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# **basic education**

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

## **SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS**

**AGRICULTURAL TECHNOLOGY**

**2019**

**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	A✓✓	(2)
	1.1.4	B✓✓	(2)
	1.1.5	B✓✓	(2)
	1.1.6	A✓✓	(2)
	1.1.7	C✓✓	(2)
	1.1.8	B✓✓	(2)
	1.1.9	B✓✓	(2)
	1.1.10	B✓✓	(2)
			(10 x 2) (20)
1.2	1.2.1	Shield✓✓	(2)
	1.2.2	Metal✓✓	(2)
	1.2.3	Geothermal✓✓	(2)
	1.2.4	Teflon✓✓	(2)
	1.2.5	Tin✓✓	(2)
			(5 x 2) (10)
1.3	1.3.1	D✓✓	(2)
	1.3.2	F✓✓	(2)
	1.3.3	G✓✓	(2)
	1.3.4	E✓✓	(2)
	1.3.5	C✓✓	(2)
			(5 x 2) (10)
<b>TOTAL SECTION A:</b>			<b>40</b>

**SECTION B****QUESTION 2: MATERIALS AND STRUCTURES****2.1 THREE influences that nickel, as an alloy element, has on stainless steel.**

- It improves the amount of toughness and the hardening ability.✓
- It gives steel a fair amount of toughness at low temperatures.✓
- Used with chromium, nickel helps to increase the hardening ability of steel.✓
- Steel, alloyed with chromium and nickel, is resistant to air.✓
- Resistant to water.✓
- Resistant to many types of chemicals, acids and alkalis.✓

(Any 3) (3)

**2.2 2.2.1 THREE applications of brass on the farm.**

- Screws✓
- Gas fittings✓
- Plumbing fittings✓
- Electric components✓
- Pneumatic fittings✓

(Any 3) (3)

**2.2.2 Explanation of the method that must be used to relieve internal stresses in brass.**

Annealing.✓ Anneal for 1/2 to 1 hour✓ at 250–300°C.✓

(3)

**2.2.3 The welding method that can be used to join two pieces of brass by using an oxy-acetylene flame.**

- Hard soldering/Brazing✓
- Soft soldering✓

(Any 1) (1)

**2.3 TWO characteristics of bronze.**

- Bronze resists corrosion, especially seawater corrosion.✓
- Resists metal fatigue more than steel.✓
- Very good conductor of heat.✓
- Very good conductor of electricity.✓
- It has low friction properties.✓
- Good resonant qualities.✓

(Any 2) (2)

- 2.4      2.4.1      **A tin/copper alloy.**
- Bronze✓ (1)
- 2.4.2      **TWO advantages of a tin/copper alloy compared to pure copper.**
- The alloy becomes harder.✓
  - It can more easily be casted than copper.✓ (2)
- 2.5      2.5.1      **TWO methods that can be used to improve the cohesion properties of an adhesive.**
- Apply a base coat if the surface is very porous.✓
  - Apply only a thin layer of adhesive.✓
  - Apply adhesive to both surfaces.✓
- (Any 2) (2)
- 2.5.2      **The difference between “duration of cohesion” and “duration of usability”.**
- **Duration of cohesion** refers to the period of time that an adhesive will stick after having been applied.✓ (1)
  - **Duration of usability** refers to the period of time a mixed adhesive remains usable before setting.✓ (1)
- 2.6      **Reasons for using casting resins in underground electrical cable joints.**
- It is watertight✓
  - Not a conductor of electricity✓
  - Tough✓
- (Any 2) (2)
- 2.7      **TWO reasons for coating automobile wiper blades with Teflon.**
- It stops the blades from squeaking as they move back and forth across the windscreen.✓
  - It has a low coefficient of friction.✓
  - It is heat and cold resistant.✓
  - The wipers slide easily and gently across the glass.✓
  - It is self-cleaning.✓
- (Any 2) (2)
- 2.8      2.8.1      **TWO ways of increasing the earth efficiency of the electric fence in poor earth conditions.**
- Increase the number of earth spikes.✓
  - Run an earth return wire in parallel to the fence line and connect it to earth spikes at regular intervals.✓ (2)

2.8.2 **TWO types of soil that have a negative influence on the earth return system of an electric fence.**

- Sandy✓
- Peat✓
- Gravel✓
- Very dry soil✓
- Snow✓
- Frozen ground✓

(Any 2) (2)

2.8.3 **TWO materials that can be used as isolators on an electric fence.**

- Plastic✓
- Bakelite✓
- Ceramic✓
- Porcelain✓
- Rubber✓

(Any 2) (2)

2.8.4 **The general rule concerning the use of barbed wire as an electric fence material? Provide a reason for this rule.**

Barbed wire may not be used in an electrified fence.✓ Because a person or animal may become entangled on the barbs of the fence and not be able to come free when shocked.✓

(2)

2.9 **FOUR characteristics of glass fibre.**

- Lightness✓
- Water tight✓
- Non-conductive of electricity✓
- Can be formed into any shape✓
- Easy to colour✓
- Colour fast✓
- Can be sawn, drilled, and filled✓
- Toughness✓
- Brittle when struck✓
- Easy repaired when broken or damaged✓

(Any 4) (4)  
[35]

**QUESTION 3: ENERGY**

3.1 **THREE disadvantages of using wind as a source for producing electric energy.**

- Wind is unreliable.✓
- Wind turbines generally produce a lot less energy than fossil fuel power stations.✓
- Wind turbine construction can be very expensive.✓
- Costly to surrounding wildlife during the building process.✓
- It causes noise pollution.✓
- People usually feel that the countryside should be left intact.✓

(Any 3) (3)

3.2 **What can be done in order for a wind turbine to produce alternating current?**

- Replace the generator with an alternator.✓
- Install an inverter/transformer.✓

(Any 1) (1)

3.3 **Description of the process of producing electricity with a photo voltaic cell.**

- When the photons in the sun's rays hit the solar cells, the electrons absorb the solar energy, transforming them into conduction electrons.✓
- If the energy of these photons is great enough, then the electrons are able to become free.✓
- An electric charge is then carried through the circuit to the destination.✓

(3)

3.4 **TWO appliances that use the heat from solar energy.**

- Solar/sun hot water geyser/tubes✓
- Solar cooker/oven✓

(Any 2) (2)

**3.5 Discuss the working of a geothermal energy power station**

- Deep holes are drilled into the earth to find a geothermal heat source. ✓
- A first pipe is inserted inside the hole which allows hot steam to rise up to the surface. ✓
- The pressurized steam is then channelled into a turbine which begins to turn under the large force of the steam. ✓
- This turbine is linked to the generator and so the generator also begins to turn, generating electricity. ✓
- Cold water is pumped down a second pipe to the heat source where the water is heated to steam and pumped back to the power station. ✓

(5)

**3.6 FOUR reasons for bio-fuel to be known as an environmental friendly fuel.**

- It is manufactured from plant and animal waste. ✓
- Biodegradable and does not harm the environment when combusted. ✓
- Lesser carbon emissions. (Less pollution) ✓
- It is a renewable source of energy. ✓

(Any 4) (4)

**3.7 TWO fuels that are manufactured from organic material.**

- Ethanol ✓
- Methanol ✓
- Bio-diesel ✓

(Any 2) (2)

**[20]**



**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**

- 4.1 4.1.1 **Description of a problem that will occur when a MIG welder is used under windy conditions.**
- Shielding gas will be blown away.✓
  - Arc difficult to strike.✓
  - Welding joint will be defective.✓
  - Porosity will occur.✓
- (Any 1) (1)
- 4.1.2 **TWO adjustments that can be made when welding with a MIG-welder to prevent the problems caused by windy conditions.**
- Increase the gas pressure to the welding joint.✓
  - Decrease the distance between the welding tip and the work piece.✓
  - Screen of the weld.✓
- (Any 2) (2)
- 4.1.3 **THREE adjustments that must be made on the MIG-welder before the welding process commence.**
- Gas flow.✓
  - Wire feed speed.✓
  - Welding current.✓
- (3)
- 4.2 4.2.1 **The welding defect that is shown in the sketch.**
- Lack of penetration.✓ (1)
- 4.2.2 **TWO welding measures that can prevent this welding defect from occurring.**
- Increase the welding current.✓
  - Increase the chamfer of the V.✓
  - Increase the root face.✓
  - Use correct welding technique.✓
- (Any 2) (2)
- 4.3 4.3.1 **The type of welding rod that must be used when welding cast iron.**
- Pure nickel✓ (1)
- 4.3.2 **A reason for pre-heating the cast iron before the welding process.**
- To prevent cracks from forming.✓ (1)

4.3.3 **TWO tasks that must be performed with an angle grinder before the weld is made.**

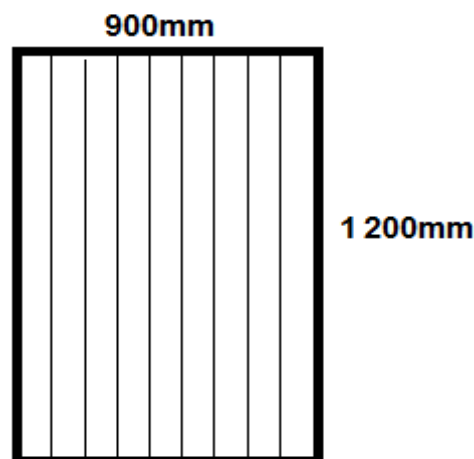
- Remove rust, grease, dirt and/or any other substances.✓
- Remove the surface layer of the metal.✓
- Make a v groove along the joint or crack.✓

(Any 2) (2)

4.4 4.4.1 **A drawing of a plan of the burglar proofing that takes the measurements that are provided in consideration.**

**Marks are allocated as follows:**

Measurements.	(1)
Correct number of round bars.	(1)
Scale.	(1)



- Height. 1 200mm and Width. 900mm✓
- 8 x Round bars. ✓
- Scale✓

(3)

4.4.2 **A material list of all the metal needed to manufacture the burglar proofing.**

- Steel square tubing at least 4 200mm✓
- Steel round bar at least 7 200mm✓

**NB. Corresponding with the sketch**

(2)

4.4.3 **Calculation of the total cost of the metal needed.**

- Square Tubing at least 4 200mm X R30✓ = R126.00✓
- Round bar at least 7 200mm X R 8,00✓ = R73.60✓
- Total** = **R199.60**✓

**NB. Must correspond with sketch**

(5)

**4.5 FOUR main personal safety hazards that can be encountered when working with a plasma cutting machine and a preventative measure at each.**

- Fire hazard.✓ Any flammable materials should be removed.✓
- Vision hazard.✓ Wear proper eye and face protection.✓
- Breathing hazard.✓ Wear respiration gear, use exhaust hood or well-ventilated area.✓
- Electric hazard.✓ Assure that machine is properly earthed/grounded. Prevent short circuits.✓
- Skin burn.✓ Face and skin protection. Helmet/Leather gloves/Leather apron and overall.✓

(Any 8) (8)

**4.6 Labels A, B, C and D of the oxy-acetylene apparatus.**

- A Cutting, oxygen valve✓
- B Cutting lever✓
- C Welding nozzle✓
- D Cutting nozzle✓

(4)  
[35]

**QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT**

5.1 5.1.1 **TWO ways in which the mass displacement on the tractor is positively influenced.**

- Lower the connecting point of the drawbar on the tractor.✓
- Increase the wheel base of the tractor.✓
- Decrease the pull force on the drawbar.✓

(Any 2) (2)

5.1.2 **THREE factors that have an influence on the depth-control system of a tractor.**

- Ploughing depth.✓
- Soil resistance.✓
- Forward speed of the tractor.✓

(3)

5.2 5.2.1 **Description of the bale forming process in the Vermeer baler up to the point where the binding of the bale takes place.**

- The baler is driven from a power take-off shaft of the tractor.✓
- The pick-up wheel, which is spring, toothed picks up the hay as the baler moves forward and puts it onto the rollers and belts.✓
- It has a bale forming mechanism that tightly rolls the hay into a round bale.✓
- Baling chamber is initially small but enlarges gradually as the hay is fed into the chamber.✓
- A tensioning system of pulleys belts and chains keeps the tension of the bale constant while it is turning around.✓
- The baling chamber enlarges with the expanding bale.✓
- If the bale is large enough ropes are bounded around the bale and the bale is expelled and the proses re-start to form a new bale.✓

(Any 6) (6)

5.2.2 **FIVE procedures that are followed when the baler is stored for a long period at the end of the season.**

- Remove all plant material from the baling chamber.✓
- Clean the baler 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.✓
- Reduce bale chamber tension completely.✓
- Cover all unpainted areas with a thin layer of grease.✓
- Grease all grease nipples.✓
- Store the baler in a dry place under cover.✓
- Release the pressure on the tires.✓

(Any 5) (5)

**5.2.3 THREE instances where a slip clutch will protect an implement during operation.**

- When foreign obstacles are impeding the working of the machine.✓
- Overloading of machine.✓
- Faulty components.✓

(3)

**5.3 FIVE measures of preventing accidents during the operation of a front loader.**

- Never walk or work under a raised loader.✓
- Raise and lower loader arms slowly and steadily.✓
- Allow for the extra length of the loader when making turns.✓
- Never move or swing a load as long as people are in the work area.✓
- Stay away from the outer edge when working along high banks and slopes.✓
- Watch for overhead wires and obstacles when you raise the loader.✓
- Carry the load low to the ground and watch for obstructions on the ground.✓
- Always use the recommended amount of counterweight to ensure good stability.✓
- Operate the loader from the operator's seat only.✓
- Move the wheels to the widest recommended settings to increase stability.✓
- Lower the loader when parking or servicing.✓
- Ensure all parked loaders are on a firm, level surface and all safety devices are engaged.✓
- Visually check for hydraulic leaks and broken, missing or malfunctioning parts. Make necessary repairs.✓
- Before disconnecting hydraulic lines, release all hydraulic pressure.✓
- Be certain anyone operating the loader is aware of safe operating practices and potential hazards.✓
- All tractors used to move bales should have roll-over protective structures.✓
- Tractor operators should utilize the tractor seat belt at all times when operating the tractor, regardless of the task that is being done.✓

(Any 5) (5)

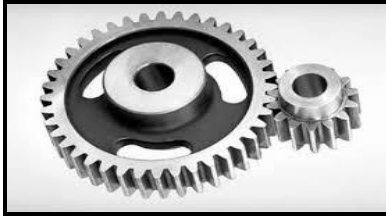
**5.4 Discussion of the role of the computer and satellite positioning systems in a combine harvester.**

- Determine the yield in each specific spot on the land.✓
- Help to spot problems in the mechanics of the harvester that can prevent loss of grain kernels.✓
- Helps to identify nutrient deficiencies in the land.✓
- Helps to identify problem areas in the cultivated field. Over watering, pests, plant density.✓

(4)

**5.5 Labelled sketches of the THREE types of gears that can be used in gearboxes.**

Straight-cut gear. (Spur gear)✓



(2)

Helical gear.✓



(2)

Double-helical gear. (Herringbone gear)✓



(2)

**5.6 THREE types of tractor power take-off drive shafts.**

- Common type PTO shaft.✓
- Live PTO shaft.✓
- Ground wheel driven PTO shaft.✓
- Independent PTO shaft.✓

(Any 3) (3)

**5.7 THREE examples of running expenses on a farm workshop.**

- Repairs✓
- Labour✓
- Supervising expenses✓
- Safety gear/clothing/shoes✓
- First Aid equipment✓
- Fuel✓
- Lubricants✓

(Any 3) (3)

**[40]**

**QUESTION 6: WATER MANAGEMENT****6.1 FIVE disadvantages of a lateral move irrigation system.**

- More labour intensive to operate✓
- Must be moved manually.✓
- It is limited in the area and amount of water it can apply.✓
- Water delivering hose must be disconnected and re-attached each time it is moved.✓
- Smart controller cannot be used on this system.✓
- Water wastage can easily occur.✓

(Any 5) (5)

**6.2 6.2.1 THREE reasons for a centre pivot irrigation system to be called a labour saving system.**

- No labourers needed to shift the pipes/system.✓
- One-man operation.✓
- Automated watering system.(cell phone)✓
- Fertilizers are applied through system.✓

(Any 3) (3)

**6.2.2 THREE instances where a safety switch will automatically cut the electricity supply to the electric motors on the wheels of the centre pivot irrigation system.**

- When the wheels gets stuck.✓
- When the electrical motor that drives the wheel breaks down.✓
- When the system gets out of line.✓
- Main pump stops delivering water.✓

(Any 3) (3)

**6.2.3 Calculation of the area of the field that must be irrigated with a centre pivot irrigation system by using the formula:  
Area =  $\pi \times r^2$  where  $\pi = 3.14$** 

$$\text{Area} = 3,14 \times (200 / 2)^2 \checkmark$$

$$\text{Area} = 3,14 \times 100^2 \checkmark$$

$$\text{Area} = 31\,400 \checkmark \text{m}^2 \checkmark$$

(4)

**6.3 THREE financial implications of over-irrigation.**

- Water wastage.✓
- Excessive electricity used for pumping.✓
- Higher fertilizer costs.✓
- Loss of the value of land. Salination.✓
- Loss of income due to lower yields.✓

(Any 3) (3)

**6.4 THREE basic types of irrigation timers used for regulating water supply.**

- Mechanical timer.✓
  - Battery powered timer.✓
  - Electronic timer.✓
- (3)

**6.5 6.5.1 Reason for the sludge to remain on the bottom of the septic tank.**

Because the sludge is heavier than the effluent.✓ (1)

**6.5.2 The function of the filter in the illustration.**

To prevent solids from flowing through the outlet pipe.✓ (1)

**6.5.3 The reason for installing the outlet pipe at a lower level than the inlet pipe.**

To prevent sewerage from flowing back into the inlet pipe.✓ (1)

**6.5.4 The reason for placing a lid above both the inlet T and outlet T pipes.**

To be able to clean the T-joint when blockages occurs.✓ (1)

**6.5.5 TWO functions of the bacteria in a septic tank.**

- To digest all organic waste matter in the system.✓
  - To prevent the tank from becoming a holding tank for waste.✓
  - To allow natural digestion to occur.✓
- (Any 2) (2)

**6.6 Explanation of the working of a distiller in a water purification system.**

- The water is heated until it becomes a vapour.✓
  - The steam cools in a different part of the filter.✓
  - The steam then condenses back to water.✓
- (3)  
[30]

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