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# basic education

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

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

**AGRICULTURAL TECHNOLOGY**

**2023**

**MARKING GUIDELINES**

**MARKS: 200**

**These marking guidelines consist of 12 pages.**

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

- |                         |        |                       |           |
|-------------------------|--------|-----------------------|-----------|
| 1.1                     | 1.1.1  | C✓✓                   |           |
|                         | 1.1.2  | A✓✓                   |           |
|                         | 1.1.3  | B✓✓                   |           |
|                         | 1.1.4  | D✓✓                   |           |
|                         | 1.1.5  | C✓✓                   |           |
|                         | 1.1.6  | A✓✓                   |           |
|                         | 1.1.7  | B✓✓                   |           |
|                         | 1.1.8  | A✓✓                   |           |
|                         | 1.1.9  | A✓✓                   |           |
|                         | 1.1.10 | B✓✓                   | (20)      |
| 1.2                     | 1.2.1  | Rolling. ✓✓           |           |
|                         | 1.2.2  | Hard facing. ✓✓       |           |
|                         | 1.2.3  | Area/Surface. ✓✓      |           |
|                         | 1.2.4  | Reduces/Decreases. ✓✓ |           |
|                         | 1.2.5  | Packing arms. ✓✓      | (10)      |
| 1.3                     | 1.3.1  | C✓✓                   |           |
|                         | 1.3.2  | F✓✓                   |           |
|                         | 1.3.3  | B✓✓                   |           |
|                         | 1.3.4  | G✓✓                   |           |
|                         | 1.3.5  | H✓✓                   | (10)      |
| <b>TOTAL SECTION A:</b> |        |                       | <b>40</b> |

**SECTION B****QUESTION 2: MATERIALS AND STRUCTURES**

- 2.1 2.1.1 THREE reasons why the machining of Vesconite holds no health risk for the person working with it.
- Does not contain any asbestos/hazardous fibres.✓
  - Does not contain any lead.✓
  - Does not give off any poisonous gases/smoke when machined.✓ (3)
- 2.1.2 TWO products that could be manufactured from Vesconite.
- Bushes.✓
  - Solid rods.✓
  - Wear plates.✓
  - Washers.✓ (Any 2) (2)
- 2.2 2.2.1 The colour of tin.
- Silvery-white.✓ (1)
- 2.2.2 THREE instances where Tin-alloys are commercially used.
- Soft solder.✓
  - Pewter.✓
  - Bronze.✓
  - Used as a coating for steel cans. ✓
  - Food containers.✓ (Any 3) (3)
- 2.3 How to reduce the magnetism property of stainless steel without affecting its tensile strength.
- Add chromium.✓
  - Manganese.✓ (Any 1) (1)
- 2.4 The process of relieving the internal stresses of brass.
- Use a low-temperature annealing process for 0.5 to 1 hours ✓at 250-300 °C, dependent on the project size.✓ (2)
- 2.5 TWO uses of phosphor bronze.
- Precision-grade bearings.✓
  - Springs.✓ (2)

- 2.6 2.6.1 FOUR household materials where Genkem contact adhesive can be used as an adhesive.
- Leather.✓
  - Glass.✓
  - Wood.✓
  - Fabrics.✓
  - Rubber.✓
  - Metal.✓
  - Plastics.✓
- (Any 4) (4)
- 2.6.2 FOUR ways to improve the strength of the joint when using a contact adhesive.
- Apply a thin base coat if the surface is very porous.✓
  - Apply only a thin layer of adhesive. Avoid thick layer of adhesive on a joint.✓
  - Apply adhesive to both surfaces.✓
  - Surface must be clean.✓
  - Make the surface rough.✓
  - Use the correct type of adhesive.✓
  - Wait 10 min until dry before joining.✓
  - Needs to be heated.✓
- (Any 4) (4)
- 2.7 2.7.1 A type of fence and the reason for using this fence.
- Temporary/movable electrical fence.✓
  - Used to hold/control/isolate animals for a short period.✓
- (2)
- 2.7.2 The function of the electric fence energizer.
- Convert the battery- or mains power into a high voltage pulse/shock ✓when the animal touches the fence. ✓
- (2)
- 2.7.3 The properties of the isolators that fix the wire of an electric fence to the posts.
- Not conduct electricity.✓
  - Water resistance.✓
  - Durable/long lasting.✓
  - Easily replaceable ✓
  - Easy to use.✓
- (Any 3) (3)
- 2.7.4 Consequences for the person touching an electric fence that has a higher amperage than prescribed by law.
- The result of too high amperage will be that a person will sustain a shock that can cause injury/tissue damage✓ or heart failure.✓
- (2)
- 2.8 Identify part **A** and **B** and the function of each.
- A** – Armoured wire.✓ Protects the cable against mechanical damage.✓
- B** – Isolation material.✓ Protects the inner cable against water/moist.✓
- (4)

**QUESTION 3: ENERGY**

3.1 3.1.1 The systems that is suitable to provide electricity for a water pump.

A Mountains direct the wind in the wind turbine ✓✓

**OR**

B Mountains block the wind ✓✓✓

(2)

3.1.2 THREE advantages of system **A** (wind) when compare to **B** (solar).

- Compact.✓
- Cheap.✓
- Easy to move.✓
- Low maintenance.✓
- Easy to install.✓
- Can operate when there is no sun. ✓
- No need to be cleaned.✓

(Any 3)

(3)

3.2 THREE disadvantages of solar geysers

- Susceptible to corrosion and scaling.✓
- Very heavy.✓
- High maintenance.✓
- Expensive.✓
- No hot water on a cloudy day or during nighttime.✓
- Can overheat.✓
- Must be orientated correctly.✓
- Can be damaged by bad weather conditions.✓

(Any 3)

(3)

3.3 THREE problems associated with a coal power station.

- Pollution.✓
- Unreliable.✓
- High maintenance.✓
- Transport of coal is expensive.✓
- Rely on fossil fuels.✓

(Any 3)

(3)

3.4 The process of extracting geothermal energy to produce electricity.

- Deep holes drilled into the earth to find a geothermal hot spot.✓
- A pipe/sleeve is installed inside the hole.✓
- Cold water is pumped into the hole to be heated by the heat source.✓
- The pressurized steam rises up to the surface.✓
- The steam is channelled to a turbine that begins to turn.✓
- This turbine is connected to the generator that generates the electricity.✓

(6)

3.5 THREE benefits of methanol when used as a supplement fuel for a vehicle.

- It offers lower exhaust emissions.✓
- Higher vehicle performance.✓
- It can easily be converted into hydrogen.✓
- Has a lower risk of flammability than petrol.✓

(Any 3)

(3)

**[20]**

**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**

- 4.1 4.1.1 Cutting of corroded metal where no electricity is available.  
**C✓** (1)
- 4.1.2 Small compact welding machine used to repair a farm gate in the field, using a small generator to produce electricity.  
**D✓** (1)
- 4.1.3 Precision cutting without the use of acetylene.  
**A✓** (1)
- 4.1.4 Welding machine without a welding rod.  
**B✓** (1)
- 4.1.5 Machine that does not require gas.  
**D✓** (1)
- 4.2 4.2.1 Correct order: 4,✓ 2,✓ 1,✓ 5,✓ 3,✓ (5)
- 4.2.2 Total cost of the angle iron used to complete the ramp.  
Angle iron (32 mm x 32 mm): 2 000 mm + 2 000 mm + 500 mm = 4 500 mm (4,5 m) ✓  
 $4,5 \text{ m} \times \text{R}95,00 = \text{R}427,50$  ✓  
Angle iron: (25 mm x 25 mm) 9 x 400 mm = 3 600 mm (3,6 m) ✓  
 $3,6 \text{ m} \times \text{R}43,00 = \text{R}154,80$  ✓  
Total cost:  $\text{R}427,50 + \text{R}154,80 = \text{R}582,30$  ✓  
(Allow for different interpretations during the marking process) (5)
- 4.3 4.3.1 Identify the component.  
Gas flow regulator.✓ (1)

- 4.3.2 The importance of setting the component correctly before proceeding with the welding process.
- To prevent spatter.✓
  - To ensure a constant weld.✓
  - To shield the weld properly.✓
  - Without the gas, your the welds will look brown, spattered and just generally not very nice.✓
  - To prevent porosity.✓
- (Any 4) (4)
- 4.3.3 Working pressure for the MIG welding process.
- Between 10 and 25 PSI.✓ (1)
- 4.4 4.4.1 Description of the overhead arc welding technique.
- Use an arc as short as possible. ✓
  - Weld a number of runs without any lateral movement. ✓
  - When molten metal starts dripping, slightly reduce the amperage. ✓
  - Move electrode/gun slightly faster. ✓
  - Hold electrode/gun in same position as in relation to base metal. ✓
- (5)
- 4.4.2 Safety measure of overhead welding, with a reason.
- Operator use leather gloves/fire retardant overall/full face welding helmet/hard hat.✓
  - To protect him from molten metal that drips from work piece and might cause serious damage to skin/ body. ✓
- (2)
- 4.5 4.5.1 THREE personal protective equipment that must be worn when performing a task with the oxyacetylene apparatus.
- Over all.✓
  - Leather gloves.✓
  - Leather apron.✓
  - Safety boots/Fire resistant shoes.✓
  - Leather spats.✓
  - Oxy-acetylene welding goggles/helmet.✓
- (Any 3) (3)
- 4.5.2 The gas cylinder that needs to be opened first, with a reason.
- Acetylene.✓
  - Acetylene is the flammable gas.✓
- (2)
- 4.5.3 Agree with this statement and motivate the answer.
- Yes.✓ Gas usage will not be effective when the bottles are lying on its side because the gas will be turned into a liquid making it difficult to pass through the gas pipes.✓
- (2)

**[35]**



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

- 5.1 5.1.1 FOUR mechanical problems that can be experienced with the cutting mechanism.
- Blunt/broken blades that cause a blockage.✓
  - Blunt/broken cutting rotor.✓
  - Seized bearings.✓
  - Worn belts and chains.✓
  - No lubrication.✓
  - Rust on the parts.✓
  - Obstructions in the mechanism.✓
- (Any 4) (4)
- 5.1.2 Choose between A and B. Motivate your answer.
- B✓ (1)
- Low initial purchasing cost.✓
  - Easy to maintain.✓
  - Efficient in small fields.✓
  - Lower maintenance cost.✓
  - Low running cost.✓
  - Not necessary for an extra tractor with a trailer.✓
- (Any 2) (3)
- 5.1.3 The procedures of preparing a machine before working with it.
- All grease points must be well greased.✓
  - The correct tension must be set for all belts and 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.✓
  - Check the tyre pressure.✓
  - Check the oil and water levels.✓
- (Any 5) (5)
- 5.2 5.2.1 Function of grease nipples.
- An external grease point to apply the grease for the universal. ✓ (1)
- 5.2.2 Function of component B.
- To keep the connected implement in the centre at the back of the tractor✓ or to stabilise the implement.✓ (Any 1) (1)
- 5.2.3 THREE requirements for screens.
- Strong✓
  - Not become loose✓
  - Weight saving✓
  - Must provide adequate/efficient protection.✓
  - Bright colour screens for clear visibility.✓
- (Any 3) (3)

5.3.1 FOUR factors to be considered before buying a new tractor that needs to be equipped with a front-end loader.

- 4x4.✓
- Power steering.✓
- Rigidity of construction.✓
- Driver safety and comfort.✓
- Driving power.✓
- Connection points for front loader hydraulics.✓
- Size of front tyres.✓
- Lifting capacity of the front-end loader.✓
- Broken/damaged parts.✓

(Any 4) (4)

5.3.2 FOUR safety precautions when working with a front-end loader against a slope.

- Only operate the loader against the vertical angle of the slope.✓
- Stay away from the outer edge when working along high banks and slopes.✓
- 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.✓
- All tractors used to move bales should have rollover protective structures (ROPS).✓
- Tractor operators should utilize the tractor seat belt at all times when operating the tractor, regardless of the task that is being done.✓

(Any 4) (4)

5.4 5.4.1 Name part A.

A - Pick-up mechanism/teeth/needles/fingers. ✓

(1)

5.4.2 Changing bale density on a ram-type baler.

By increasing or decreasing the resistance✓ to the hay moving through the baling chamber.✓

(2)

5.4.3 The functions of the slip clutch on the ram-type baler.

- Prevent heavy objects from being taken into the baler.✓
- Protect the pick-up if it is impeded by anything.✓
- Protect the auger if it becomes overloaded.✓

(3)

5.5 5.5.1 Reason why a differential is fitted on a tractor.

Differential is used to divide the rotation equal between the two rear wheels, ✓ change the direction of rotation ✓ and to affect speed reduction. ✓  
(Any 2) (2)

5.5.2 Name parts A and B.

A - Driving shaft. ✓

B - Crown wheel gear. ✓

(2)

5.6 Complete the table:

SYMPTOM	DEFECT ON TRACTOR
Black smoke	5.6.1
5.6.2	Water leaks into combustion chamber.
Blue smoke	5.6.3

- 5.6.1
- Diesel mixture too rich. ✓
  - Worn/faulty injectors. ✓

(Any 1) (1)

5.6.2 White smoke. ✓

(1)

- 5.6.3
- Engine uses oil. ✓
  - Piston rings are worn. ✓
  - Cylinder sleeves are worn. ✓
  - Valve stem seals are worn. ✓

(Any 1) (1)

5.7 5.7.1 Name of the tool.

Pneumatic/Air wrench/Drill with a drill attachment. ✓

(1)

5.7.2 Power source used.

Air/Compressor. ✓

(1)

[40]

**QUESTION 6: WATER MANAGEMENT**

- 6.1 6.1.1 Reasons why movable sprinkler irrigation systems is the most effective for using on small pieces of irrigation fields.
- Inexpensive to purchase.✓
  - Low maintenance cost.✓
  - Low running cost.✓
  - Low labour needs.✓
  - The reach of the system is more suitable for small fields because of the limited length of the pipe.✓ (Any 4) (4)
- 6.1.2 Working of the movable/drum/travelling irrigation system.
- The system makes use of polyethylene tubing coiled on a steel drum.✓
  - It is powered by irrigation water or a small engine .✓
  - The sprinkler is pulled across the field by its own cable system.✓
  - The system shuts down automatically when the sprinkler reaches the end of the line.✓
  - A large sprinkler attached to the systems applies water in a circular pattern.✓ (Any 4) (4)
- 6.2 6.2.1 Reason for connecting an irrigation sprinkler to a Variable Rate Applicator.
- To adapt the rate of water application to various needs as occurring in the irrigation field.✓ (1)
- 6.2.2 Reasons for the sprinklers positioned at a specific height above the crop.
- To limit evaporation.✓
  - To ensure effective distribution of the water.✓
  - To prevent the sprinkler from interference by the plants.✓ (Any 2) (2)
- 6.3 Explanation of the term irrigation scheduling.
- It is the process used by irrigation system managers✓ to determine the correct frequency/flow and duration of watering.✓ (2)
- 6.4 FOUR aspects that must be considered when choosing a suitable site for building a septic tank system.
- Must be installed a safe distance from houses, boreholes, traffic and drinking water installations, rivers, streams, underground aquifers.✓
  - A septic tank must be below ground level.✓
  - The drainage field must channel the wastewater away from houses.✓
  - Not installed uphill from the house.✓
  - Availing wind directions must be considered to accommodate odours or smells.✓ (Any 4) (4)

- 6.5 Identification of a drainage system.
- 6.5 6.5.1 To remove large amounts of rainwater from suburban areas.  
Chanel drain.✓ (1)
- 6.5.2 To remove excess water from lawns.  
Perforated pipes.✓  
Drainage ditch.✓ (Any 1) (1)
- 6.6 Effective use of computer software in an irrigation system.
- Prevent over and under irrigation by regulating the water supply.✓
  - Remote operation capability.✓
  - Variable Rate Irrigation Sprinkler integration/adaptability/capability.✓
  - It controls the time, duration and tempo of water supply.✓
  - It receives inputs from different monitoring devices.✓
  - It receives information from different remote information sources.✓
  - Programmable.✓
  - Control liquid fertilizer application.✓ (Any 2) (2)
- 6.7 TWO devices that measure evapotranspiration in a field.
- Tensio-meter.✓
  - Evaporation pan/class-A pan.✓ (2)
- 6.8 TWO disadvantages of distillation as a water purifying method.
- Distillation cannot remove chemicals.✓
  - It is a time consuming method.✓
  - Energy consuming method.✓ (Any 2) (2)
- 6.9 Method of filtration of water with a jug filter system.
- Water is poured into the top of the jug.✓
  - The water works its way downward through the filtration medium.✓ (2)
- 6.10 THREE reasons for fitting farm machinery with a GPS.
- For precision agriculture.✓
  - To pinpoint location of machinery.✓
  - Necessary for autonomous machinery.✓
  - To apply VRT.✓
  - To measure speed for accurate application of fertilizer and chemicals. ✓ (Any 3) (3)
- [30]**

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