



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**AGRICULTURAL TECHNOLOGY**

**NOVEMBER 2009**

**MARKS: 200**

**TIME: 3 hours**

**This question paper consists of 17 pages and 1 answer sheet.**

**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 on the attached ANSWER SHEET.
- 2.2 Follow the instructions when answering the multiple-choice questions.
- 2.3 Place the COMPLETED ANSWER SHEET inside the ANSWER BOOK.

**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 It is in your own interest to pay attention to the accuracy and neatness of your work.

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

Various options are provided as possible answers to the following questions. Choose the answer and make a cross (X) in the block (A – C) next to the question number (1.1 – 1.20) on the attached ANSWER SHEET.

EXAMPLE:

1.0	<input checked="" type="checkbox"/> A	B	C
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- 1.1 The galvanised coating on pipes must be removed prior to welding, because the gases given off during the welding process ...
- A are poisonous.  
B cause welding defects.  
C can cause an explosion. (2)
- 1.2 What causes the poisoning when inhaling exhaust gases from a petrol engine?
- A Hydrochloric acid  
B Carbon monoxide  
C Carbon dioxide (2)
- 1.3 The oil that can be used in the braking system of a vehicle is ...
- A plant oil.  
B engine oil.  
C mineral oil. (2)
- 1.4 The colour of the fire extinguisher used to extinguish wood, paper or plastic fires, is ...
- A green.  
B black.  
C red. (2)
- 1.5 The use of gloves when handling an injured person, is absolutely necessary, because blood can transmit ...
- A Aids.  
B HIV.  
C Both A and B. (2)
- 1.6 The panels of a greenhouse are made of clear plastic, because they have to ...
- A let light through.  
B absorb light.  
C reflect light. (2)

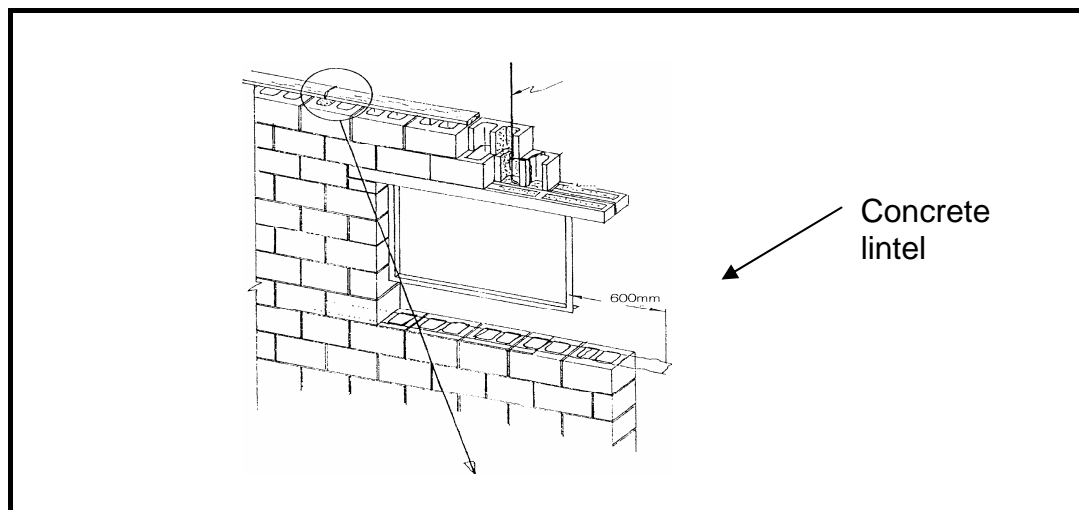
- 1.7 Which ONE of the following is a type of Perspex that is extremely heat resistant?
- A Visconite
  - B Bakelite
  - C Teflon
- (2)
- 1.8 A non-lethal voltage induced by the shock from an electrical fence may not exceed ... volts.
- A 10 000
  - B 220
  - C 12
- (2)
- 1.9 The MIG welding process uses ... as a shield between the melted puddle and the surrounding atmosphere.
- A inserted gas
  - B welding-rod flux
  - C acetylene gas
- (2)
- 1.10 The acetylene welding pressure gauge for welding mild steel must be set at ...
- A 0,6 kPa
  - B 60 kPa
  - C 600 kPa
- (2)
- 1.11 Energy that is obtained from earth gas, like methane, is called ... energy.
- A nuclear
  - B geothermal
  - C bio-
- (2)
- 1.12 The bale density of round bales can be changed by ...
- A increasing or decreasing the tempo of baling.
  - B increasing or decreasing the resistance to the hay moving through the baling chamber.
  - C tightening or loosening the bale-density lever.
- (2)
- 1.13 The grounded material and the air in a hammer mill are effectively separated by a ...
- A cyclone.
  - B rotor and hammers.
  - C screen.
- (2)

- 1.14 The part on the three-point coupling of a tractor used to set the cross angle of a hitched implement, like a plough, is called a ...
- A top link.
  - B levelling box.
  - C sensitivity element. (2)
- 1.15 Watering schemes, like canals, were put in place by the government to provide water to irrigate fertile agricultural land. The person in charge of regulating these schemes is called a ...
- A water surveyor.
  - B mayor.
  - C agent. (2)
- 1.16 A system that was developed by the American government to determine your exact location, globally, is called the ...
- A internet.
  - B GPS.
  - C GIS. (2)
- 1.17 The scale shown on a drawing plan refers to the ... of the drawing in relation to the end product.
- A ratio
  - B different views
  - C projection (2)
- 1.18 A factor that is not an expense associated with the running expenses of a tractor, is ...
- A fuel.
  - B repairs.
  - C depreciation. (2)
- 1.19 A borehole should be lined ...
- A to prevent loose soil and stones from falling into the borehole.
  - B to prevent water leakage.
  - C to prevent pollution. (2)
- 1.20 The reason for blue smoke emissions from the exhaust of a diesel tractor is ...
- A a faulty fuel distribution line.
  - B a diesel mixture that is too rich.
  - C worn piston rings. (2)

**TOTAL SECTION A: 40**

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

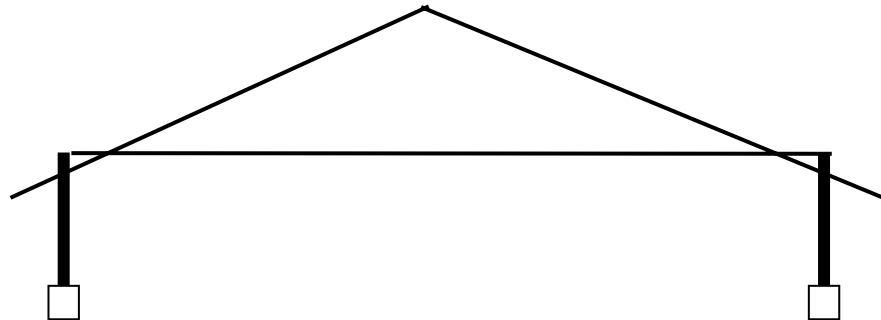
- 2.1 There are many environmental factors that should be considered when erecting buildings and other structures on the farm.
- 2.1.1 Identify the most important factor to consider when planning the foundations of these structures. (2)
- 2.1.2 Name ONE insulation material that can be used in the roofs of buildings to keep the inside cool. (1)
- 2.2 Name TWO important procedures that should be followed before galvanised roof plates can be painted. (2)
- 2.3 Security fences can be made from various types of wire. Name TWO of these types of wire. (2)
- 2.4 Adhesives play an important role in everyday repair jobs on the farm.
- 2.4.1 Name the TWO most important aspects to be considered when choosing an adhesive for a specific purpose. (2)
- 2.4.2 Describe the difference between the *cohesion* and *adhesion properties* of an adhesive. (2)
- 2.5 Concrete lintels are always used over windows and wall openings (except in the case of face-brick walls) as you can see in the sketch below.



- 2.5.1 Explain the reason for using lintels over windows and wall openings. (2)
- 2.5.2 Layers of brick over the windows must always be reinforced with brick force. How many layers of bricks above all window openings must be reinforced, according to the national building regulations? (1)

- 2.5.3 The illustration below shows a roof construction without the triangular shapes of the roof trusses.

Redraw this construction and draw the support struts that must strengthen the construction to form a functional roof truss that can carry the combined weight of the roof plates.



(2)

- 2.5.4 Give TWO reasons for the use of pine wood in the manufacturing of roof trusses. (2)

- 2.6 Water supply for animals is essential and farmers should always make sure that enough fresh water is available at all times and that animals can drink without injuring themselves.

- 2.6.1 Name FOUR requirements that should be kept in mind when designing drinking troughs for animals. (4)

- 2.6.2 Design and sketch an effective water drinking facility for cattle. The topography of the area must be taken into account to make sure that the water pressure would be suitable for cattle. Indicate the sizes of the pipes and volume of the troughs. Water must be supplied to approximately 40 cattle.

Your free-hand drawing must include the following:

- A VIEW that shows the position of the water tank, pipe lines and drinking troughs.
- Indicate the scale of the drawing.

Marks will be awarded for:

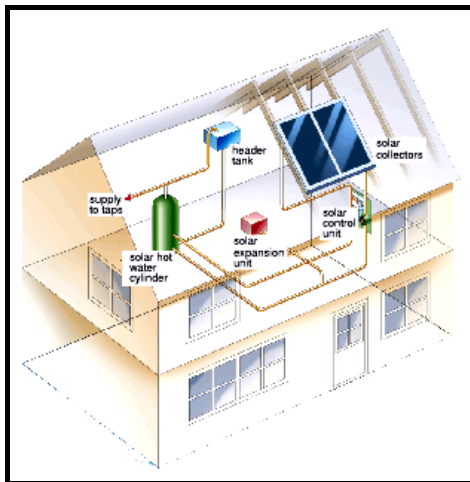
- Accuracy
- Scale
- Neatness (10)

- 2.6.3 Explain why the concrete for building the water trough cannot be poured on a very cold day when the temperature drops to below freezing point. (3)

**[35]**

**QUESTION 3: ENERGY**

3.1 The illustrations below show two different systems of producing electricity.

**A****B**

3.1.1 Identify the different energy sources labelled A and B that are shown above. (2)

3.1.2 Which ONE of the above indicated methods would you erect on your farm to produce electricity if no local electricity was available? Elaborate on your answer by comparing the two systems in table form. (7)

3.1.3 Name THREE factors that should be kept in mind when installing the system labelled A. (3)

3.2 Complete the following statements by filling in the missing word(s). Write the word(s) next to the question number (3.2.1 – 3.2.5) in the ANSWER BOOK.

3.2.1 The type of power station that uses water as an energy source is called a ... power station. (1)

3.2.2 Geothermal systems use the ... of the earth to produce electricity. (1)

3.2.3 ... are used to store excess electricity. (1)

3.2.4 The mechanical part in the bio-electrical system that is used to convert turning energy into electric energy is called a ... (1)

3.2.5 The device that is used in an electric power station to change direct current to alternating current, is called a ... (1)



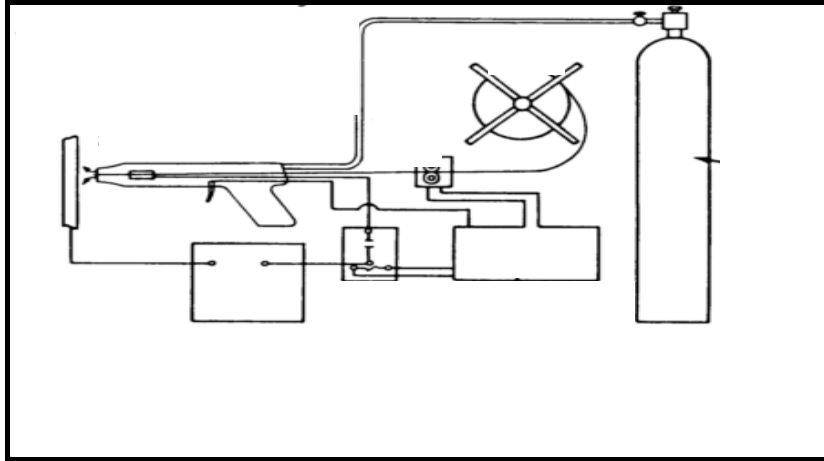
3.3 The sign below is used to warn people against potential danger.



- 3.3.1 Against which type of dangerous situation does this sign warn people? (1)
- 3.3.2 What principles must be remembered when placing safety signs? (2)
- [20]**

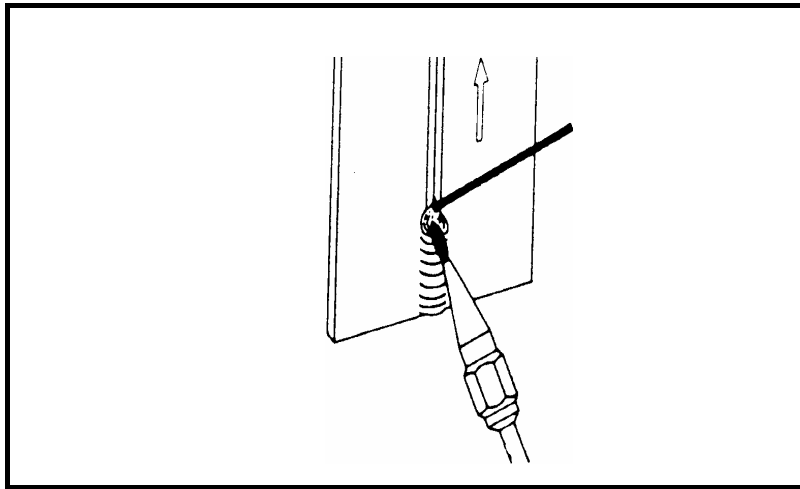
**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**

- 4.1 Study the sketch below of a welding machine that is used on the farm to construct or repair structures and equipment.



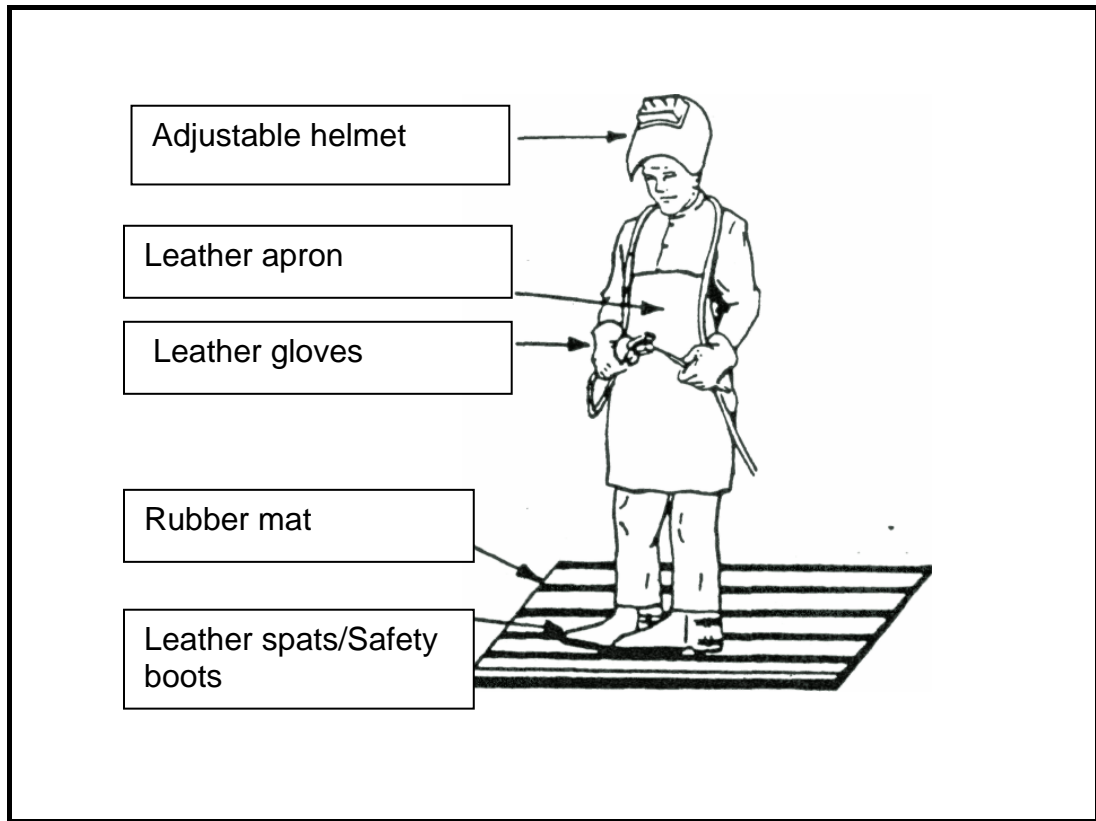
- 4.1.1 Identify this type of welding machine and state the type of gas that is used here. (2)
- 4.1.2 Name any SIX advantages of this welding machine. (6)
- 4.1.3 Name THREE different metals that can be successfully welded with this welding machine. (3)
- 4.2 A welding operator should have extensive knowledge of the various welding techniques to be able to make a strong and neat welding joint.
- 4.2.1 Make a neat sketch of a butt-welding joint where four runs were made to build up the joint. (4)
- Show the two pieces of metal with the four welding runs.
  - Show the sequence of the runs (1 to 4).
- 4.2.2 Suggest THREE precautionary measures that should be taken to prevent undercutting and overlapping when doing arc welding. (3)
- 4.2.3 Name THREE advanced arc-welding methods, apart from the normal underhand welding, that can be used on the farm. (3)

- 4.3 Vertical up welds are done where it is not possible for the work to be done in the normal underhand position, for example on the chassis of a trailer.



- 4.3.1 Where do you start when performing a vertical up weld? (1)
- 4.3.2 At what angle must the welding torch be held, with regard to the work piece, while doing a vertical up weld? (1)
- 4.3.3 How can it be prevented that molten metal from the puddle runs down during vertical up welding? (2)
- 4.3.4 Why is it necessary to inspect the welding bead continuously while welding? (1)
- 4.3.5 Indicate what should be checked after the welding is completed. (1)

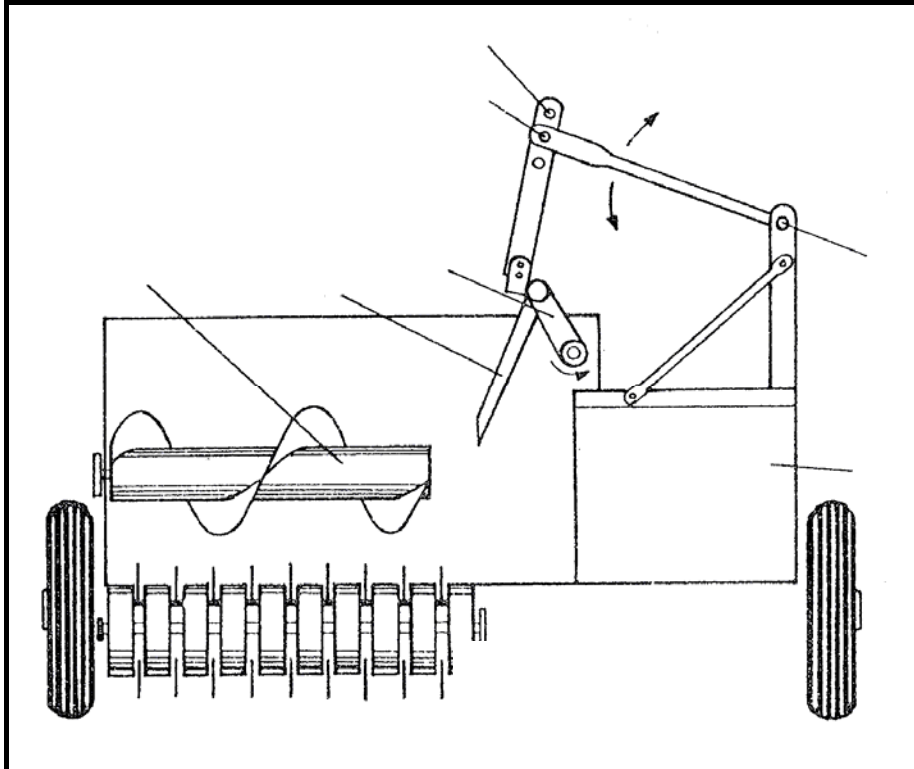
4.4 The use of safety equipment in the welding workshop is very important. Study the sketch below and answer the questions that follow.



- 4.4.1 Name TWO functions of the adjustable welding helmet. (2)
  - 4.4.2 Name TWO serious effects that ultraviolet rays have on the human body. (2)
  - 4.4.3 What purpose does the rubber mat serve? (1)
  - 4.4.4 Name THREE precautionary measures that should be taken before welding commences. (3)
- [35]**

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

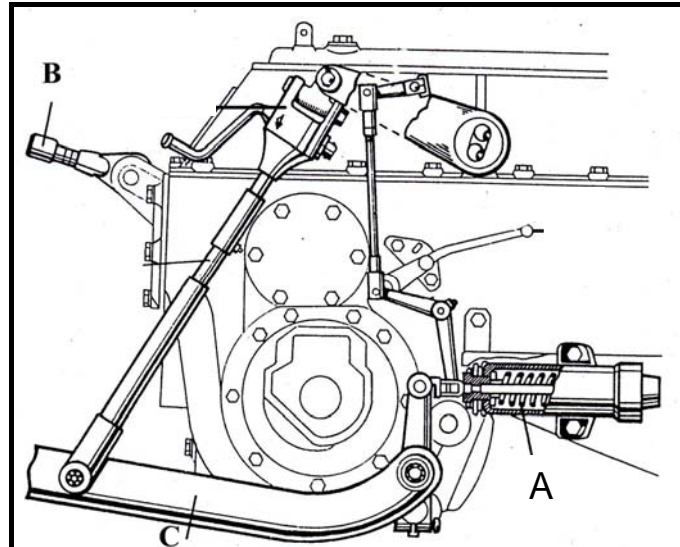
- 5.1 Study the illustration of a baling machine below and answer the questions that follow.



- 5.1.1 Describe the working of the ram type baler from the moment the hay is picked up to the moment that the hay enters the baling chamber. (3)
- 5.1.2 Describe the function of the ratchet plate slip clutch of the baler. (3)
- 5.1.3 Explain what is meant by *timing of the bale mechanism* at the ram type baler. (2)
- 5.1.4 Name FIVE procedures to follow when the baler is stored for a long period at the end of the season. (5)
- 5.2 Name FOUR safety measures that should be followed when working with compressed air. (4)

5.3 The illustration below shows the location of the sensitivity element in the three-point mechanism of a tractor.

Study the illustration carefully and answer the questions that follow.



5.3.1 Explain the function of the sensitivity element indicated by A. (3)

5.3.2 Name the THREE factors that have an influence on the depth control system of a tractor when busy ploughing. (3)

5.3.3 Name THREE ways in which the mass displacement of a tractor can be changed negatively. (3)

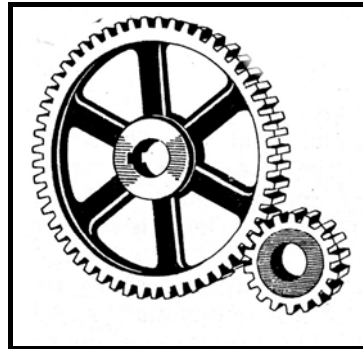
5.4 You want to drive a centrifugal pump for a centre pivot irrigation system with the aid of an electrical motor. The speed of the electrical motor is 2 400 r/min with a pulley radius of 200 mm. Calculate the diameter of the driven pulley if the speed of the centrifugal pump is 2 400 r/min, using the formula below. (Show ALL calculations.)

$$N_a \times D_a = N_g \times D_g$$

- $N_a$  = Speed of driving pulley
- $D_a$  = Diameter of driving pulley
- $N_g$  = Speed of driven pulley
- $D_g$  = Diameter of driven pulley

(4)

5.5 The illustration below shows a gear that can be used in a windmill.



- 5.5.1 What type of metal is usually used for the manufacturing of gears? Motivate your answer. (2)
- 5.5.2 Name the type of gear shown above. (1)
- 5.5.3 Determine the speed ratio if the large gear has 51 teeth and the small gear has 17 teeth. (Show ALL calculations.) (3)

5.6 Name FOUR points that have to be inspected by the operator of a tractor before a job is undertaken. (4)  
**[40]**

**QUESTION 6: WATER MANAGEMENT**

- 6.1 Water is a national resource of South Africa that has to be protected because it is so scarce. It is predicted that South Africa will have a water crisis in 2020.
- 6.1.1 Briefly explain why it is necessary for farmers to do water scheduling in irrigation. (2)
- 6.1.2 Before irrigation scheduling can take place, it is necessary to determine the evapotranspiration. Name any TWO pieces of equipment that can be used to determine the evaporation in a specific field. (2)
- 6.2 A borehole should always have a casing. Name TWO types of material that can be used as a casing for a borehole. (2)
- 6.3 Brick or concrete-lined canals can be used to convey water from a water source to irrigation lands. Which THREE factors will determine the rate of flow in these canals and what is usually used to extract water from the canal? (3)
- 6.4 Water wells were dug many years ago to get access to underground water for animal and human consumption. This indigenous knowledge is still used today with great success.
- 6.4.1 Briefly describe ONE method of extracting water from a water well. (2)
- 6.4.2 What is the maximum depth of a well and why should it not be deeper? (2)
- 6.4.3 Give a reason why a well should always have a cover. (1)
- 6.5 The following drainage systems can be used to drain excess water from cultivated lands: a natural system, a herringbone system and a grid system.
- For each of the following scenarios, choose one of the above-mentioned systems that would give the best results:
- 6.5.1 The system used where a piece of land has a clear depression down the middle (1)
- 6.5.2 The system used on level ground where the land mostly has a slight slope to one side (1)
- 6.5.3 The system used when there are wet patches on the land (1)



6.6 A farmer needs to know the amount of water that is delivered to his/her centre pivot irrigation system, to be able to irrigate his/her lands effectively. The method that he/she used to calculate the flow rate, was to use a water tank of known size that was filled with water. The time that it took to fill the tank was measured.

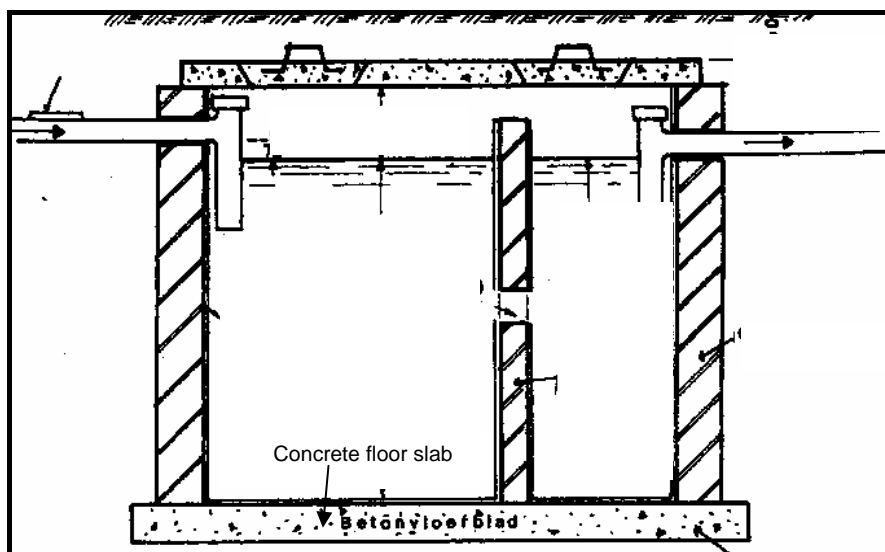
6.6.1 Calculate the flow rate of water in a pipe delivery system, by using the data below: (Show ALL calculations.)

- It took 2 minutes to fill the tank.
- The content of the tank is 2 000 litres. (4)

6.6.2 Give reasons why it is sometimes necessary for the farmer to determine the flow rate in a pipe delivery system. (2)

6.7 The management of sewage is important on the farm, as it can be a health risk when these systems leak or overflow.

Study the diagram of a sewerage system below and answer the questions that follow.



6.7.1 Briefly discuss how the sewage in a septic tank is broken down. (3)

6.7.2 For a septic tank system to function properly, users should remember certain measures. Name TWO of these important measures. (2)

6.7.3 Name TWO precautionary measures that should be considered when choosing a location for building a septic tank. (2)

[30]

**TOTAL SECTION B: 160**

**GRAND TOTAL: 200**

**ANSWER SHEET****EXAMINATION  
NUMBER:**

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**CENTRE  
NUMBER:**

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

1.1	A	B	C
1.2	A	B	C
1.3	A	B	C
1.4	A	B	C
1.5	A	B	C
1.6	A	B	C
1.7	A	B	C
1.8	A	B	C
1.9	A	B	C
1.10	A	B	C
1.11	A	B	C
1.12	A	B	C
1.13	A	B	C
1.14	A	B	C
1.15	A	B	C
1.16	A	B	C
1.17	A	B	C
1.18	A	B	C
1.19	A	B	C
1.20	A	B	C

**TOTAL SECTION A: (20 x 2) 40****TOTAL:**

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