



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

EXEMPLAR 2014

MEMORANDUM

MARKS: 200

This memorandum consists of 15 pages.

SECTION A**QUESTION 1****1.1**

1.1.1	A ✓	(2)
1.1.2	B ✓	(2)
1.1.3	C ✓	(2)
1.1.4	C ✓	(2)
1.1.5	B ✓	(2)
1.1.6	D ✓	(2)
1.1.7	B ✓	(2)
1.1.8	C ✓	(2)
1.1.9	A ✓	(2)
1.1.10	C ✓	(2)

(10 x 2 = 20)**1.2**

1.2.1	Hydraulic ✓✓	(2)
1.2.2	GPS ✓✓	(2)
1.2.3	Photons ✓✓	(2)
1.2.4	Double ✓✓	(2)
1.2.5	Rollers ✓✓	(2)

(5 x 2 = 10)**1.3**

1.3.1	B ✓✓	(2)
1.3.2	C ✓✓	(2)
1.3.3	A ✓✓	(2)
1.3.4	E ✓✓	(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
 - Mild steel or low carbon steel✓
 - Medium carbon steel✓
 - High carbon steel✓ (3)
- 2.1.2
 - Increased strength✓
 - Easier machinability✓
 - Increased ductility✓
 - Increased wear resistance✓
 - Increased hardness
 - Increased strength and hardness at higher temperatures
 - Colour change
 - Conductivity
 - Corrosion
 - Elasticity
 - Brittleness
 - Change the metal's property to a higher or lower melting point
 - To increase toughness
 - For grain refinement against temper brittleness (Any 4) (4)
- 2.2 2.2.1
 - Glass fibres, chopped strand mat or woven cloth✓
 - Resin✓
 - Catalyst (hardener) ✓
 - Accelerator✓ (4)
- 2.2.2
 - Sand the area to be repaired. ✓
 - Mix the resin and the catalyst. Follow manufacturer's instructions for the mixing ratio. ✓
 - Paint a thin layer of resin onto the piece of work. ✓
 - Place the glass fibre mat onto the resin. ✓
 - Push the mat down with a stiff brush. ✓
 - Add more resin till you observe a clear/transparent colour which is an indication of proper saturation. ✓
 - Check and remove all air bubbles.
 - Leave the piece of work to dry sufficiently before applying the next layer.
 - When finished, sand the area to the required finish.
 - Do your paintwork. (Any 6) (6)
- 2.3 2.3.1
 - Dead short. ✓
 - Vegetation growing into the fence. ✓
 - Broken or damaged insulators. ✓
 - Objects lying on or against the fence. (Any 3) (3)

- 2.3.2
- Increasing the number of earth spikes. ✓
 - Run an earth return wire parallel to the fence line and connect it to earth spikes at regular intervals. ✓
- (2)
- 2.3.3
- Inadequate surface area of earth spike. ✓
 - Bad soil conditions. ✓
 - Corrosion of wires. ✓
 - Loose or bad wire connections.
- (Any 3) (3)
- 2.4
- High temperature resistant. High melting point. ✓ 600 degrees.
 - Cold resistant up to -454 degrees.
 - Does not react with chemicals. ✓
 - Does not corrode. ✓
 - No stress cracking. ✓
 - Very low friction coefficient.
 - Has a non-stick surface.
 - Nonconductive. (Heat/Electricity)
 - Non contaminable.
 - No moisture absorption.
- (Any 4) (4)
- 2.5
- Paint and coatings. ✓
 - Adhesives as used in fibreglass. ✓
 - Handles of tools. ✓
 - Glue.
 - Parts in electrical systems.
 - Marine applications.
- (Any 3) (3)
- 2.6
- Bushes. ✓
 - Thrust washers ✓
 - Solid rods ✓
 - Plates and wear strips
- (Any 3) (3)
- [35]**

QUESTION 3: ENERGY

- 3.1 3.1.1 Solar panels✓ (1)
- 3.1.2
 - High sun temperatures throughout the year. ✓
 - No obstacles blocking the sun. ✓ (trees or mountains)
 - Thanks to improving technology, solar is also extremely portable.✓
 - Solar power can create more energy than is necessary for a single family's needs.
 - Environmentally friendly energy source.
 - Limitless. (Any 3) (3)
- 3.1.3
 - Before you are able to produce electricity through solar energy, 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)
- 3.2
 - River or stream is available on the farm. ✓
 - River or stream has a strong flow. ✓
 - Reservoir, dam on a high point on the farm is available to tap hydro-power. (Any 2) (2)
- 3.3
 - Area with a constant wind speed. ✓
 - No obstacles between the turbines and the wind. ✓
 - The turbine should be above anything that can cause turbulence.
 - Erect it on a ridge rather than at the back of the ridge.
 - It is preferable to locate the turbine at a point where the wind is perpendicular to the side of a ridge. (Any 2) (2)

- 3.4
- The main advantage that biofuel has over other energy sources is the cost factor. ✓
 - With the ever increasing prices of crude oil, biofuel offers a cheaper solution to our energy needs. ✓
 - One of the main reasons for this low cost is that biofuels are made from plant and animal waste. ✓
 - Biodegradable and does not harm the environment when combusted. ✓
 - Less pollution. ✓
 - Biogas waste can be sold as fertiliser.
 - Less carbon emissions mean that these fuels are environmentally friendly which is what the world needs today.
 - It takes years for conventional fuels to regenerate, whereas there is no such problem for biofuels.
 - Doesn't require any radical changes to switch to the use of biofuels unlike the difficulties in switching to other renewable energy sources such as solar and wind power.
 - It is a renewable source of energy as you can just keep producing more.
 - Ethanol is very inexpensive to produce.
 - Can help prevent engine knocking.

(Any 5) (5)

- 3.5
- It can be used in diesel engines without any modifications to the engine. ✓
 - Diesel engines were originally designed to run on vegetable oil rather than fossil fuel. ✓
 - The use of biodiesel reduces emissions of carbon monoxide and other hydrocarbons.
 - It is used to stimulate the production of agricultural crops.
 - It can be used alone or blended with petro-diesel.
 - Biodiesel reduces fuel system wear, and increases the life of the fuel injector equipment.
 - It has virtually no sulphur content.

(Any 2) (2)
[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

- 4.1 4.1.1
- Mild steel-based rod containing alloy elements.✓
 - Non-ferrous, such as phosphor bronze. ✓
 - Nickel-copper.
- (Any 2) (2)
- 4.1.2
- Horizontal rolled position.✓
 - Horizontal fixed position.✓
 - Vertical up position.✓
- (3)
- 4.1.3
- Overhead welding✓ /overhand.
 - Vertical welding✓ /underhand/down hand.
 - Horizontal square butt weld.✓
 - Pipe welding.
 - Hard facing.
- (Any 3) (3)
- 4.2
- Tack welding.✓
 - Clamping of the parts.✓
 - Hold in place with welding magnets.
 - Welding of patch work.
 - Planning of welding sequence.
- (Any 2) (2)
- 4.3
- Set the gas to a neutral flame.✓
 - Hold the torch perpendicular or 90 degrees to the work piece. ✓
 - Nozzle 2 mm from the metal. ✓
 - Heat the metal until it has a red-hot colour. ✓
 - Press down on the oxygen cutting lever slowly. ✓
 - Once you start the cut, you should move the cutting torch nozzle slowly in the direction in which you are cutting.
 - Move the torch at the correct speed.
 - Make sure the flame cuts through the metal.
- (Any 5) (5)
- 4.4 4.4.1
- Current too low.✓
 - Preparation too narrow.✓
 - Root face too large.✓
 - Root gap too small.✓
 - Worn contact tip causing irregular arc.
 - Incorrect alignment of plates.
- (Any 4) (4)

- 4.4.2
- Never work with a welder of which the power supply is not connected to the earth leakage circuit breaker. ✓
 - Never weld when standing in water. ✓
 - Pistol must be thoroughly insulated. ✓
 - Keep flammable materials away from flying sparks. ✓
 - A helmet with clear glass must be worn to protect the eyes from flying slag.
 - A visor with dark filter glasses that fits over the clear glasses must be worn to protect the user against ultraviolet rays when welding.
 - It is extremely dangerous to look at the flame with uncovered eyes when welding. It can lead to painful arc eyes or even blindness.
 - Caution must be taken when welding any drums; explosive gasses or substances can lead to explosions.
 - Certain metals such as copper, manganese steel and galvanised metals emit poisonous vapours when welded.

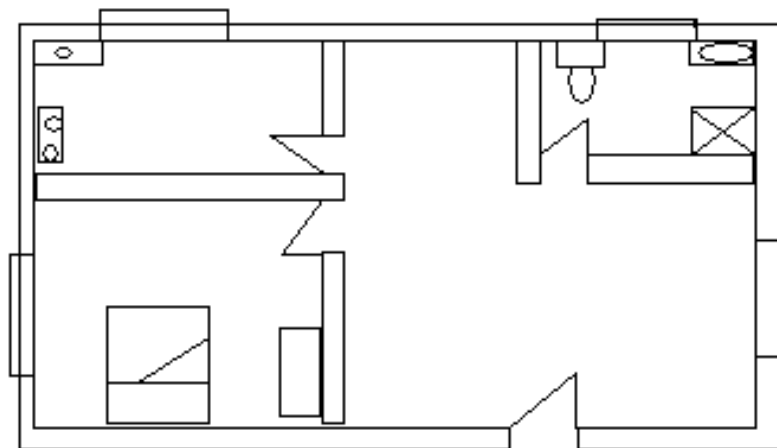
(Any 4) (4)

- 4.4.3
- High welding speed/faster ✓
 - Important savings in materials and weight ✓
 - High mechanical properties of welding joints. ✓
 - Neat and smooth seam surface ✓
 - Guaranteed welding strength for root and layer welding.
 - Safety against cold shuts and cracks.
 - Welding in all positions, vertical up, down and overhead.
 - Excellent fusion and penetration.
 - Operation requires less manual skills.
 - Welding area is easier to see.
 - No heavy slag to control or to chip away, compressed gas seals the weld pool.
 - Potentially cheaper.
 - Welds a wider range of thickness.
 - Welding wire runs from a spool and does not need to be replaced regularly.
 - Different metal types can be welded.

(Any correct answer will be accepted) (4)

4.5 Marks will be given for:

Neatness of the drawing	1
Are the rooms asked drawn?	1
Are the windows and doors drawn?	2
Are the beds, cupboards, shower and stove drawn?	2
Are the washbasin and toilet drawn?	2



(8)
[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

- 5.1
- Make sure the power take-off is shielded.✓
 - Always shut the engine down and make sure that the implement has stopped before making any adjustments or repairs.✓
 - Make use, if necessary, of weights on the wheels and nose to prevent rollover.✓
 - Make sure that steps and platforms are safe and clear of tools.✓
 - Make sure all electric parts such as lights, indicators and brake lights are working.
 - Be sure that reflector tape is visible on parts as described.
 - The wheels must be as wide as possible for the particular job.
 - Make sure the tractor is matched for its load.
 - Make sure the tractor's steering, brakes and clutch are working properly.
 - Are all gauges working?
 - Check all fluid levels, fan belts, hydraulic hoses and attachment ends.
 - Required signs like 'Slow Moving Vehicle' are indicated on the tractor.

(Any 4)

(4)

- 5.2 5.2.1
- Precision soil sampling, data collection and data analysis enable localised variation of chemical applications and planting density to suit specific areas of field.✓
 - Accurate field navigation minimises redundant application or skipped areas, enables maximum ground coverage in the shortest time.✓
 - Ability to work through low visibility conditions such as rain, dust, fog and darkness increases productivity.✓
 - Accurately monitored yield data enables future site-specific field preparation.
 - Elimination of the need for human 'flaggers' increases spray efficiency and minimises over-spray.

(Any 3)

(3)

- 5.2.2
- A Geographical Information System (GIS) is capable of capturing, storing, analysing and displaying geographically referenced information.✓
 - A GIS system integrates hardware and software from all forms of geographically referenced information.✓
 - A lot of information is able to be viewed and understood.✓
 - A GIS helps to answer your questions and solve problems on the ground.✓
 - GIS technology can be integrated into any enterprise information system framework.

(Any 4)

(4)

- 5.3
- Read and understand the operator's manual and become familiar with the machine. ✓
 - Remove all debris from lawns before mowing. ✓
 - Use recommended personal protection equipment (PPE) including close-fitting clothing when operating a lawn mower. ✓
 - 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 a proper label.
 - Turn off the motor before cleaning the area under the deck.
 - Disconnect the spark or electric plug before trouble-shooting or repairing the mower.
 - Perform routine maintenance according to the schedule recommended by the manufacturer.
 - Keep a running mower away from bystanders and pets.
- (Any 3) (3)
- 5.4
- Parallel bar rake. ✓
 - Rotary rake. ✓
 - Wheel rake.
- (Any 2) (2)
- 5.5
- Capacity of the baler. ✓
 - Storage facility. ✓
 - Labour and manpower. ✓
 - Transporting of bales.
 - Handling equipment.
- (Any 3) (3)
- 5.6 5.6.1
- Hydraulic pump. ✓
 - Control valves. ✓
 - Pipes and fittings. ✓
- (3)

- 5.6.2
- Not compressible.✓
 - Good lubrication properties.✓
 - Able to withstand different operating temperatures.✓
 - Not volatile.
 - Relatively cheap.
 - Easily conductible in pipes.
 - Flow easily through filters.
 - Readily available.
 - Contain only good additives which are not harmful to the components.
- (Any 3) (3)
- 5.6.3
- To standardise implements. ✓
 - A single person can attach an implement. ✓
 - To connect the tractor and implement faster to save time.
 - Put the worker in less danger to be between the tractor and the implement.
 - It is much safer and the possibility of injury when connecting is much smaller.
- (Any 2) (2)
- 5.7
- Safety.✓
 - Fuel consumption.✓
 - Minimum wear and tear on the engine and tyres.✓
 - Optimal power performance.
 - Adequate application.
- (Any 3) (3)
- 5.8
- Hydraulic pressures relieve valves on the implements.✓
 - Shear pin/shear bolt.✓
 - Safety springs.
- (Any 2) (2)
- 5.9
- Use of the tractor.✓
 - Power output of the tractor.✓
 - Availability of parts and service.✓
 - Type of construction.
 - Complicity.
 - Driver comfort.
 - Versatility and application.
 - Reliability.
 - Price range.
 - Operating expenses.
- (Any 3) (3)

- 5.10
- Pump tyres.✓
 - Spray-painting.✓
 - Pneumatic tools.✓
 - Cleaning of engines.
 - Any other relevant task.

(Any 3) (3)

- 5.11
- Incorrect adjustment.✓
 - Too much free play on clutch pedal. ✓
 - Air in hydraulic system.
 - Defective clutch plate.

(Any 2) (2)
[40]

QUESTION 6: WATER MANAGEMENT

- 6.1
- Distillers.✓
 - Process of reverse osmosis. ✓
 - Whole house purifications systems.✓
 - Faucet water filters.✓
 - Sand filters.
- (Any 4) (4)
- 6.2 The sprinklers closest to the centre should be smaller and further from each other, ✓
while the sprinklers further to the end should give more water and the distribution circle may overlap.✓
- (2)
- 6.3
- Water rights.✓
 - Depletion of underground aquifers.✓
 - Sinkholes✓
 - Under-irrigation leads to increased soil salinity.✓
 - Over-irrigation can cause drainage problems.
 - Water pollution.
 - Irrigation with high-sodium water may damage soil structure.
- (Any 4) (4)
- 6.4
- Types of soil.✓
 - Types of crops.✓
 - Topography. ✓
 - Volume of crops.✓
 - Availability of water.
 - Infiltration factors.
 - Water-holding capacity.
- (Any 4) (4)
- 6.5
- Diameter of the main line.✓
 - Length and the number of towers.✓
 - Area to be irrigated.✓
 - Availability of electricity.
 - Drive mechanisms.
 - Rate of application.
 - Type of water applicable.
- (Any 3) (3)

- 6.6
- Low labour needs.✓
 - Better water distribution.✓
 - Better water control scheduling.✓
 - Easy to maintain.
 - Controlled over a distance.
 - Any other relevant task.
- (Any 3) (3)
- 6.7 The water from the septic tank is properly filtered and safer ✓for use while water from a French drain can drain into the ground that can cause pollution. ✓ (2)
- 6.8
- Hydroponics.✓
 - Furrow irrigation.✓
 - Flood irrigation.
 - Micro irrigation (gravity feed systems).
 - Drip irrigation.
- (Any 2) (2)
- 6.9
- To prevent erosion of the land.✓
 - To stabilise soil.✓
 - To move unwanted water away.✓
 - Reclaiming of land for agriculture.✓
- (4)
- 6.10
- Wells.✓
 - Dams. ✓
 - Rivers.
 - Tanks.
- (Any 2) (2)
- [30]**
- TOTAL SECTION B: 160**
GRAND TOTAL: 200