basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

FEBRUARY/MARCH 2017

MEMORANDUM

MARKS: 200

This memorandum consists of 13 pages.

SECTION A

QUESTION 1

1.1
1.1.1 C✓✓
1.1.2 A✓✓
1.1.3 D✓✓
1.1.4 B✓✓
1.1.5 A✓✓
1.1.6 D✓✓
1.1.7 C✓✓
1.1.8 D✓✓
1.1.9 A✓✓
1.1.10 C✓✓

(10 x 2) (20)

1.2
1.2.1 Aluminium✓✓
1.2.2 Mechanical/motion✓✓
1.2.3 Mechanisation✓✓
1.2.4 Teflon✓✓
1.2.5 Chemicals ✓✓

(5 x 2) (10)

1.3
1.3.1 B✓✓
1.3.2 A✓✓
1.3.3 D✓✓
1.3.4 C✓✓
1.3.5 F✓✓

(5 x 2) (10)

TOTAL SECTION A: 40

SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

2.1 2.1.1 **THREE influences of nickel on stainless steel.**

- Improves the toughness and the hardening ability.✓
- Gives steel a fair amount of toughness at low temperature.✓
- Steel which is alloyed with chromium and nickel is resistant to air,✓ water and many chemical acids and alkali. (3)

2.1.2 **The final product when two or more pure metals are melted together.**
Alloy✓ (1)

2.2 **What happens to a metal when it is annealed?**
Metal becomes soft✓ (1)

2.3 **TWO reasons why flux residues must be removed after soft soldering.**

- To reduce the tendency to cause staining.✓
- To reduce the tendency to cause corrosion.✓ (2)

2.4 **A reason why brass, which has been heated to a red hot temperature, should not be cooled in cold water.**

- Cracks may be caused✓
- Becomes hard and brittle (Any 1) (1)

2.5 **THREE properties of tin.**

- Silvery-white in colour✓
- Soft✓
- Malleable✓
- Prevents corrosion/anti-corrosive
- Prevents contamination of food (Any 3) (3)

2.6 2.6.1 **Definition of *adhesion*.**
Ability of the molecules of an adhesive to cling to the molecules of other substances.✓ (1)

2.6.2 **TWO important aspects when an adhesive is chosen.**

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

2.7 **FOUR precautionary measures when working with glass fibre.**

- Catalyst and accelerator should always be stored separately.✓
- Remove all resin catalyst and accelerator from skin.✓
- Wear gloves if skin is sensitive.✓
- Use acetone in well ventilated room.✓
- Handle resin casting carefully as they are brittle.
- Glass fibre matting has small pieces of fibre that can penetrate the skin.
- Wear nose mask.
- Wear eye protection (Any 4) (4)

2.8 **TWO reasons why a vesconite bush is easily removed from a shaft.**
- No electrolytic corrosion occurs with vesconite.✓
- It does not seize like metallic bearings.✓ (2)

2.9 2.9.1 **THREE factors which cause interference on an electric fence.**
- Bad joints✓
- Leaking insulation✓
- Vegetation touching the fence line✓
- People
- Animals
- Bad earthing/dry soil
- Too long distances
- Water (Any 3) (3)

2.9.2 **Must be included in the electric game fence where it crosses the pathway of humans.**
A non-electrified✓gate✓ (2)

2.9.3 **THREE types of material that can be used as isolators between wires and posts of electric fences to prevent short circuits.**
- Ceramic✓
- Rubber✓
- Plastic✓ (Any 3) (3)

2.9.4 **TWO types of batteries for an electric fence.**
- Disposable/rechargeable battery✓
- 12 volt wet rechargeable battery✓
- Deep cycle battery (Any 2) (2)

2.10 2.10.1 **A type of wire that is for constructing an electric fence.**
Steel ✓wire (1)

2.10.2 **The minimum thickness of the wire for the electric fence.**
2–3 mm✓ (1)

2.10.3 **A cost-effective process used to protect electric fence components from corrosion.**
- Galvanize✓
- Paint (Any 1) (1)

2.10.4 **TWO factors when installing the electric fence energizer.**
- Constructed so as to exclude dust and water✓
- Not installed in dusty locations✓
- Fire hazard
- Theft
- Damage by animals (Any 2) (2)

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QUESTION 3: ENERGY

3.1 3.1.1 **THREE aspects when selecting a wind turbine to generate power for the electric fence on a game farm.**

- Surrounding environment/site selection/topography✓
- Cost effectiveness✓
- The average wind speed✓
- Length of the fence
- Capacity
- Theft
- Maintenance (Any 3) (3)

3.1.2 **FOUR advantages of using a wind turbine to generate electrical energy.**

- Wind power has no fuel costs✓
- Low maintenance costs✓
- Wind power has no clean-up costs✓
- Natural gas and oil imports can be reduced✓
- Do not contribute to air pollution
- Wind is a renewable energy source
- Personal energy independence (Any 4) (4)

3.2 3.2.1 **TWO types of energy that are generated directly from solar energy and an example of a device that can effectively convert such type of solar energy for use.**

- Heat✓ Solar/sun geyser or solar cooker✓
- Electricity✓ Solar cell/photo-electric cells✓ (4)

3.2.2 **The component that is used to change direct current (DC) generated by photovoltaic cells into alternating current (AC).**
Alternator/Inverter/rectifier✓ (1)

3.2.3 **The most common semiconducting material used for the manufacturing of solar panels.**
Silicon✓ (1)

3.3 3.3.1 **The gas that is used to manufacture methanol fuel and an example for the gas source.**

- Methane gas✓ (1)
- Rubbish dump/sewage/manure✓ (Any 1) (1)

3.3.2 **TWO advantages of methanol fuel.**

- It offers lower exhaust emissions and higher vehicle performance.✓
- It can easily be made into hydrogen, offering a promising future for use in methanol fuels cells.✓
- Methanol has a lower risk of flammability than gasoline. (Any 2) (2)

3.4 **Describe how geothermal steam is used to generate electricity.**

- The pressurized steam is channelled to a turbine which begins to turn under the large force of the steam.✓
- This turbine is linked to the generator✓ that generates electricity.✓ (3)

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QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1 4.1.1 **THREE settings on the MIG welding machine that must be done before welding.**

- Welding current/arc strength/arc force/power✓
- Gas supply pressure/working pressure. (Between 15 and 25 PSI) ✓
- Speed of the wire feed✓
- Appropriate shielding gas
- Time setting for continuous welding (Any 3) (3)

4.1.2 **Sound that the MIG welding process makes.**

- Continuous sparking✓
- An egg frying sound✓ (2)

4.1.3 **Wrong setting on the MIG welding machine when holes occur when welding.**

The power of the welding machine is too high.✓ (1)

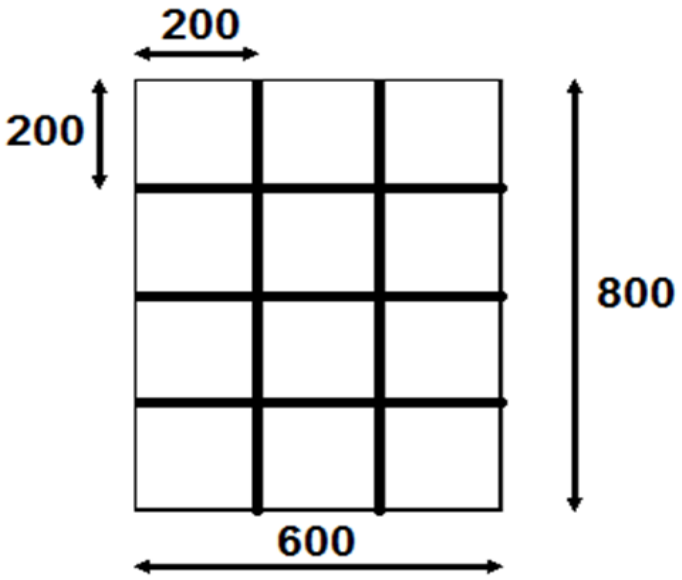
4.2 4.2.1 **How must an oxy-acetylene flame be extinguished after completing a welding job?**

- Turn off the acetylene valve on the torch handle.✓
- This will extinguish the flame.✓
- Turn off the oxygen valve on the torch handle.✓
- Next, remove your safety goggles or mask and your welding gloves.✓
- Turn the main cylinder valve clockwise on the top of both gas cylinders to close the bottles.✓
- Now open the two valves on the torch handle to 'bleed' the system.
- Turn both the oxygen and acetylene regulator handles counter-clockwise until they are loose.
- Close both valves on the torch handle.
- Put the handle and tips away, and return the gas cylinders and their hoses to their proper storage area. (Any 5) (5)

4.2.2 **Symptoms experienced when inhaling welding vapours from galvanized steel.**

- Flu like symptoms✓ (fever/headaches/red eyes/sinus) (1)
- Heavy metal poisoning✓ (welding shivers) (1)

4.3 4.3.1 **Drawing of the burglar proofing.**



- Drawing of burglar bars in frame:
  (Horizontal x 3 ✓and Vertical x 2✓) 2 marks
- Dimensions✓ 1 mark
- Spacing off the bars✓ 1 mark (4)

4.3.2 **Calculate the cost of the materials to be used for manufacturing the burglar proofing bars.**

- Total length of horizontal square bars is:
  (600 mm x 3 = 1800 mm) + (800 mm x 2 = 1600 mm) = 3400 mm✓
  = 3,4 metres✓
- Price of square bar is R5,00 x 3,4 m
  = R15,20✓ (3)

4.4 **Discussion of the overhead arc welding technique.**

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

4.5 **THREE circumstances for using the horizontal square butt welding joint.**

- When two pieces of metal less than 6 mm in thickness are welded.✓
- The metal is in an upright position.✓
- One work piece is on top of the other.✓ (3)

4.6 4.6.1 **Information source to consult for choosing the correct eye protection for plasma cutting.**

- User manual✓
- Internet
- Supplier (Any 1) (1)

4.6.2 **THREE advantages of a plasma cutting machine over the oxy-acetylene cutting set.**

- Rapid cutting speeds✓
- Wide range of metals and thickness✓
- Easy to use✓
- Economical (Any 3) (3)

4.7 **Explanation of the end result if the air filters on the plasma cutting machine becomes saturated with moisture.**

- Moisture is going to penetrate the machine.✓
- The moisture entering the torch is highly conductive✓and can cause internal arcing ✓that can damage the torch. (Any 3) (3)

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QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 **FIVE safety measures applicable when using a push lawn mower.**

- Read and understand the operator's manual and become familiar with the machine.✓
- Remove all debris from lawns before mowing.✓
- Use recommended PPE (Personal Protective Equipment) including closefitting 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 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 5) (5)

5.2 5.2.1 **Device that allows the power take-off shaft to operate at an angle.**
Universal joint✓ (1)

5.2.2 **TWO requirements of power take-off shaft screens.**

- Strong✓
- Not become lose/tight✓
- Weight saving/Light
- Must provide sufficient protection (Any 2) (2)

5.3 5.3.1 **Reason why a combine harvester breaks the kernels.**
Happens when the drum speed✓is incorrect✓ (2)

5.3.2 **Reason why the kernels are blown out with the chaff.**
The blower ✓of the combine harvester creates too much wind.✓ (2)

5.4 **The part of the hammer mill that is responsible for each of the following:**

5.4.1 **Pulverize the feed.**
Rotor and hammer✓ (1)

5.4.2 **Determine the size of the final ground product.**
Sieve✓ (1)

5.4.3 **Separate the ground material effectively from the air.**
Cyclone✓ (1)

5.5 **The procedure to follow when the silage cutter is prepared for use.**

- All grease points must be well greased.✓
- The correct tension must be set for all belts or chains.✓
- Check that all parts are functioning correctly by operating it slowly.✓
- Replace all worn parts immediately especially the cutter blades.✓
- Service according to manufacturer's specifications.✓
- Lift up all dust release guards.
- Check that there is no damage to the blades and that they are sharp.

(Any 5) (5)

5.6 **Preventative measures that the operator must keep in mind to prevent the following injuries:**

5.6.1 **The driver injured by a falling bale.**

- The tractor should have roll-over protective structures.✓
- Do not lift or carry the bale too high.
- Carry the bale in the front of the tractor. (Any 1) (1)

5.6.2 **Bystanders injured by a bale falling from the loader.**

- Never drive close near people.✓
- Never walk or work under a raised loader.
- Never move or swing a load as long as people are in the work area.

(Any 1) (1)

5.6.3 **Side overturn of the tractor on a steep slope.**

- Never work with two wheels on the downhill side and two wheels on uphill side.✓
- As the bale is lifted, the centre of gravity gets higher and the potential for the tractor to roll down the slope increases. (Any 1) (1)

5.7 5.7.1 **TWO safety mechanisms used in ram type baling machine.**

- Slip clutch✓
- Screens✓
- Shear bolts
- Ram stop (Any 2) (2)

5.7.2 **Function of the auger in the ram type baling machine.**

The auger constantly rotates✓ and feeds the hay✓ to the packing arms.✓ (3)

5.8 **Name the parts that are used to connect an implement to the tractor.**

- Two lifting arms✓
- Top link✓
- Two stabilising chains✓ (3)

5.9 **THREE shafts that are found in the manual gearbox of a tractor.**

- Main shaft/Input shaft✓
- Counter shaft✓
- Output shaft✓ (3)

5.10 **Comparison of the two different types of drive belts.**

	V-BELT	FLAT BELT
Alignment	5.10.1 V-belts do not easily slip off dis-aligned pulleys.✓	5.10.2 If the pulleys over which they run are not aligned accurately the flat belt is thrown off.✓
Speed	5.10.3 V-belts can accommodate low and high speed.✓	5.10.4 Flat belts only low speed.✓
Lubrication	5.10.5 Lubrication is never necessary with a V-belt.✓	5.10.6 If flat belts are not lubricated regularly, they tend to slip on pulleys.✓

(6)
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QUESTION 6: WATER MANAGEMENT

6.1 6.1.1 **Calculation of the length and costs of the pipes.**
13 x 100 m = 1 300 m✓ of pipe
1 300 m x R6,50 ✓
= R8 450,00✓ (3)

6.1.2 **Calculation of the total cost of T-joints and elbows**
- 19 x R8,00 = R152,00✓
- 4 x R6,50 = R26,00✓
- Total Cost: R152,00 + R26,00 = R178,00✓ (3)

6.2 **The function of a one-way irrigation valve.**
An irrigation valve regulates✓the one-directional flow✓of water in an irrigation system.✓ (3)

6.3 **FOUR reasons for preferring sprinkler irrigation to flood irrigation.**
- When water supply is weak✓
- Surface gradient (steep) leads to erosion✓
- Infiltration tempo not constant✓
- Drainage problems with the soil✓ (4)

6.4 **The safety feature that is built into the centre pivot irrigation system to prevent it from falling when one of the wheels gets stuck.**
When the system gets out of line✓a safety switch cuts the electricity to the wheels✓preventing the other wheels from moving forward.✓ (3)

6.5 **THREE important reasons why a farmer will choose a drip irrigation system instead of an overhead irrigation system.**
- Water saving✓
- Application of herbicides✓
- Liquid fertiliser can be given effectively through this system on the spot✓
- More economical✓ (4)

6.6 **TWO types of equipment that can be used to determine evaporation in a specific field.**
- Tensio-meter✓
- Evaporation pan/class-A pan✓
- Neutron probe (Any 2) (2)

6.7 **THREE types of irrigation systems that can be used by farmers to water large fields.**

- Flood irrigation✓(furrow/bed irrigation)
- Hand moved sprinkler pipes✓
- Centre Pivot (Drop down pipes) or high fixed sprinklers✓ (3)

6.8 **A problem that is commonly experienced by irrigation farmers.**

- Rivers that dries up✓
- Price of water
- Low water quotas
- Pollution-heavy metals (Any 1) (1)

6.9 **Kind of capital.**

6.9.1 Fixed capital✓ (1)
6.9.2 Working or floating capital✓ (1)
6.9.3 Working or floating capital✓ (1)
6.9.4 Moveable capital✓ (1)
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TOTAL SECTION B: 160
GRAND TOTAL: 200