(Any 3) (3)

4.3.3 TWO measures that can be taken to control distortion of welding joints.

- Pre-setting✓
- Welding of patch work✓
- Clamping✓
- Spot welding✓

(Any 2) (2)

4.4 The process of vertical up arc welding.

- Welding upwards in a vertical position may prove to be a problem, because the molten metal of the puddle will tend to run down.✓
- A special electrode is used for vertical welding with an arc welder. It makes the process easier as it “freezes” more quickly.✓
- Amperage can be reduced slightly from the normal down hand setting.✓
- The tip of the electrode must point upwards, so that the electrode forms an angle of up to 30° with the horizontal plane.✓
- The arc must be kept short and the speed must be just sufficient to prevent the molten metal from the puddle to run down.✓
- Very little lateral movements of the electrode must be made when welding upwards.✓

(Any 4) (4)

4.5 The procedure that must be followed to prepare cast iron for the welding process.

- Use a pure nickel-welding rod.✓
- Amperage on machine must be set as low as possible.✓
- Arc must be a little longer than when welding mild steel.✓
- Make sure that all rust, grease, dirt and/or any other substances, which can weaken the join has been removed, before starting with the process of joining.✓
- Remember to remove the surface layer of the metal where the join is to be made.✓
- Vaseline in the cracks will colour the chalk that is used to mark the crack grey or show a wet line.✓
- Mark the line by means of a prick-punch and hammer to prevent the line from disappearing when grinding out the V-groove.✓
- Pre-heating of a casting to be welded can help to prevent it from forming new cracks.✓

(Any 6) (6)

4.6 4.6.1 THREE disadvantages of MIG welding.

- Higher initial setup cost.✓
- Atmosphere surrounding the welding process has to be stable (hence the shielding gases), therefore this process is limited to draught free conditions.✓
- Higher maintenance costs due to extra electronic components.✓
- The setting of machine variables requires a high skill level.✓
- Less efficient where high duty cycle requirements are necessary.✓
- Radiation effects are more severe.✓
- Difficult to transport around.✓

(Any 3) (3)

4.6.2 THREE possible causes of porosity when performing MIG welding.

- Gas flow too low or too high✓
- Blocked nozzle✓
- Leaking gas lines✓
- Draughty conditions
- Nozzles distance from work is too great✓
- Painted, wet or oily plate✓
- Wet or rusty electrode/wire✓

(Any 3) (3)
[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT**5.1 5.1.1 Name of component A.**

Cyclone/Dust/air outlet✓ (1)

5.1.2 The function of component A.

It separates the grounded material effectively from the air/dust release.✓

It separates the dust and grounded material✓ (Any 1) (1)

5.1.3 The function of the components of the hammer mill.

- A Screens: Determine the size of the final grounded product✓
 B Hammers: Pulverize the fodder✓
 C Fan: Blow the pulverized material through the screens✓ or to blow the dust out of dust release (3)

5.2 TWO essential personal protection clothing that must be worn when using the push lawnmower

- Safety boots/shoes✓
- Long pants/overall✓ (2)

5.3 The differences between Bale A and Bale B under the following headings in table form.

		BALE A	BALE B
5.3.1	Storage space	Storage space optimally utilized✓	Loss of space between bales✓
5.3.2	Bale handling	Bales handled manually✓	Bales handled with tractor✓
5.3.3	Rope consumption	Low rope consumption✓	High rope consumption✓

(6)

5.4 TWO functions of the slip clutch,

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

5.5 FOUR general problems that can occur when using the combine harvester.

- Loss of maize kernels due to blowers that is set incorrectly.✓
- Thresher that breaks the kernels.✓
- Too much foreign particles.✓
- Mechanical problems.✓
- Cannot use harvester when it has rained.✓
- Cannot harvest early in the morning because of dew.✓ (Any 4) (4)

5.6 5.6.1 **The mechanism that is used to hitch an implement to the tractor.**

Three point mechanism.✓ (1)

5.6.2 **The names of components A, B and C and the function of each.**

A Top link.✓ To lift or lower the rear of the implement.✓ (2)

B Levelling box.✓ To adjust the cross-angle of the implement in relation to the tractor.✓ (2)

C Draw bars/lifting arms.✓ To hitch the implement✓ (2)

5.7 5.7.1 **The reason for removing the air from a hydraulic system.**

- Air is compressible and will influence the operation of the system.✓ (1)
- Air lock✓ (Any 1)

5.7.2 **The side of the cylinder that is the strongest.**

A✓ (1)

5.7.3 **Explanation for the answer in Question 5.7.2**

Because of the area that is subjected to the oil pressure in the cylinder is larger on this side.✓ (1)

5.7.4 **Where this type of cylinder can be used and an explanation for the choice.**

Planter✓ Where movement is needed in both directions.✓ (2)

5.8 **THREE factors that can cause a decrease in the value of a tractor.**

- As soon as a tractor leaves the supplier it is second hand.✓
 - Wear on the engine, tyres etc.✓ (all acceptable answers)
 - New tractor models with better features come into the market.✓
 - Availability of parts after a couple of years.✓
 - Use/misuse of the tractor.✓
- (Any 3) (3)

5.9 **Calculation of the diameter of the driven pulley.**

$$N_a \times D_a = N_g \times D_g$$

$$4\,000 \times 70 = 2\,000 \times D_g \checkmark$$

$$D_g = \frac{4\,000 \times 70}{2\,000} \checkmark$$

Driven pulley diameter $D_g = 140 \checkmark$ mm✓ (5)

5.10 **An explanation of what will happen to the load on the left hand side if pulley A on the right hand side is turned clockwise.**

Load will be lowered.✓ (1)

[40]

QUESTION 6: WATER MANAGEMENT**6.1 Explanation of the basic steps that a farmer should follow in selecting a pump for a specific irrigation system.**

- Estimate the flow and pressure requirements according to the irrigation system.✓
- Make a decision on which pump will work best ✓
Rotary pump, centrifugal pump, submersible pump, turbine pump, jet pump etc.✓
- Do research on the different pump models and select a preliminary pump.✓
- Create a first draft irrigation design. This must be done to calculate the pressure and volume that the pump will supply.✓
- Return to the pump selection to ensure that the choice of the pump is the correct one and the most cost-effective.✓
- Cost of pump.✓

(Any 5) (5)

6.2 6.2.1 The design principles that are incorporated into the sprayers of the centre pivot system to ensure the equal distribution of water from the centre of the pivot to the outer end of the pivot.

- The holes of the sprayer nozzles are small near the centre and gets larger to the end of the pivot.✓
- A pressure regulator is installed on the down pipes to equalise/ regulate the water pressure in the system.✓
- Distance between the adjacent sprayers is further apart near the centre and closer together at the end of the pivot.✓
- Fine mist spray at the centre and a heavier drop at the end of the pivot.✓

(Any 3) (3)

6.2.2 The calibration of the water distribution system on a centre pivot is necessary by referring to the movement of the centre pivot and the lay out of the land.

- The centre pivot move in a circle.✓
- This means that the outer circle wheels cover a greater distance than the inner wheels.✓
- Thus the wheels in the outer circle must move faster than the wheels in the inner circles.✓
- Therefore the water distribution must be regulated to compensate for this unequal speed of the wheels along the length of the centre pivot.✓
- Topography/ gradient of the land.✓
- Type of soil.✓
- Kind of crop.✓

(Any 3) (3)

6.2.3 TWO common soil problems when water distribution is not correctly calibrated in an irrigation system.

- Soil can be washed away✓/Soil erosion✓
- Over or under irrigation✓
- Salination/soil become brackish (Salts)✓
- Fertilizers washed away/leaching of nutrients✓

(Any 2) (2)

6.3 6.3.1 **A device that can be used to determine soil water content and the necessity for such a device in irrigation management.**

Neutron Probe.✓ Soil water content must be determined to ensure optimum plant growth✓ and thus prevent over or under irrigation✓ that has an impact on profitability.✓

(4)

6.3.2 **Explanation of reason for measuring a crop's evapotranspiration**

The reason for measuring the tempo of water evaporation is to correctly calibrate water scheduling✓ of the centre pivot irrigation system according to the current weather conditions such as Wind, Temperature. Humidity.✓

(2)

6.4 **Calculation of the flow rate of water in a pipe delivery system when it takes 5 minutes to fill a 15 000 litre tank. Show ALL calculations.**

$$\begin{aligned}\text{Flow rate} &= \frac{\text{Content}}{\text{Time}} \\ &= \frac{15\,000}{5} \\ &= 3000 \text{ litres/minute} / 50 \text{ litre per second}\end{aligned}$$

(4)

6.5 6.5.1 **The name of the water purification system.**

Under counter water purification system or faucet purification system or household filtering system✓

(1)

6.5.2 **Description of the working of the water purification system.**

- Water is sent through three different size membranes.✓
- The first membrane catches the bigger particles and a second and third membrane catches the smaller particles.✓
- One of the three cartridges could also be a water softener.✓

(Any 2)

(2)

6.5.3 **The name of the process when water is cleaned by sending it through different liquids, separated by a thin permeable film which only allows water to pass through on a molecular level.**

Reverse osmoses✓

(1)

6.6 **Description of the breakdown process of household sewerage in the septic tank.**

- Sewerage is anaerobically broken down by bacteria.✓
- Very little solids remain when the watery sewerage flows to second tank.✓
- Only liquid sewerage water remains in second tank and access water flows through an overflow valve into the stone drain.✓

(3)

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TOTAL SECTION B: 160
GRAND TOTAL: 200