basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

NOVEMBER 2019

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 15 pages.

SECTION A

QUESTION 1

1.1	1.1.1	A✓✓	(2)
	1.1.2	B✓✓	(2)
	1.1.3	D✓✓	(2)
	1.1.4	C✓✓	(2)
	1.1.5	C✓✓	(2)
	1.1.6	A✓✓	(2)
	1.1.7	A✓✓	(2)
	1.1.8	A✓✓	(2)
	1.1.9	D✓✓	(2)
	1.1.10	B✓✓	(2)
			[20]
1.2	1.2.1	Penetrable/spongy/permeable✓✓	(2)
	1.2.2	Round/Cylindrical/Vermeer✓✓	(2)
	1.2.3	Hammers/Rotor✓✓	(2)
	1.2.4	Oil/Hydraulic✓✓	(2)
	1.2.5	Negative(Accept any relevant word to 'negative')✓✓	(2)
			[10]
1.3	1.3.1	A, E or H✓✓	(2)
	1.3.2	A✓✓	(2)
	1.3.3	A, E or H✓✓	(2)
	1.3.4	C✓✓	(2)
	1.3.5	B✓✓	(2)
			[10]

TOTAL SECTION A: 40

QUESTION 2: MATERIALS AND STRUCTURES

2.1 2.1.1 **The metal that can effectively be used for soldering.**

Copper/Brass/stainless steel/ mild steel✓ (1)

2.1.2 **The metal that will be the best for installation of warm water pipes in a farm house.**

Copper✓ (1)

2.1.3 **The material that is used to manufacture foil that is used to cover food.**

Aluminium✓ (1)

2.1.4 **THREE reasons why stainless steel is the best material that can be used to manufacture food processing equipment.**

- It is resistant against corrosion.✓
- It is harder than steel/tensile strength.✓
- It is resistant against air, water and chemical acids and alkali.✓
- Heat resistance. ✓
- Can absorb shock and vibration.✓
- Easy to clean. ✓
- Neutral to food. ✓
- Food lasts longer.✓
- Does not contaminate food.✓ (3)

2.2 **THREE factors that you must consider when identifying tin.**

- When heated in air, tin forms tin oxide (stannic oxide) which is feeble acidic.✓
- Pure white tin slowly tends to become grey powder.✓
- Tin is a silvery-white, soft, malleable metal that can be highly polished.✓
- Tin has a crystalline structure and when a tin bar is bent, a 'tin cry' is heard, due to the breaking of these crystals.✓
- It resists oxygen and water but dissolves in acids and bases.✓
- Exposed surfaces form an oxide film.✓ (Any 3) (3)

2.3 **TWO advantages of a tin/copper alloy compared to pure copper.**

- The alloy becomes harder than copper.✓
- It is more easily casted than copper.✓ (2)
- Strength.✓

2.4 **TWO properties of bronze.**

- Bronze resists corrosion. (especially seawater corrosion)✓
- Resists metal fatigue more than steel.✓
- Better conductor of heat and electricity than most steels.✓

- High electrical conductivity.✓
- Low-friction properties of bearing bronze.✓
- Resonant qualities of bell bronze.✓
- Bronze is a solid at room temperature.✓
- Bronze is copper-coloured.✓
- Bronze is odourless.✓
- Bronze has melting point of ~950 degrees Celcius to 1050 Degrees Celcius.✓
- Bronze is ductile.✓
- Bronze has low friction properties.✓
- Lasts longer

Brownish red in color. ✓ (2)

2.5 **TWO important aspects that must be considered when an adhesive is to be chosen for a specific application.**

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

2.6 **FOUR precautionary measures that must be taken into account when working with glass fibre.**

- Catalyst and accelerator should always be stored separately. (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.✓
- Don't breath in glass fibre or get it in your eyes.✓ (Any 4) (4)

2.7 **FOUR properties of Vesconite that makes it suitable to be used in marine applications.**

- Vesconite has the lowest rates of wear. Even in dirty and un-lubricated conditions.✓
- Vesconite gives long life with low maintenance and low friction.✓
- Vesconite is ideal for many marine applications. Water is an excellent lubricant for Vesconite.✓
- Vesconite is dimensionally stable/strong.✓
- Vesconite will not swell and seize or soften and wear under water like nylon.✓
- Vesconite's internal lubricants make it well suited to upper rudder bearing applications where there are long periods between greasing.✓
- Long wear life. Vesconite gives up to ten times the service life of phosphor bronze in poorly lubricated conditions.✓
- Vesconite bearings may be machined to the correct clearance without fear of swelling.✓
- Easy to remove and replace.✓ (Any 4) (4)

2.8 2.8.1 **Explanation of the function of the electric wires shown by arrow A.**

The function of the wires is to connect both the positive and the negative wires adjacent to the gate to the wires on the other side of the gate ✓so that there is a continuous circuit in the fence when the gate is opened. ✓ (2)

2.8.2 **Name of the component of the electric fence shown by arrow B and an explanation of its function.**

Earth return spike/Ground spike.✓
The negatively charged spike creates a path through the ground when an animal touches the positive wires of the fence. The animal is the missing link in order to complete the loop.✓ (2)

2.8.3 **FOUR safety precautions applicable to electric fencing on the farm.**

- Install warning signs.✓
- No barbed wire must be electrified.✓
- Electric fences shall be installed and operated so that they cause no electrical hazard to persons, animals or their surroundings.✓
- Electric fence constructions, which are likely to lead to entanglement of animals or persons, shall be avoided.✓
- An electric fence shall not be supplied from more than one energizer.✓
- Current/amperage not be higher than 0,002 Amp.✓
- Voltage not to be higher than 10 000 Volts.✓
- The gap between two separate electric fences with different energizers shall be at least 2 m.✓
- If this gap is to be closed, this should be affected by means of an electrically non-conductive material.✓ (Any 4) (4)

2.8.4 **The procedure that must be followed when the earth system of an electric fence is being tested.**

- Firstly short out the live fence line to ground.✓
- Switch the energizer ON.✓
- Measure the voltage between the ground and the earth spike with a meter.✓
- If this is above 200 volts the earth installation is inefficient.✓
- Check the connections or increase the number of earth spikes.✓
- If you get a shock from the earth spike before you short the fence line, then there is a poor Earth **AND** possibly a fault on the fence line as well. (Check for vegetation on the line or faulty insulators).✓ (4)

[35]

QUESTION 3: ENERGY

3.1 3.1.1 **Explanation of how electricity is generated with the solar panel.**

- There needs to be some form of solar cell or panel.✓
- The solar panels are made of a semi conductive material; the most common material is silicon.✓
- The semi-conductive material contains electrons which are quite happy just sitting there.✓
- When photons (contained within the sun's rays) hit the solar cells, ✓ the electrons absorb this solar energy, transforming them into conduction electrons.✓
- If the energy of these photons is great enough, then the electrons are able to become free, and carry an electric charge through a circuit to the destination.✓ (5)

3.1.2 **FOUR possible reasons for a solar panel not working to its full potential.**

- Some electrons may be lost.✓
- When the electrons release heat; the panel also becomes warm, interfering with other aspects of the solar cells.✓
- Number of solar panels determines the efficiency of the system.✓
- Expensive technology produces energy more efficient than cheaper ones.✓
- Location of installation.✓
- Objects blocking the sun's rays.✓ (Any 4) (4)

3.2 **Explanation of the working of a geothermal power station from the moment that a geo thermal energy source is discovered to the point that electricity is delivered by the power station.**

- Deep holes are drilled into the earth into the geothermal hot spot.✓
- A pipe is installed inside the hole which allows hot steam to rise up to the surface.✓
- The pressurized steam is then channelled to a turbine which begins to turn under the force of the steam.✓
- This turbine is linked to the generator and so the generator also begins to turn, generating electricity.✓
- The cool water is then pumped down a new pipe where the water is again heated by the earth and then sent back up the first pipe to repeat the process.✓ (5)

3.3 **THREE advantages that wind as an alternative energy source has to a farmer that has no access to the national electricity grid.**

- Wind power has no fuel costs.✓
- Low or negligible maintenance costs.✓
- Wind power has no clean-up costs.✓
- Wind energy has no carbon tax costs.✓
- Farmer can produce his/her own electricity for powering electric equipment.✓ (Any 3) (3)

3.4 **TWO types of vegetable oils that can economically be used to manufacture bio-fuels.**

- Soya oil.✓
- Canola oil.✓
- Sunflower oil.✓
- Peanut oil.✓
- Pecan nut oil.✓
- Avocado pear oil ✓ (Any 2) (2)

3.5 **The alternative fuel that can be manufactured from methane gas to supplement gasoline.**

Methanol.✓ (1)
[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

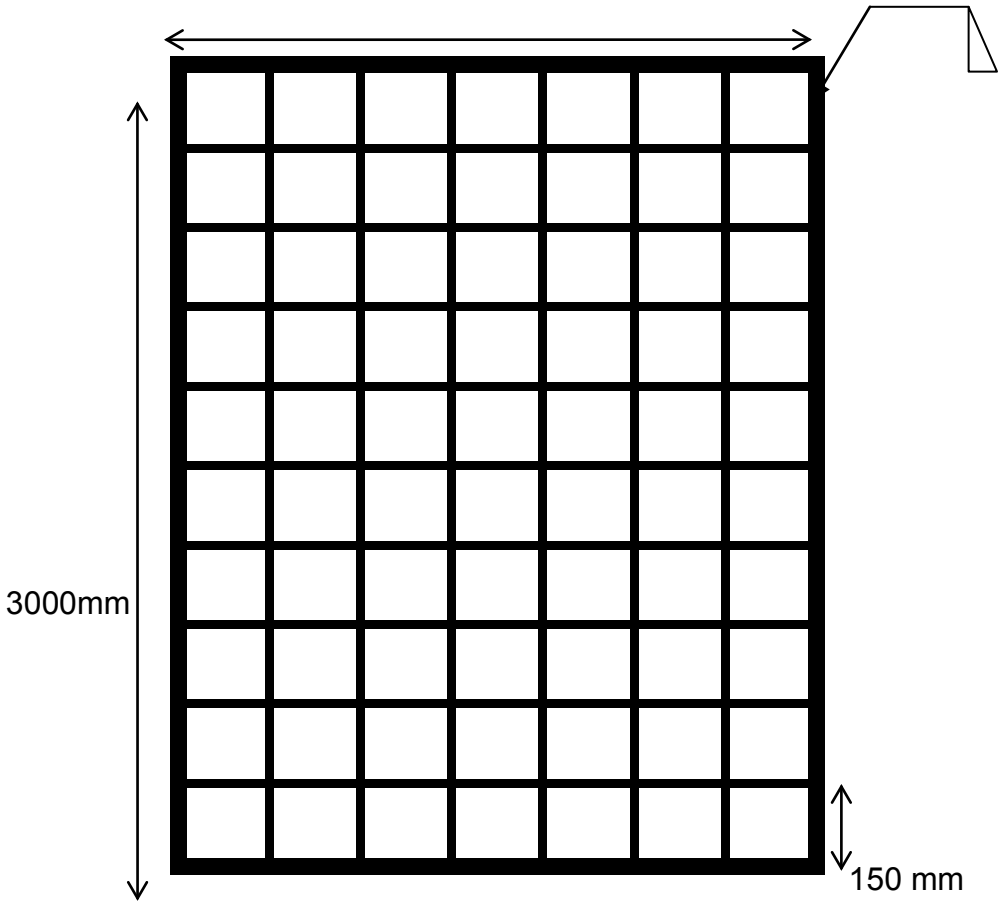
4.1 4.1.1 **The steps that must be followed when replacing the damaged contact tip on the MIG handset.**

- Unscrew the welding shield cup.✓
- Unscrew the bad welding tip.✓
- Slide a new tip into place.✓
- Screw the new tip on.✓
- Replace the welding cup.✓ (5)

4.1.2 **THREE disadvantages of MIG welding.**

- Higher initial setup cost.✓
- No gas, no welding.✓
- Harmful fumes.✓
- Difficult to move around.✓
- Atmosphere surrounding the welding process has to be stable (hence the shielding gasses); therefore this process is limited to draught free conditions.✓
- Higher maintenance costs due to extra electronic components.✓
- The setting of plant variables requires a high skill level.✓
- Less efficient where high duty cycle requirements are necessary.✓
- Radiation effects are more severe.✓ (Any 3) (3)

4.2 4.2.1 Neatness of sketch.✓ (1)
4.2.2 Any Applicable measurement.✓ (1)
4.2.3 Any Applicable welding joint.✓ (1)



4.2.4 **Material list.**

Pflat bar 2 of 3 000mm = 6m✓
2 of 2 100mm = 4,2m✓
10,2m

Round bar 13 of 3 000mm = 39m✓
19 of 2 100mm = 39.9m✓
78,9m (4)

4.2.5 **Cost.**

Flat barl. 10,2m x R5 = R51,00✓
Round bar 78,9m x R3 = R236,70✓
Total cost = R287,70✓ (3)

4.3 **Explanation of the term hard-facing of a worn part.**

- It is the process by which worn parts can be built up by padding with a wear resistant metal.✓
- The type of hard-facing and type of electrode used are determined by the service requirements of the parts concerned.✓ (2)

4.4 **Description of the overhead arc welding process from the moment that the arc is struck.**

- Use an arc as short as possible.✓
- When molten metal starts dripping, the amperage should be reduced slightly.✓
- Move electrode slightly faster.✓
- Hold electrode in same position as in relation to the base metal.✓
- Weld a number of runs without any lateral movement.✓
- Chip away slag and clean the weld.✓ (Any 5) (5)

4.5 4.5.1 **FOUR advantages of the plasma cutting apparatus.**

- Faster cutting speed.✓
- Wide range of materials and thickness.✓
- Easy to utilize.✓
- Economical.✓ (4)

4.5.2 **Description of the cutting process when using an oxy-acetylene apparatus.**

- First bring the material up to red hot.✓
- Oxygen is then fed with the lever on the cutting attachment.✓
- The steel actually ignites giving of more heat to keep the process going.✓
- The steel turns into a liquid.✓
- The iron liquid is cleared from the cut by pressure from the oxygen stream.✓ (Any 3) (3)

4.5.3 **THREE types of metals that can be cut with an oxy-acetylene cutting apparatus.**

- Mild steel.✓
- Cast iron/Iron.✓
- Stainless steel.✓ (3)

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QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 **FIVE safety precautions regarding the use of a ride on rotary lawn mower.**

- Read and understand the operator's manual.✓
- Remove all debris from lawns before mowing.✓
- Use recommended PPE.✓
- 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.✓
- Do not allow bystanders and children near the machine.✓ (Any 5) (5)

5.2 5.2.1 **Part fitted between the tractor and the baling machine.**

- PTO (Power Take Off shaft)✓ (1)

5.2.2 **Description of the maintenance of the baling machine at the end of the baling season.**

- Remove all bales from baling chamber.✓
- Clean the baler properly.✓
- Drain and replace all oil.✓
- Releases the tension on all drive belts.✓
- Remove all chains, clean and oil them, and replace them.✓
- Dismantle all slip clutches, clean them and reassemble them but do not put the springs under tension.✓
- Totally reduce bale chamber tension.✓
- Cover all unpainted areas with a thin layer of grease.✓
- Grease all grease nipples.✓
- Store baler in a dry place under cover.✓ (Any 5) (5)

5.2.3 **Description of the working and construction of the universal joint that is installed in the drive mechanism of the baling machine.**

- It allows the shaft to work at an angle.✓
- It is commonly used in shafts that transmit rotary motion.✓
- It consists of a pair of hinges located close together, oriented at 90° to each other, connected by a cross shaft.✓ (3)

5.2.4 **The type of hydraulic cylinder that will be suitable for the lifting and lowering of the machine's pick-up wheel with a motivation.**

- A double acting cylinder.✓
- This type of cylinder allows both push and pulls forces✓ to lower or lift the pick-up wheel.✓ (3)

5.3 5.3.1 **The function of the bearing shown.**

- Constrains relative motion between moving parts.✓
- Provides for free linear movement of the moving part.✓
- For free rotation around a fixed axis/shaft.✓
- It is machine part that allows one part to bear (i.e., to support) another.✓ (Any 2) (2)

5.3.2 **Description of the aspects that must be considered when maintenance and lubrication is carried out on bearings.**

- Bearings require periodic maintenance to prevent premature failure.✓
- Bearings need periodic lubrication and cleaning.✓
- May require adjustment to minimize the effects of wear.✓
- Use correct type of lubricant.

(Any 2) (2)

5.4 **THREE precautionary measures for the safe transportation of tractors on public roads.**

- Watch out for traffic hazards.✓
- Know equipment clearance requirements.✓
- Know the size and weight of the equipment.✓
- Secure tractor.✓
- Put on SMV (slow moving vehicle) sign.✓
- Indicate *'Abnormal load'* ✓
- Lock brake pedals together.✓
- Consider condition of the road.✓ (Any 3) (3)

5.5 5.5.1 **Calculation of the gear ratio if the large drive gear has 54 teeth and the small driven gear has 18 teeth. (Show all calculations).**

$$\text{Gear Ratio} = \frac{\text{Drive gear}}{\text{Driven gear}}$$
$$= \frac{54}{18}$$✓✓
The gear ratio is 1:3✓✓

(4)

5.5.2 **The direction that the small gear will turn if the large gear turns clock-wise.**

Anti-clockwise.✓ (1)

5.5.3 **How to asist the two gears to turn in the same direction.**

Install an idler gear between the two gears.✓ (1)

5.6 **THREE reasons for installing a differential in the rear axle of a tractor.**

- Changing direction of rotation.✓
- Speed reduction.✓
- Dividing rotation equal between the rear wheels.✓
- To change the drive system in a ninety degree angle. (3)

5.7 **TWO running expenses associated with a tractor that must be considered when drawing up a farm budget.**

- Repairs/Maintenance.✓
- Oil.✓
- Fuel.✓
- Grease.✓
- Labour.✓ (Any 2) (2)

5.8 **Explanation of why it is better for the operator to keep the loaded bucket low to the ground rather than raised up to the highest point.**

- In the raised position, the tractor is less stable and the potential for side overturn increases.✓
- As the load is lifted, the centre of gravity gets higher and the potential for the tractor to roll down the hill increases.✓
- The chance of side overturns increases when carrying a load on the front-end loader, especially on slightly rough ground.✓
- Moving the centre of gravity forward causes a transfer of weight from the rear wheels to the front, making it much easier to bounce a rear tyre off the ground when passing over bumps or holes.✓
- Plus, the additional weight on the front tyres may exceed the axle and tyre load-carrying capacity.✓ (5)

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QUESTION 6: WATER MANAGEMENT

6.1 **Identification of the instruments shown below as used in irrigation scheduling.**

A. Evaporation pan.✓
B. Anemometer/Windspeed meter.✓ (2)

6.2 **THREE problems associated with irrigation on commercial farms.**

- Competition for surface water rights.✓
- Depletion of underground aquifers.✓
- Lack of rain.✓
- Expensive to maintain/repair.✓
- Ground subsidence.✓
- Water rights.(Legislature)✓
- Under irrigation or irrigation giving only just enough water for the plant.✓
- Over irrigation because of poor distribution uniformity.✓
- Chemicals may lead to pollution.✓
- Irrigation with saline or high-sodium water may damage soil structure.✓

(Any 3) (3)

6.3 **TWO instances where a travelling sprinkler gun may be used more effectively than a side roll irrigation system.**

- Sport fields.✓
- Parks.✓
- Gardens.✓
- Cemeteries.✓
- Small farms.✓
- Pastures with obstacles. ✓

(Any 2) (2)

6.4 6.4.1 **TWO reasons for dividing irrigation fields into zones.**

- The crop that is planted has different water needs because it is not planted at the same time.✓
- There is not enough water available to run the system over the entire area at once.✓
- Saves water.✓
- Saves electricity.✓
- Type of soil.✓ (2)

6.4.2 **The type of irrigation control system can be used on the centre pivot to apply water efficiently to the different zones?**

Computer technology/Variable-flow technology/Irrigation timer.✓ (1)

6.5 **THREE reasons for a centre pivot to run out of line.**

- Mechanical failure.✓
- Electrical failure on one of the towers.✓
- Get stuck in the mud.✓
- Wheel puncture.✓
- Structural failure.✓
- Strong winds.✓

(Any 3) (3)

6.6 **THREE methods a farmer can use to test the moisture content of soil.**

- Feel method.✓
- Gravimetric.✓
- Neutron probe.✓
- Moisture meter. (3)

6.7 6.7.1 **FIVE components of a home sewerage treatment system.**

- Manhole
- House sewer/Toilet/Kitchen sink/piping system.✓
- Septic tank.✓
- Distribution box.✓
- Absorption field.✓
- Cesspools.✓ (5)

6.7.2 **Explanation of what causes the destruction of micro-organisms in a home sewerage treatment system.**

- Excessive quantities of detergents, laundry waste, bleach, household chemicals, and caustic drain openers.✓
- Garbage disposal grinds which substantially increase the accumulation of solids.✓
- Disposal of items not biodegradable in the system (plastics etc.).✓
- Disposal of excessive amounts of grease and fats, which are biodegradable but need particular types of bacteria to digest them.✓
- Disposal of cigarette butts and sanitary napkins which are also biodegradable but are not readily decomposable.✓
- Too many people using a smaller/inadequate or failing system.✓ (Any 5) (5)

6.8 **Description of French drainage system.**

Installed around the foundation perimeter of a house or building ✓to channel the water away from the structure.✓ (2)

6.9 **Explanation of TWO reasons for the farmer to be able to determine the flow rate in a water pipe delivery system.**

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

[30]

TOTAL SECTION B: 160
GRAND TOTAL: 200