basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

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MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 15 pages.

SECTION A

QUESTION 1

1.1	1.1.1	C✓✓	(2)
	1.1.2	D✓✓	(2)
	1.1.3	B✓✓	(2)
	1.1.4	C✓✓	(2)
	1.1.5	A✓✓	(2)
	1.1.6	D✓✓	(2)
	1.1.7	A✓✓	(2)
	1.1.8	D✓✓	(2)
	1.1.9	C✓✓	(2)
	1.1.10	A✓✓	(2)
			[20]
1.2	1.2.1	Yield monitor/Monitor/Harvest Monitor✓✓	(2)
	1.2.2	Nickel✓✓	(2)
	1.2.3	Tension/Density✓✓	(2)
	1.2.4	Hydraulic oil✓✓	(2)
	1.2.5	Carbon monoxide✓✓	(2)
			[10]
1.3	1.3.1	B✓✓	(2)
	1.3.2	A✓✓	(2)
	1.3.3	G✓✓	(2)
	1.3.4	D✓✓	(2)
	1.3.5	E✓✓	(2)
			[10]

TOTAL SECTION A: 40

SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

2.1 **The metal that can be used to manufacture a coiled spring.**

- Medium carbon steel.✓
- Spring steel.✓
- Bronze.✓ (Any 1) (1)

2.2 **THREE properties of Vesconite that makes it possible for use in marine applications.**

- Vesconite gives long life with low maintenance and low friction.✓
- Water is an excellent lubricant for Vesconite. ✓
- No lubricant needed ✓
- Vesconite will not swell and seize or soften when subjected to wet conditions.✓
- Vesconite is dimensionally stable.✓
- Is corrosion resistant.✓
- It remains hard in water.✓
- It does not delaminate/crumble✓
- Easy to machine.✓
- Waterproof/resistant.✓
- Does not react with chemicals.✓ (Any 3) (3)

2.3 2.3.1 **THREE commercial uses of Teflon.**

- All-weather clothing.✓
- Eyeglass lens coating.✓
- Teflon tape.✓
- Magazines for guns.✓
- Coating for cookware.✓
- Oil and water seals.✓
- O-rings.✓
- Pipe saddles.✓
- Valves.✓
- Flanges.
- Wiper blades.✓
- Lubrication.✓
- Solar panel surface coating.✓ (Any 3) (3)

2.3.2 **The critical melting point of Teflon.**

Plus minus 327 °C.✓ The point where the Teflon will start melting.✓
(Any 1) (1)

2.4 **FOUR properties of copper that make it ideal for the manufacturing of electrical wires.**

- Copper is a good conductor of heat.✓
- Copper is a good conductor of electricity.✓
- Does not rust/ corrode easily.✓
- It is ductile./Malleable✓
- Can be easily joined by soldering.✓
- Durability/Lasts long.✓
- It is flexible.✓
- Can be manufactured into a variety of diameters and lengths.✓
- Non-magnetic. ✓ (Any 4) (4)

2.5 **FOUR properties of brass products that makes it more suitable than the use of steel products.**

- Resists metal fatigue better 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. ✓
- Resistance to corrosion/rust by sea water.✓
- Durable.✓
- Shining.✓ (Any 4) (4)

2.6 **TWO circumstances where bronze hammers are used instead of metal hammers.**

- In explosive atmospheres.✓
- In the presence of flammable vapours.✓
- To prevent dents on metal Bearings.✓ (Any 2) (2)

2.7 **Complete the following table by writing only the correct answer in your answer book next to the appropriate question number.**

Type of adhesive	**Use of product**
Silicon	2.7.1 Sealant/joining.✓
PVC Weld	2.7.2 Joining PVC pipes/products.✓
Resorcinol	2.7.3 Joining or sealing of wood products.✓
No more nails	2.7.4 Mounting applications.✓

(4)

2.8 2.8.1 **Description of the 'resin' that is used in the making of glass fibre products.**

A low viscosity fluid✓or paste that can be transformed to tough flexible solids by adding a hardening agent.✓ (2)

2.8.2 **THREE reasons why glass fibre is preferred as a construction material for the manufacturing of small boats.**

- Lightness.✓
- Easily repaired when broken.✓
- Strength / toughness.✓
- Stability.✓
- Water tight.✓
- Easy to colour.✓
- Easy to shape.✓
- Easy to clean.✓
- Corrosion resistant.✓
- Not conducting electricity. (Any 3) (3)

2.9 2.9.1 **Description of the working of the earth return system of an electric fence.**

- 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.✓
- The animal is the missing link that complete the loop.✓
- If the animal touches the wire an electric current, spark or shock passes from the wire through the animals back to the energiser.✓ (2)

(Any 2)

2.9.2 **TWO probable causes of a voltage drop in the electric fence circuit.**

- Vegetation touching the electric fence wires. ✓
- Short circuit, ✓ defective energizer, ✓ cracked isolators, ✓wires touching the ground.✓ (Any 2) (2)

2.9.3 **The procedure that must be followed when testing the earth system of an electric fence.**

- First short out the live fence line to the 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 multi-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.✓ (Any 4) (4)

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QUESTION 3: ENERGY

3.1 3.1.1 **The source of the energy shown in the illustration.**

Geothermal energy.✓ (1)

3.1.2 **THREE important factors that can play a role in the initial exploration phase of the energy source.**

- Is the rock formation suitable to drill through?✓
- Do the source contain sufficient heat?✓
- Sustainability of the heat source.✓
- Environmental factors.✓
- Local community/ green groups don't support the installation.✓

(Any 3) (3)

3.2 3.2.1 **Description of the process of generating electricity with a wind turbine.**

- The wind turns aeroplane shaped blades that are attached to the turbine.✓
- The turbine turns the main shaft.✓
- This turning motion is transferred by the shaft to the gearbox.✓
- The gearbox increases the revolutions. ✓
- The gearbox output shaft is connected to the generator that produces electricity.✓

(Any 4) (4)

3.2.2 **Necessity of adjusting the pitch of the blades of a wind turbine.**

Increase or decrease the rotating speed.✓ (1)

3.2.3 **The necessity to change the pitch of the blades on a regular basis.**

- Protect the wind turbine from turning too fast in strong winds✓ and too slow in mild winds.✓
- To harness the full power ✓of the available wind. ✓

(Any 2) (2)

3.2.4 **THREE disadvantages of wind energy.**

- Unreliability of the wind in certain areas.✓
- Wind turbines produce a lot less electricity than other available resources.✓
- Construction of wind turbines can be very costly.✓
- High noise levels.✓
- Can take time to repair if parts are defective.✓
- Can affect ecosystem (animal movement and behaviour)✓ (Any 3)

(3)

3.3 **FOUR reasons why photovoltaic energy panel systems are suitable for use in deep rural areas where electricity is not available.**

- No power lines needed.✓
- No noise from generators.✓
- Energy cheap after initial installation.✓
- No pollution.✓
- It is portable.✓
- Easy to install.✓
- Easy to maintain.
- More reliable energy source.✓
- Can store energy in batteries for use at night.✓
- No Carbon taxes.✓
- No fuel costs.✓
- Renewable source of energy.✓
- Sufficient amount of energy.✓ (Any 4) (4)

3.4 **TWO types of plants that can be used as a source to manufacture biodiesel.**

- Sunflower.✓
- Soya.✓
- Canola.✓
- Sugarcane.✓
- Maize.✓
- Sorghum. ✓
- Wheat (Mark any oily plant correct) (Any 2) (2)

[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1 4.1.1 **Identification of parts A and B as indicated in the illustration.**

A. Welding gun.✓
B. Crocodile clamp/Earth clamp/Earth connection.✓ (2)

4.1.2 **TWO gases provided as a mixture by the cylinder.**

Argon✓,CO_2.✓ and Helium. ✓ (Any 2) (2)

4.1.3 **The function of the heat that is produced by the electric arc.**

Melts the metal to produce the joint.✓ (1)

4.1.4 **The purpose of the gas shielding the welding bead.**

Shields the area around the welding process✓ so that the melted metal joint does not get contaminated by surrounding air/oxygen.✓ (2)

4.1.5 **TWO non-ferrous metals that can be successfully welded with this machine.**

- Copper.✓
- Aluminium.✓
- Titanium. ✓ (2)

4.2 **The function of a Push Pull torch as found on a MIG – welding machine.**

This is a MIG torch used for aluminium welding.✓ The torch head has a pair of rollers driven by a motor which pulls the wire as well as the MIG welder roller system pushing the wire.✓This ensures correct wire feed of the softer alloy wire✓ and prevents snags and wire feed problems.✓ (Any 2) (2)

4.3 **The precautionary measures that can be taken to overcome the problem of dripping metal when welding in the vertical up welding position.**

- A special electrode can be used.✓
- The tip of the electrode must be pointed upwards so that it forms an angle up to 30° with the horizontal plane.✓
- Arc must be kept short.✓
- Speed must be sufficient.✓
- Very little lateral movements of the electrode must be made.✓ (5)

4.4 4.4.1 **Calculation of the total cost for the materials needed if two hinges cost R24.00 and 1 meter of 25mm round tubing costs R11.40. Show all calculations.**

Round tubing:
(700 mm x 8) + (600 mm x 4).✓
= 8 000 mm.✓

OR

= 5 600 mm + 2 400 mm.✓
= 8 000 mm.✓

8 m x R11,40.✓
= R91,20.✓

Total cost: R91,20 + R24,00.✓
= R115,20.✓ (6)

4.4.2 **The total area of one gate.**

Area = length x breadth
= 600 mm x 700 mm.
= 4 20 000 mm^2.✓✓
Or
0.42 m^2 (2)

4.4.3 **THREE types of pipe welding positions.**

- Horizontal fixed position.✓
- Vertical position.✓
- Vertical/Horizontal movable position.✓ (3)

4.5 **Description of 'hard-facing' as done on the front end of the ripper tooth.**

- It is the process by means of 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.✓ (Any 2) (2)

4.6 **TWO reasons for the distortion of metal plates that can occur in welding joints.**

- Too much heat.✓
- Wrong welding technique.✓
- Wrong setup/pre-setting.✓ (2)

4.7 **Comparison of the plasma cutting process to the Oxy-acetylene cutting process by completing the table.**

	Plasma cutting	**Oxy-acetylene cutting**
Speed	4.7.1 High cutting speed.✓	4.7.2 Low cutting speed.✓
Gasses used	4.7.3 Argon.✓ Nitrogen.✓ Oxygen.✓ (Any 1)	
Radiation		4.7.4 Low.✓

(4)

[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 5.1.1 **Explanation of what is meant with 'timing' of the ram baler.**

It is the exact moment when the needles lift the binding rope to bound the compressed hay.✓✓ (2)

5.1.2 **THREE requirements for the screens used to safeguard the dangerous mechanisms of implements.**

- Must appear neat.✓
- Safeguard the equipment.✓
- Removed and replaced easily.✓
- Don't become loose.✓
- Weight saving.✓
- Keep out all undesired matter.✓
- Must be strong.✓
- Warning signs.✓ (Any 3) (3)

5.1.3 **FOUR safety mechanisms that could be found on the ram-type bailing machine.**

- Slip clutch.✓
- Screens/covers.✓
- Shear bolt.✓
- Ram stop safety mechanism.✓ (4)

5.2 **FOUR safety precautions when working with the combine harvesting machine.**

- Don't let people ride on top of the harvester.✓
- Watch out for obstacles in the way of the harvester.✓
- Drive mechanisms must be screened off.✓
- Operate according to circumstances/instruction manual.✓
- Re-position the grain delivery auger after emptying the grain bin.✓
- Take note and act on warning signals from sensors.✓
- Fix mechanical problems immediately.✓
- Check for mechanical problems.✓
- Keep clothing away from moving parts.✓
- Switch off the machine when doing maintenance. ✓ (Any 4) (4)

5.3 5.3.1 **Identification of the gear.**

Double-helical gear. (Herringbone gear).✓ (1)

5.3.2 **ONE disadvantage of this type of gear.**

Cannot be used in gearboxes of cars because it cannot be meshed from the side.✓ (Any 1) (1)

5.4 5.4.1 **FOUR factors that must be considered when a new hammer mill is bought.**

- Must have a sturdy construction.✓
- Replaceable wearing parts.✓
- Rotor housing should close tightly.✓
- Size of the hopper feed aperture/opening.✓
- Availability of parts.✓
- Service intervals.✓ (Any 4) (4)

5.4.2 **THREE advantages of installing a hammer mill on a level surface.**

- The mass of moving parts is spread equally over bearings.✓
- Cyclone hangs level on the blower pipe.✓
- Looks neat.✓
- Minimum vibration. ✓
- Prevent damage to parts.✓
- Prevent from falling over.✓ (Any 3) (3)

5.4.3 **THREE factors to be considered when attaching the hammer mill to the PTO shaft of the tractor.**

- Check if the anchor bolts of the static machine are tight.✓
- Check that the universal joints are well lubricated.✓
- Check that the drive shaft guard is present and without cracks.✓
- Check that the driving shaft is properly secured to the PTO shaft.✓
- Ensure that the driving shaft is as straight as possible.✓
- Check for bystanders when reversing the tractor.✓
- Make sure that the hammer mill is level.✓ (Any 3) (3)

5.5 5.5.1 **TWO advantages of using this mechanism to move heavy hay bales.**

- The rear tyres of a tractor are better suited to carry the extra weight.✓
- There is less chance of side overturns.✓
- The load is not too high.✓ (Any 2) (2)

5.5.2 **THREE components on a tractor's three-point mechanism that are used to connect this implement.**

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

5.6 **Description of the working of an automatic depth control mechanism as found on a tractor.**

- The automatic depth control mechanism is activated by the sensitivity element✓ when the ploughing depth changes according to ploughing circumstances.✓
- Ploughing depth varies when the plough penetrates too deeply in soft patches of soil✓or when the plough tends to lift up in a hard patch of soil.✓ (4)

5.7 5.7.1 **The necessity to install bearings in the drive mechanisms of pumps.**

- To reduce wear of moving parts.✓
- To avoid overheating of parts.✓
- To facilitate extended use of parts at high speed.✓
- To avoid premature of failure of parts.✓ (Any 2) (2)

5.7.2 **ONE task that should be performed during the maintenance of this type of bearing.**

- Apply appropriate lubricant.✓
- Cleaning.✓
- Check if seals are intact and not worn/broken.✓
- Check minimum free play.✓ (Any 1) (1)

5.8 **THREE types of gearboxes that can be used in tractors.**

- Sliding gearbox.✓
- Constant mesh gearbox.✓
- Synchronised gearbox.✓
- Automatic gearbox.✓ (3)

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QUESTION 6: WATER MANAGEMENT

6.1 **Names of the different components and one function of each.**

	Name of component	Function of component
	6.1.1 Gearbox.✓	6.1.2 Provides rotation to the wheels and also reduce the speed to the wheels.✓
	6.1.3 Electric motor.✓	6.1.4 Turns the gearbox connected to the wheels.✓
	6.1.5 Water pump/Centrifugal pump.✓	6.1.6 Delivers the water from the source to the centre pivot.✓

(6)

6.2 6.2.1 **How a drone can help a farmer to increase crop yield on a piece of irrigation land.**

- By installing a multispectral camera on the Drone.✓
- The camera can detect moisture variances in soil and generate a geographic map.✓
- It detects system faults. Leaking pipes or tyres that are deflated.✓
- It can detect persons that steal or vandalise equipment.
- It can detect areas where plant growth is weak. ✓ (Any 3)

(3)

6.2.2 **The system installed on the Drone to pin point exact location.**

GPS (Global Positioning System).✓ (1)

6.3 **THREE types of sensors that provides input data to the 'irrigation controller' of an irrigation system.**

- Soil moisture sensor.✓
- Rain sensor/Rain meter✓
- Humidity sensor.✓
- Wind speed sensor.✓
- Tensiometer.✓
- Barometer/pressure meter.✓
- VRT/GPS✓ (Any 3)

(3)

6.4 **This can be installed on the water delivery pipe of an irrigation system to measure the exact amount of water that is delivered to the crop.**

Water meter/Flow meter.✓ (1)

6.5 **Importance of automation of an irrigation system.**

- To save water.✓
- Prevent over irrigation.✓
- Prevent under irrigation.✓
- To save money.✓
- Optimisation of labour.✓
- Distance control/monitoring.✓ (Any 4) (4)

6.6 **Description of the working of a farmhouse septic tank system from the moment that waste has been flushed down the toilet.**

- Sewage enters the septic tank through the inlet pipe.✓
- Heavy solids settle to the bottom.✓
- The lighter solids, fats and greases partially decompose and rise to the surface and form a layer of scum.✓
- The solids that have settled to the bottom are broken down by bacteria and form sludge.✓
- The discharge from the septic tank is distributed evenly to the absorption field.✓ (5)

6.7 **TWO common materials used to manufacture the rainwater gutters and down pipes found on farm buildings.**

- Aluminium.✓
- PVC.✓
- Zinc.✓
- Galvanized steel.✓ (Any 2) (2)

6.8 **Description of the distillation process used to purify battery water.**

- Water is boiled until it turns into steam/vapour.✓
- The steam/vapour is transferred to a different container via a piping system.✓
- Cooled down steam turns back into distilled water.✓ (3)

6.9 **Complete the following table by writing the correct answer next to the appropriate question number.**

Technological System	Application
Geographical Information System	6.9.1 Can be used to monitor plant growth/density.✓
Variable Rate Technology	6.9.2 Found in field equipment and has the ability to precisely control application rate of fertilisers/ manure/pesticides/herbicides/irrigation .✓

(2)
[30]

TOTAL SECTION B: [160]
GRAND TOTAL: [200]