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)

TOTAL SECTION A: 40

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.✓ (1)
  - 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)

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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 **generato**r.✓ (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✓ (2)
- Heat energy✓ - Solar hot water panel/solar cooking systems✓ (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)

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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_2 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**

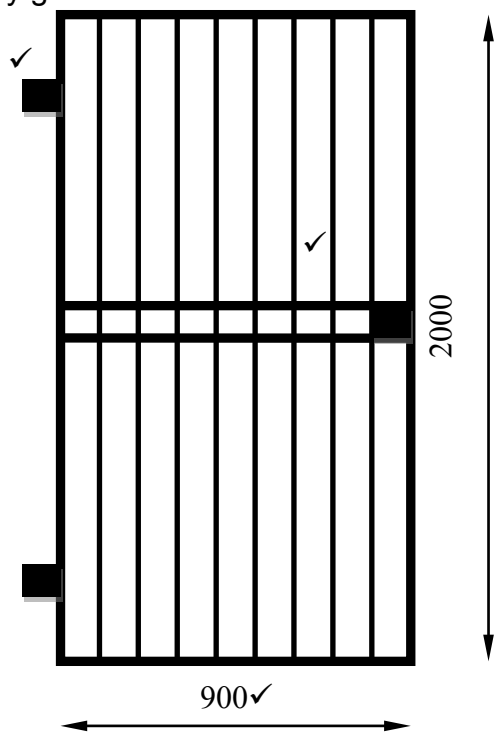
Marks will be allocated for the following :

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

(4)

Sketch of the safety gate.

Neatness✓



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)

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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. (2)

(Any 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. (2)

(Any 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. (3)

(Any 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.✓ (1)
- Faulty diesel pump

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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.✓	• Not expensive.✓ • Light easy movable. • Small area irrigation. (Any 1)	(2)
B	Pop up Sprinkler.✓	• No pipes on the surface.✓ • Even distribution of water. • Sprinkler heads are underground. (Any 1)	(2)
C	Centre pivot irrigation.✓	• Minimum labourers needed.✓ • Large area can be irrigated. • Fertilizer/pesticide application possible. (Any 1)	(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)

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TOTAL SECTION B: 160
GRAND TOTAL: 200