



# basic education

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

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**AGRICULTURAL TECHNOLOGY**

**NOVEMBER 2015**

**MEMORANDUM**

**MARKS: 200**

**This memorandum consists of 17 pages.**

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

1.1	1.1.1	D✓✓	(2)
	1.1.2	B✓✓	(2)
	1.1.3	D✓✓	(2)
	1.1.4	D✓✓	(2)
	1.1.5	A, B, C✓✓	(2)
	1.1.6	A✓✓	(2)
	1.1.7	A✓✓	(2)
	1.1.8	B✓✓	(2)
	1.1.9	B✓✓	(2)
	1.1.10	A✓✓	(2)
			(10x2) (20)
1.2	1.2.1	Nickel✓✓	(2)
	1.2.2	Anaerobic bacteria✓✓	(2)
	1.2.3	Levelling box✓✓	(2)
	1.2.4	Global Positioning System(GPS)✓✓	(2)
	1.2.5	Generator✓✓	(2)
			(5x2) (10)
1.3	1.3.1	D✓✓	(2)
	1.3.2	F✓✓	(2)
	1.3.3	A✓✓	(2)
	1.3.4	E✓✓	(2)
	1.3.5	C✓✓	(2)
			(5x2) (10)
<b>TOTAL SECTION A:</b>			<b>40</b>

**SECTION B****QUESTION 2: MATERIALS AND STRUCTURES****2.1 2.1.1 Material added to copper:**

- a) Zinc✓
  - b) Tin✓
- (2)

**2.1.2 TWO methods to permanently join copper products.**

- Soft soldering✓
  - Brazing✓
  - Silver soldering
- (Any 2) (2)

**2.1.3 A substance that can dissolve tin.**

- Acids✓
  - Base
- (Any 1) (1)

**2.2 2.2.1 TWO most important aspects when choosing an adhesive.**

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

**2.2.2 Preparation of diesel tank for adhesive.**

Clean the surface area around the crack with a cloth and sand it lightly until there are no more signs of dirt, rust or diesel fuel before applying the adhesive.✓

(Any 1) (1)

**2.3 2.3.1 Delamination ability (Vesconite)**

Delamination cannot occur because liquid cannot penetrate the bearing layers that can cause it to peel or break off,✓ creating weaknesses and uneven surfaces.✓

(2)

**2.3.2 Friction ability**

Vesconite has a low static and dynamic friction✓ which remains in tough working environments; whether dry or wet, lightly or heavily loaded.✓

(2)

**2.3.3 Corroding ability**

Vesconite is not subjected to rust,✓ acid- and electrolytic corrosion.✓

(2)

2.4 2.4.1 **TWO methods of preventing lightning damage to the electric fence energizer.**

- Install lightning protectors/arrestor.✓
  - Switch off all electricity during thunderstorms.✓
- (2)

2.4.2 **The procedure when testing the earthing system of an electrical fence.**

- Firstly short out the live fence line to ground, ✓ either with a metal stake or by laying the fence line on the ground for about 100 meters and at least 30 meters away from the energizer.✓
- 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.

(Any 4) (4)

2.4.3 **Description of the earth return system of an electric fence and TWO probable causes of a voltage drop in the electric fence loop.**

- As with all energizers there must be a return path through the ground and earth spike back to the energizer in order to complete the loop.✓
- Always bear in mind that all electrical circuits must form a complete loop from the positive (live) to the negative (earth) and is just as much part of the circuit as the fence line and the **animal** is the missing link that completes the loop.✓
- **Vegetation** will also complete the loop causing the output voltage of the energizer to drop. Therefore it is very important to keep any growth on the line to a minimum to ensure the animal receives the maximum shock from the energizer.✓
- **Short circuit** ( defective energiser, cracked isolator, wires touching the ground/uprights and)

(Any 2) (2)

2.5 2.5.1 **The correct type of fence wire for an electric fence.**

Steel wire✓ (1)

2.5.2 **The prescribed minimum thickness of the wire used for an electric fence.**

1.5 - 3 mm✓ (1)

2.5.3 **TWO methods to protect the bare electric wires of an electric fence from corrosion.**

- Tinning✓
- Galvanizing✓
- Electroplating

(Any 2) (2)

2.6 **FOUR safety requirements for insulating material used on the ceiling.**

- Must not be harmful or dangerous to people when inhaled or touched.✓
- Should not burn easily.✓
- Rodents and insects must not be able to eat it or build their nests in it.✓
- Should be light.✓

(4)

2.7 **Four components in logical sequence of use.**

- A) Solar panel✓
- B) Solar regulator✓
- C) Battery✓
- D) Inverter DC-AC✓

(4)  
**[35]**

**QUESTION 3: ENERGY****3.1 Description of the function of the wind turbine parts:****3.1.1 Propeller blades**

The blades are shaped like aeroplane wings to catch the wind and turn a large rotor.✓

(1)

**3.1.2 Main shaft**

The main shaft is connected to the rotor and **transfers** the turning motion from the rotor to the **generator**.✓

(1)

**3.1.3 Gearbox**

To regulate the speed of the generator.✓  
Decrease or increase speed

(1)

**3.1.4 Generator**

The generator converts mechanical energy **into direct current** electrical energy.✓

(1)

**3.2 3.2.1 TWO types of energy that sun rays consist of and a method that can be used to harness each.**

- Light energy✓ - Photo voltaic cells✓
- Heat energy✓ - Solar hot water panel/solar cooking systems✓

(2)

(2)

**3.2.2 TWO factors that determine the efficiency of a solar electric cell.**

- The cell is defective.✓
- 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 energy technologies produce more efficient than cheaper ones.
- Location/orientation of the cell.
- Obviously nearer the equator, you will receive a slightly better output.
- Solar panels should always be facing the direction of the sun/north.
- No objects blocking the sun's rays. (Trees, mountains, buildings)

(2)

(Any 2)

**3.2.3 Device used to change the direct current of the solar cell into useful alternating current.**

Inverter✓

(1)

**3.3 TWO problems with geothermal energy.**

- Pumping too much cold water into the geothermal energy source, as this will cool the source.✓ (Rock deep inside the earth)
- Escaping gasses from deep within the earth's centre.✓

(2)

**3.4 THREE disadvantages of biofuel.**

- Low energy output of the fuels.✓
- The production cost of the fuel is currently very high.✓
- Certain food crops like maize are needed to make them which may lead to an imbalance in the production of certain crops.✓
- There is a huge quantity of water required to grow the crops which may affect the local water resources.
- The more land to produce crops for bio-fuels, the more habitats will be lost for animals and wild plants.
- If bio-fuel becomes lucrative for farmers, they may grow crops for bio-fuel production instead of food production.
- Less food production will increase prices and cause a rise in inflation.

(Any 3) (3)

**3.5 Description of *ethanol* and *methanol*.**

Ethanol

Is made by fermenting✓ and then distilling starch and sugar crops: maize, sorghum, potatoes, wheat, sugar-cane, cornstalks, fruit or vegetable waste.✓

(2)

Methanol

Is made from woody plant fibres, coal or natural gas.✓ It is used primarily as a supplement to gasoline. It can be harvested from the methane gas in landfills in addition to fermented waste products such as sewage and manure.✓

(2)

**[20]**

**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES****4.1 THREE safety hazards**

- Not a proper welding helmet, ✓
- with no proper safety glasses, that should be placed over his face. ✓
- He should wear safety clothes, leather apron and a fire retardant overall. ✓
- He is not supposed to hold welding rods in his other hand while welding.
- He must look where he weld.

(Any 3) (3)

**4.2 4.2.1 The type of metal that the cutting nozzle is manufactured from.**

Copper ✓

(1)

**4.2.2 FOUR hints to ensure good quality welding joints when oxy-acetylene welding is done in the OVERHEAD welding position.**

- A reduced melting pool is required, big enough to create the wanted penetration. ✓
- Reduce the size of the welding flame. ✓
- Use a slightly thicker welding rod. ✓
- Increase the force of the welding flame a little bit as this will help to keep the molten metal positioned. ✓

(4)

**4.3 Welding defect that is caused during MIG-welding.**

4.3.1 Porosity ✓

4.3.2 Lack of penetration ✓

4.3.3 Spatter ✓

4.3.4 Undercutting ✓

(4)

**4.4 MIG-welding process from the moment the arc is struck until the torch trigger is released.**

- The heat produced by the short circuit/weld arc, ✓ along with a non-reactive (hence inert) gas ✓ helps to melts the metal and allows them to mix together. ✓
- Once the heat is removed, ✓ the metal begins to cool and solidify, and forms a new piece of fused metal. ✓
- No slag is formed because of the absence of a flux.

(Any 5) (5)

**4.5 TWO gasses that can be used as a MIG shielding gas.**

- Argon ✓
- Helium ✓
- Carbon dioxide
- Argon and CO<sub>2</sub> mixture

(Any 2) (2)



4.6 4.6.1 **A material list for the gate.**

- 1) Square tubing 19 mm x 7 600 mm✓
- 2) Round bar rods of Ø 12 mm x 16 000 mm✓
- 3) 2 x Hinges✓
- 4) 1 x Lock✓

(4)

4.6.2 **Total cost of the materials for the safety gate.**

Square tubing: 7 600 mm x R 25.00=R 190.00✓

Round bar: 16 000 mm x R 6.00= R 96.00✓

Lock: 1 x R 80.00✓

Hinges: 2 x R 10.00 = R 20.00✓

Total cost: R 386.00✓

(Calculations must correlate if the learners design differs from given measurements.)

(5)

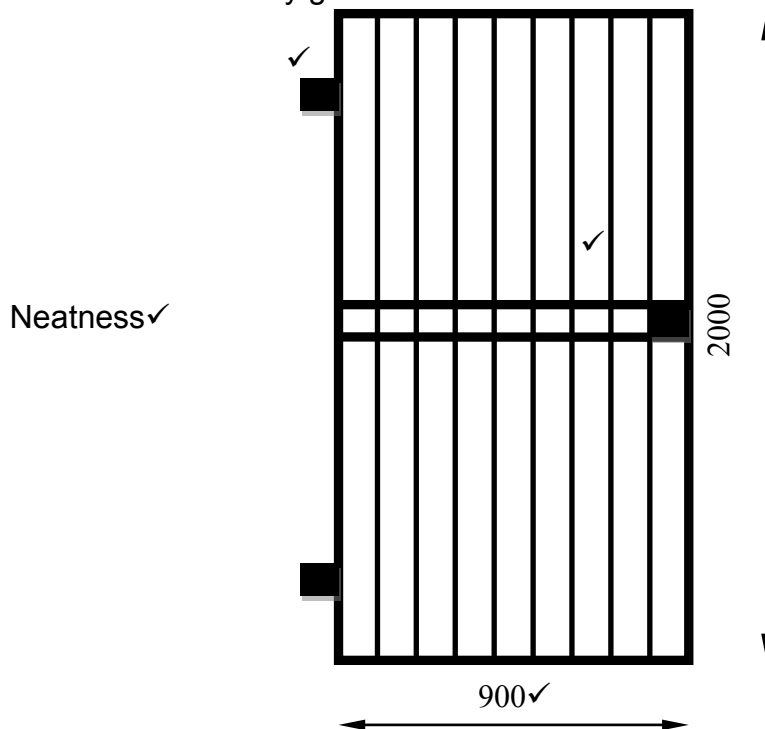
4.6.3 **Neat sketch of the safety gate with the parts**

Marks will be allocated for the following :

Hinges	(1)
Lock	(1)
Measurements	(1)
Neatness	(1)

(4)

Sketch of the safety gate.



4.7 **Gas to be used.**

4.7.1 Air/Oxygen✓ (1)

4.7.2 Argon or Hydrogen✓ (Any 1) (1)

4.7.3 Nitrogen✓ (1)

**[35]**

**QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT**5.1 5.1.1 **Mechanism indicated by the arrow.**

Slip clutch✓

(1)

5.1.2 **TWO reasons for installing the mechanism indicated by the arrow in the driveline of the cutting machine.**

- Prevent machine from further damage when blade mechanisms are obstructed.✓
- Protect the machine from braking teeth or blades when a solid object is struck.✓
- Protect the machine when breakages occur.
- Protect the machine when overloading of cutting mechanisms occurs.

(Any 2)

(2)

5.1.3 **TWO procedures that must be followed when the cutting machine is stored for a long period.**

- Remove all grass from the machine.✓
- Clean the cutting machine properly.✓
- Drain and replace all oil.
- Release 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.
- Cover all unpainted areas with a thin layer of grease.
- Grease all grease nipples.
- Store cutting machine in a dry place and under cover.

(Any 2)

(2)

5.2 5.2.1 **Bale forming mechanism of each baler.**

Baler A Vermeer has belts/chains. Baling chamber enlarges with the forming of the bale.✓

Baler B Welger has rollers. Rollers roll the hay inside the baling chamber. The baling chamber stays the same size.

(2)

**5.2.2 TWO safety precautions when baling is done against a slope or hillside.**

- Bales on a slope have the potential to roll down the hill, break through fences and cross highways.✓
- Always orient the bale correctly before ejecting the bale from the bale chamber.✓
- Sometimes this just means backing the baler at the right angle to eject the bale perpendicular to the slope.
- The objective is to make certain that the bale will come to rest securely on the hillside.
- Steep slopes may require that the bale be hauled to a flat location before ejection.

(Any 2) (2)

**5.3 The role of advanced technological devices, like computers and satellite.**

- Enable the tractor to drive by itself in a straight line with the aid of satellite navigation.✓
- Computers help you to identify problems in the mechanics of the tractor that can prevent damage to tractor systems.✓
- Computers analyse data from the mechanics and make corrections.
- GPS are used to determine exact coordinates.
- Computers analyse data from the environment.
- Computers analyse data from the drawn implements. (VRT Spreaders)
- Easier to make precise contours.

(Any 2) (2)

**5.4 5.4.1 Sources for reliable information on tractor oil.**

- Consult the workshop/operation manual.✓
- Internet.
- Tractor sale agent/cooperation or service station.

(Any 1) (1)

**5.4.2 THREE advantages of the use of automatic transmission oil.**

- Not compressible.✓
- Good lubrication qualities.✓
- Remains liquid over a large temperature range.✓
- Not volatile.
- Relatively cheap.
- Easily conductible in pipes.
- Flow through filters, pipes, oil pumps and cylinders with ease.
- Contains detergents that keep parts clean.

(Any 3) (3)

- 5.5 5.5.1 **Parts A and B.**
- A Top link✓
  - B Levelling box✓
- (2)
- 5.5.2 **The working of part C.**
- The driver of the tractor manoeuvres the control lever✓
  - that activates the hydraulic system that lifts the two arms and the attached implement.✓
- (2)
- 5.6 5.6.1 **TWO ways in which a tractor’s mass displacement can be positively counteracted, preventing the tractor from falling backwards.**
- Decreasing the tow bar pulling force.✓
  - Lowering the tow bar connection point on the tractor.✓
  - Increase the wheel base of the tractor.
  - Place weights on the nose of the tractor or the sides of the front wheels.
- (Any 2) (2)
- 5.6.2 **THREE factors that have an influence on the depth control system of a tractor when ploughing is done.**
- Ploughing depth.✓
  - Soil resistance.✓
  - Forward speed of the tractor.✓
- (3)
- 5.7 **THREE requirements for the screens used to safeguard all moving parts of implements.**
- Must appear neat.✓
  - Safeguard the equipment. / operator✓
  - Removed and installed easily.✓
  - Must not become loose.
  - Weight saving.
  - Keep out all undesired matter.
  - Strong enough.
- (Any 3) (3)
- 5.8 5.8.1 **TWO main functions of a rear tractor differential.**
- Changing direction of rotation.✓
  - Speed reduction.✓
  - Divide rotation equally between the rear wheels.
- (Any 2) (2)
- 5.8.2 **Explain the following statement: “A locked differential can provide a significant traction advantage over an open differential.”**
- A locked differential forces both left and right wheels✓
  - on the same axle to rotate at the same speed under nearly all circumstances, without regard to traction differences experienced at both the wheels.✓
- (2)

**5.9 A solution for jerky rotation of universal joint**

- Use two universal joints joined by an intermediate shaft.✓
  - The second universal joint must be phased in relation to the first universal joint to cancel the changing angular velocity.✓
- (2)

**5.10 Farm workshop equipment A, B and C.**

- A - Air wrench or impact wrench.✓
  - B - Bottle jack or hydraulic jack.✓
  - C - Hydraulic press.✓
- (3)

**5.11 THREE advantages of the standardization of farm implements and tractor spares.**

- Any implement can be used on any make and model tractor.✓
  - The same engine and spares can be used on a variety of tractors.✓
  - Spares can be purchased from any agent instead of a specific one.✓
  - Spares can be offered to the farmer relatively cheaply, because of mass production.
  - A reduced quantity of spares needs to be kept in stock for maintenance and service purposes.
  - When a farmer decides to purchase a new tractor, he will not have to take a special course on how to maintain it.
- (3)

(Any 3)

**5.12 Fault with a diesel tractor if black smoke is detected at the exhaust outlet.**

- Diesel mixture too rich.✓
  - Faulty diesel pump
- (1)

[40]

**QUESTION 6: WATER MANAGEMENT**

6.1 **The name of the irrigation method and provide ONE advantage of that type of irrigation system.**

A	"Hand Move" portable sprinkler system.✓	<ul style="list-style-type: none"> <li>• Not expensive.✓</li> <li>• Light easy movable.</li> <li>• Small area irrigation.</li> </ul> <p style="text-align: right;">(Any 1)</p>	(2)
B	Pop up Sprinkler.✓	<ul style="list-style-type: none"> <li>• No pipes on the surface.✓</li> <li>• Even distribution of water.</li> <li>• Sprinkler heads are underground.</li> </ul> <p style="text-align: right;">(Any 1)</p>	(2)
C	Centre pivot irrigation.✓	<ul style="list-style-type: none"> <li>• Minimum labourers needed.✓</li> <li>• Large area can be irrigated.</li> <li>• Fertilizer/pesticide application possible.</li> </ul> <p style="text-align: right;">(Any 1)</p>	(2)

6.2 **The basic steps in selecting a suitable pump.**

- Decide on the type of pump that best fits your needs, rotary, centrifugal, submersible, turbine, jet pump, etc.✓
  - Estimate the flow rate (LPM) and pressure requirements.✓
  - Research the available pump models and select a preliminary pump model that meets the requirements you established above.✓
  - Create a first draft irrigation design. The irrigation should be designed for the flow and pressure the pump will produce.✓
  - Once you have a first draft of your irrigation you may be able to fine tune your pump selection based on that design. ✓
  - Make your final pump selection.✓
- (6)

6.3 **TWO reasons why a farmer need to determine the water flow rate of a pipe delivery system.**

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

**6.4 TWO preventative measures a farmer must keep in mind to prevent theft when installing electrical irrigation cables.**

- Install the electrical cable inside the water pipe.✓
- Install cables deeper underground than normal.✓
- Bury cables in concrete.
- CC TV systems/Cameras.
- Remote controlled alarms.
- Security guards.

(Any 2) (2)

**6.5 Computer software effectively regulates an irrigation system to ensure a better harvest.**

- It controls the amount of water supply.✓
- It controls the time, duration and tempo of water supply.✓
- It receives information from different monitors for instance rainfall/temperature/soil moist/wind speed, analyse it, and make alterations to the water supply.
- By managing liquid fertilizer supply.

(Any 2) (2)

**6.6 TWO devices to determine water evaporation in a field of maize.**

- Tensiometer✓
- Evaporation pan✓
- Neutron probe

(Any 2) (2)

**6.7 6.7.1 Unblocking irrigation sprayers without dismantling the whole system.**

- The tap at the end of the irrigation system is opened and all impurities in the pipe are flushed out.✓
- Unscrew the nozzle to remove blockages that is stuck.
- Making use of usable chemicals.

(Any 1) (1)

**6.7.2 Describe the internal construction of the sprinkler head of an irrigation sprayer and explain the reason for the design.**

The top of the sprinkler head is a circular shape with a series of fins or thin blades arranged in a circular pattern.✓

- When the sprinkler is activated, the water passes through the sprinkler head that changes the water flow from a steady stream to a circular arc shape.✓
- The water dispersion is designed to maximize the surface area that is reached by the water.✓

(3)



**6.8 The drainage method that can be used in each of the following situations.**

6.8.1 Septic tank / municipal system✓ (1)

6.8.2 French drain✓ (1)

6.8.3

- Drainage ditch✓
- Channel drain
- Storm water drain

(Any 1) (1)

**6.9 Functioning of a septic tank.**

- Solids are 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)  
**[30]**

**TOTAL SECTION B: 160**  
**GRAND TOTAL: 200**