



# basic education

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

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**AGRICULTURAL TECHNOLOGY**

**FEBRUARY/MARCH 2014**

**MARKS: 200**

**TIME: 3 hours**




**This question paper consists of 15 pages.**

**INSTRUCTIONS AND INFORMATION**

1. GENERAL INSTRUCTIONS AND INFORMATION
  - 1.1 This question paper consists of TWO sections, namely SECTION A and SECTION B.
  - 1.2 BOTH sections are COMPULSORY.
2. SECTION A: MULTIPLE-CHOICE QUESTIONS
  - 2.1 Answer the questions in this section in the ANSWER BOOK.
  - 2.2 Follow the instructions when answering the multiple-choice questions.
3. SECTION B: STRUCTURED QUESTIONS
  - 3.1 This section consists of FIVE questions.
  - 3.2 Answer the questions in this section in the ANSWER BOOK.
  - 3.3 Number the answers correctly according to the numbering system used in this question paper.
  - 3.4 Start EACH question on a NEW page.
  - 3.5 You may use a non-programmable calculator.

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

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–C) next to the question number (1.1–1.20) in the ANSWER BOOK, for example 1.21 A.

- 1.1 The type of fire extinguisher used to extinguish a fire caused by faulty electric wires:
- A Foam extinguisher
  - B Carbon dioxide extinguisher
  - C Water extinguisher
- (2)
- 1.2 A safety symbol that indicates poisonous substances:
- A 
  - B 
  - C 
- (2)
- 1.3 ... is/are a biological hazard and can cause an occupational illness.
- A Battery acid
  - B Plastic bags
  - C Bacteria
- (2)
- 1.4 Tractor rollovers are often caused by ...
- A a too low speed.
  - B working on a steep ditch, hill or washout.
  - C using the wrong gear.
- (2)
- 1.5 Chromium decreases the ... of stainless steel.
- A hardness
  - B magnetism
  - C weldability
- (2)
- 1.6 ... takes place when pure metal is exposed to oxygen and water.
- A Oxidation
  - B Distortion
  - C Shrinking
- (2)

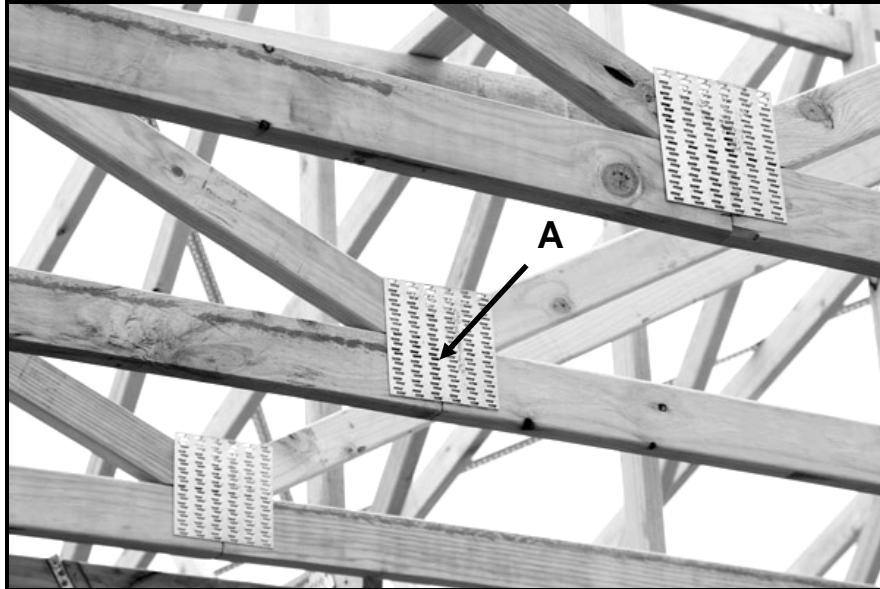
- 1.7 Silicon is an example of a/an...  
A adhesive.  
B resin.  
C fibreglass. (2)
- 1.8 The cohesion ability of an adhesive refers to the ...  
A inherent strength of the adhesive.  
B period of time that the adhesive will remain usable before mixing.  
C ability of the molecules of the adhesive to cling to the molecules of other substances. (2)
- 1.9 The type of roof covering material which is no longer used because it can cause lung cancer:  
A Asbestos  
B Fibreglass  
C Galvanised zinc (2)
- 1.10 ... are used to support the walls above door and window openings.  
A Welded round-bar mats  
B Trusses  
C Lintels (2)
- 1.11 According to national safety guidelines, the amperage of an electric fence may never be higher than ... amperes.  
A 0,007  
B 0,005  
C 0,002 (2)
- 1.12 What completes the circuit from the positive (live) to the negative (earth) on the energiser of an electric fence?  
A Insulator  
B Earth spike  
C Lightning arrestor (rod) (2)
- 1.13 A renewable energy source that is derived from either plants or animals and does not harm the environment when combusted:  
A Fossil fuel  
B Coal  
C Biodiesel (2)
- 1.14 Photovoltaic cells use ... energy to generate electricity.  
A sun  
B wind  
C geothermal (2)

- 1.15 A disadvantage of a/an ... welder is that it cannot be used to weld thick metal plates.
- A MIG
  - B conventional arc
  - C inverter
- (2)
- 1.16 Pure ... welding rods are used to weld cast iron.
- A chromium
  - B nickel
  - C manganese
- (2)
- 1.17 A ... is a safety device on a ram-type baling machine.
- A shear bolt
  - B cyclone
  - C sensitivity element
- (2)
- 1.18 The tempo of baling with the round baler will influence the ... of the bales.
- A density
  - B form
  - C quality
- (2)
- 1.19 What will the speed ratio of a gear assembly be if the drive gear has 100 teeth and the driven gear has 50 teeth?
- A 3 : 1
  - B 1 : 2
  - C 2 : 5
- (2)
- 1.20 The goal of irrigation scheduling is to determine the ...
- A input cost of the irrigation system.
  - B correct frequency and duration of water application.
  - C evaporation rate.
- (2)

**TOTAL SECTION A: 40**

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

- 2.1 Study the photograph below of roof trusses that were erected on a farm and answer the questions that follow.



- 2.1.1 Name the component indicated by **A** and also state its function. (2)
- 2.1.2 Name the type of timber that is commonly used to manufacture roof trusses. (1)
- 2.1.3 Briefly explain the importance of using triangular shapes in the design of roof trusses. (3)
- 2.1.4 Explain the treatment method of timber trusses to preserve and protect it against moisture and insects. (2)

2.2 Study the picture below of a worker mixing mortar and concrete for building purposes and answer the questions that follow.



2.2.1 Briefly describe the effect of age on the storage life of a bag of cement. (2)

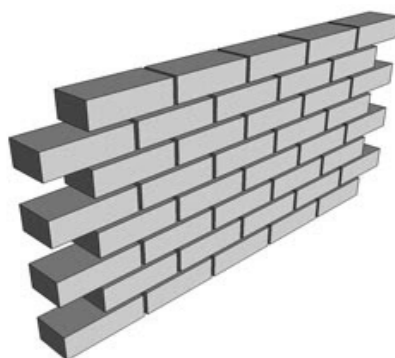
2.2.2 When cement is stored, the storage must comply with certain conditions.

Name FIVE measures that can be taken to ensure that cement is usable after storage. (5)

2.2.3 Discuss FOUR properties of sand that is used for building purposes. (4)

2.2.4 Name a type of stone that is NOT suitable for mortar and concrete mixtures. (1)

2.3 The sketch below shows a brick wall. Answer the questions that follow.



2.3.1 Name the type of brick bond shown in the sketch above. (1)

2.3.2 Recommend a material that can be used in the construction of a wall to prevent water from rising from the foundation into the wall. (2)

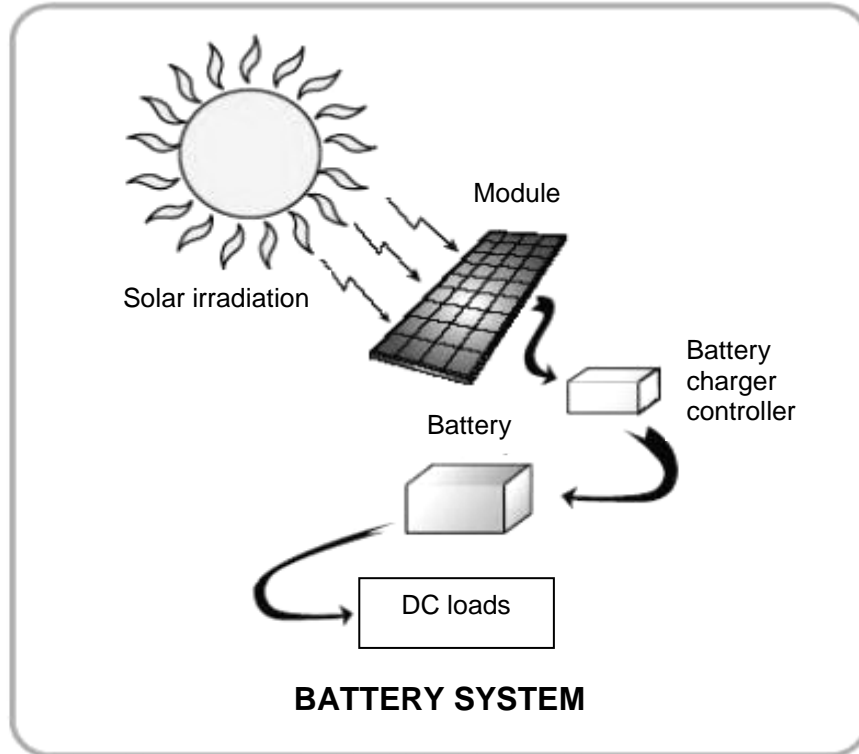
2.3.3 Name a method used to strengthen a brick wall in order to prevent it from cracking. (2)

- 2.4 Briefly explain each of the following conditions under which an adhesive can be used:
- 2.4.1 Heat resistance (1)
  - 2.4.2 Water resistance (1)
  - 2.4.3 Elasticity (1)
  - 2.4.4 Load capacity (1)
  - 2.4.5 Inflammability (1)
- 2.5 Name FIVE precautionary measures that should be kept in mind when using synthetic material such as fibreglass. (5)
- [35]**



**QUESTION 3: ENERGY**

3.1 The sun is an energy source which is used to generate electric energy on farms.



- 3.1.1 Identify the device in the illustration above that converts the radiant energy from the sun into electrical energy. (1)
- 3.1.2 Explain FIVE advantages of using solar energy in the agricultural sector. (5)
- 3.1.3 What apparatus can be used to change the direct current generated by the device (identified in QUESTION 3.1.1) to an alternating current that is suitable for electrical appliances? (1)

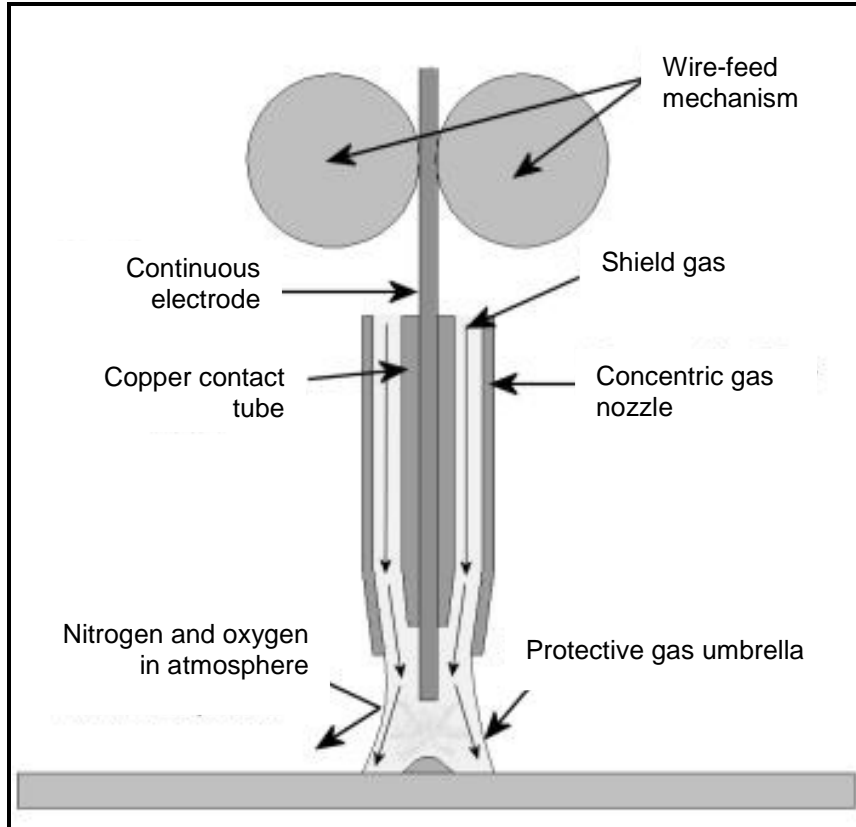
- 3.2 Energy usage has increased dramatically in the last few years due to increased demand. The picture below shows a way of addressing the energy shortage.



- 3.2.1 Identify the device in the picture above to convert wind energy to electrical energy. (1)
- 3.2.2 Briefly discuss how this device generates electrical energy. (4)
- 3.2.3 State FOUR disadvantages of this energy source. (4)
- 3.3 The agricultural industry is moving towards using biofuel as an alternative to normal fossil fuel.
- State FOUR advantages of biofuel. (4)
- [20]**

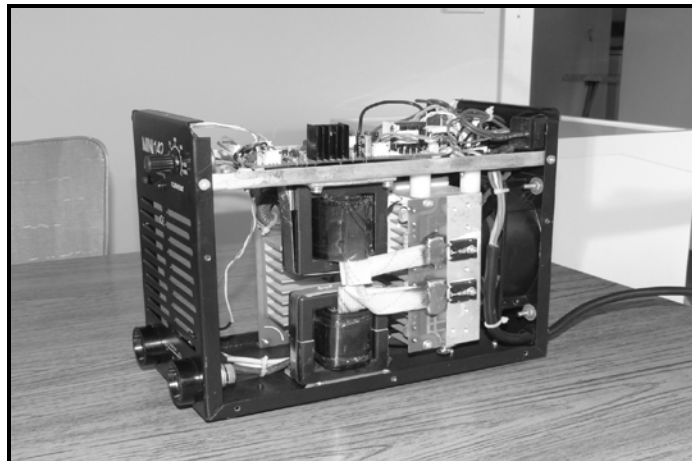
**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**

4.1 Study the welding process in the picture below and answer the questions that follow.



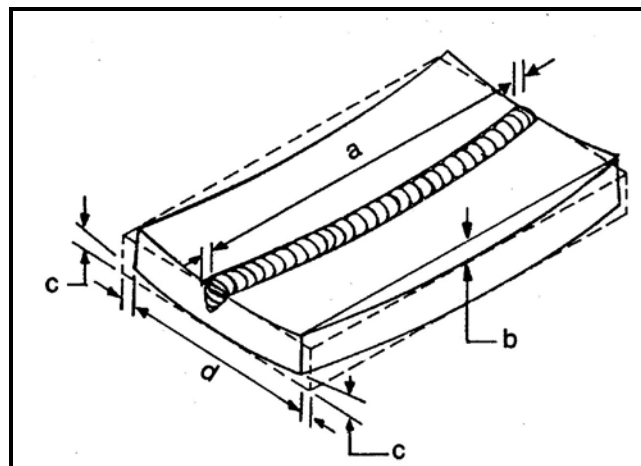
- 4.1.1 Identify the welding process used in the picture above. (1)
- 4.1.2 Name the main function of the gas shield. (1)
- 4.1.3 State the function of the continuous electrode (filler wire). (2)
- 4.1.4 The continuous electrode and the contact tip sometimes stick together.  
Name the cause of this and also explain how it can be prevented. (2)
- 4.1.5 Name THREE different metals that can be welded successfully with this welding machine. (3)

4.2 The photograph below shows the inside of an inverter welding machine.



- 4.2.1 Explain FIVE advantages of this type of welding machine. (5)
- 4.2.2 Describe the working of the inverter welding machine. (5)
- 4.2.3 Name THREE safety items that must be used to protect the body when working with welding machines. (3)
- 4.2.4 Name the type of fire extinguisher that is most suitable for a welding workshop. (1)

4.3 The sketch below explains distortion and shrinking during the welding process. Answer the questions that follow.



- 4.3.1 Name the different types of distortion or shrinking that takes place from a to d during the welding process in the sketch above. (4)
- 4.3.2 Distortion of a welding joint because of heat is a common welding defect.

State FIVE factors causing distortion and shrinking of welding joints. (5)

4.4 Describe the procedure to follow when welding a square butt weld. (3)

[35]

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

5.1 The photographs below show two types of drive belts that can be used in the drive system of a hammer mill.



**A**



**B**

5.1.1 Tabulate the properties of the V-belts in photograph **A** with those of the flat belts in photograph **B**. (10)

5.1.2 The hammer mill in the photograph above must run at a speed of 4 000 r/min for optimal efficiency and to minimise vibration. The diameter of the pulley on the hammer mill is 150 mm and the pulley on the tractor is 300 mm.

Calculate the speed of the drive pulley and show ALL calculations.

Formula:  $N_a \times D_a = N_g \times D_g$ ,  
 where  $N_a$  = speed of drive pulley  
 $D_a$  = diameter of drive pulley  
 $N_g$  = speed of driven pulley  
 $D_g$  = diameter of driven pulley (5)

5.2 The photograph below shows a hammer mill that is used to grind feeds on a farm.



5.2.1 Discuss FOUR factors to consider when coupling the hammer mill to the power take-off (PTO) drive shaft of the tractor. (4)

- 5.2.2 Describe SIX safety measures that should be taken into consideration when working with the hammer mill. (6)
- 5.2.3 Name FOUR aspects that should receive special attention when maintenance is carried out on the hammer mill. (4)
- 5.3 A hydraulic cylinder that is used for various applications on farm implements is shown below.



- 5.3.1 Describe the working of the single-action hydraulic cylinder. (8)
- 5.3.2 Name the THREE types of gears used in tractor gearboxes. (3)
- [40]**

**QUESTION 6: WATER MANAGEMENT**

- 6.1 Septic tanks are used on most farms and therefore it is very important to understand the working and construction of the system.
- 6.1.1 Make a neat sketch of a septic-tank system that can effectively treat household sewerage.
- Marks will be allocated for:
- Correctness (4)
  - Labelling (4)
  - Neatness (2)
- (10)
- 6.1.2 Briefly explain the way in which this sewerage system functions. (8)
- 6.1.3 The placing of a septic tank on the premises must be well planned. Name some places that are NOT suitable for building a septic tank. (4)
- 6.2 State the technical factors that should be kept in mind when installing drinking water for farm animals. (5)
- 6.3 Give reasons why it is necessary for the farmer to determine the flow rate of a pipe delivery system. (3)
- [30]**
- TOTAL SECTION B: 160**  
**GRAND TOTAL: 200**