



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

AGRICULTURAL TECHNOLOGY

NOVEMBER 2015

MARKS: 200

TIME: 3 hours

This question paper consists of 19 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.
 - 1.3 Answer ALL the questions in the ANSWER BOOK.
 - 1.4 Number the answers correctly according to the numbering system used in this question paper.
 - 1.5 You may use a non-programmable calculator.
 - 1.6 Write neatly and legibly.
2. SECTION A: SHORT QUESTIONS
 - 2.1 This section consists of THREE questions.
 - 2.2 Follow the instructions when answering the questions.
3. SECTION B: STRUCTURED LONG QUESTIONS
 - 3.1 This section consists of FIVE questions.
 - 3.2 Start EACH question on a NEW page.

SECTION A**QUESTION 1**

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1.1–1.1.10) in the ANSWER BOOK, for example 1.1.11 B.

1.1.1 According to regulations in the Occupational Health and Safety Act, 1993 (Act 85 of 1993), the noise level experienced in a workshop is classified as too loud when ...

- A a cellphone cannot be heard ringing.
- B the knocking sound in an engine cannot be heard.
- C a loose valve in an engine can hardly be heard.
- D someone standing a metre away from you needs to speak loudly in order to be heard.

1.1.2 A plasma cutting machine operates by using a very high voltage and ...

- A a jet of water to cool the work piece.
- B low amperage.
- C an oxyacetylene flame.
- D high amperage.

1.1.3 An advantage of using a MIG welder is that ...

- A copper can be welded.
- B very thick metal can be welded.
- C the initial setup cost is very low.
- D no flux has to be removed after welding.

1.1.4 The tip of a MIG welding torch is covered with a ... which protects the electrode and directs the flow of gas.

- A rubber housing
- B Vesconite tube
- C layer of grease
- D metal shroud

1.1.5 An example of a biofuel crop that can be used as an alternative to diesel:

- A Maize
- B Sunflower seed
- C Sugar cane
- D Woody plant fibre

1.1.6 ONE of the following does NOT cause a tractor to turn onto its side because of a change in the tractor's centre of gravity:

- A Filling the tractor's rear wheels with water
- B Carrying a bale too high on the front-end loader
- C Rounding the corner too fast
- D Transporting loads that exceed the load capacity of the vehicle

1.1.7 ..., such as harassment, is a health hazard that can cause occupational illnesses.

- A Workplace stress
- B Biohazards
- C Physical agents
- D Chemical hazards

1.1.8 The speed ratio of a gear assembly if the drive gear has 60 teeth and the driven gear has 20 teeth:

- A 1 : 3
- B 3 : 1
- C 1 : 1
- D 1 : 2

1.1.9 The prescribed mixing ratio on a container of Roundup herbicide is 5 ml herbicide added to 1 l of water.

Determine how much of the herbicide must be added to 20 l of water in a knapsack sprayer:

- A 50 ml
- B 100 ml
- C 5 l
- D 1 l

1.1.10 The background colour of safety signs on electrical fences that warn people against electrical shock:

- A Yellow
- B Black
- C White
- D Red

(10 x 2) (20)

1.2 Change the UNDERLINED word(s) in each of the following statements to make the statements TRUE. Write only the answer next to the question number (1.2.1–1.2.5) in the ANSWER BOOK, for example 1.2.6 Tractor.

1.2.1 A pure chromium welding rod is used to weld broken or cracked cast-iron parts.

1.2.2 Household sewage in a septic tank is broken down by acids.

1.2.3 The top link is used to adjust the cross-angle of an implement in relation to a tractor.

1.2.4 A variable-rate technology system is used to determine an exact location by using various satellites.

1.2.5 The rotor of a wind turbine is connected to a main shaft that spins a motor that generates electricity. (5 x 2) (10)

1.3 Choose a word/term from COLUMN B that matches the description in COLUMN A. Write only the letter (A–G) next to the question number (1.3.1–1.3.5) in the ANSWER BOOK, for example 1.3.6 H.

COLUMN A		COLUMN B	
1.3.1	Houses the guard plates and wearing plates of a hammer mill	A	rotor and hammers
1.3.2	Facilitates the process of feeding raw material into a hammer mill	B	fan
1.3.3	Pulverises the fodder to a specified particle size inside a hammer mill	C	cyclone
1.3.4	Determines the size of the final ground material produced by a hammer mill	D	framework
1.3.5	Separates the ground material and air inside a hammer mill	E	screen
		F	hopper
		G	power take-off shaft

(5 x 2) (10)

TOTAL SECTION A: 40

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

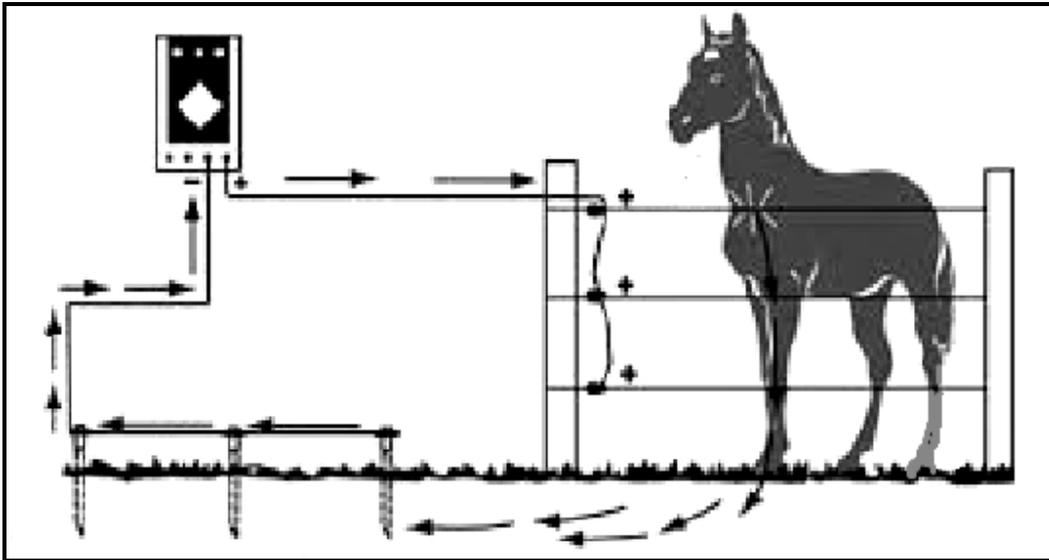
Start this question on a NEW page.

- 2.1 The instrument below shows that copper is used in many applications in and around the house.



- 2.1.1 Write down the material that is added to copper to form the following:
- (a) Brass
 - (b) Bronze
- (2)
- 2.1.2 Name TWO methods that can be used to permanently join copper products.
- (2)
- 2.1.3 Name a substance that can dissolve tin.
- (1)
- 2.2 There is a crack in the diesel tank of your tractor and you need an adhesive to temporarily repair the crack.
- 2.2.1 State the TWO most important aspects that must be considered when an adhesive is chosen to repair the diesel tank.
- (2)
- 2.2.2 Explain the process of preparing the diesel tank before the adhesive is applied.
- (1)
- 2.3 Describe the following properties of Vesconite:
- 2.3.1 Delamination ability
 - 2.3.2 Friction ability
 - 2.3.3 Corroding ability
- (2)
(2)
(2)

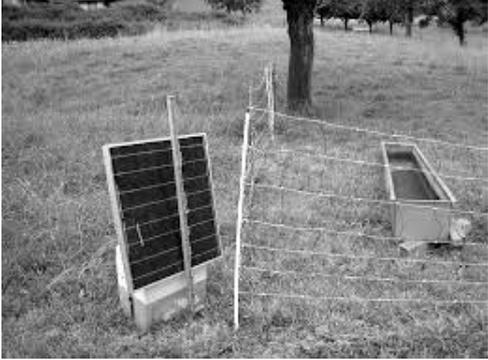
- 2.4 Electric fencing is a very effective method of safeguarding animals and can be used in various temporary and permanent applications.



- 2.4.1 Suggest TWO methods of preventing lightning damage to an electric fence energiser. (2)
- 2.4.2 Discuss the procedure to follow when testing the earthing system of an electric fence. (4)
- 2.4.3 Briefly describe the earth return system of an electric fence and state TWO probable causes of a voltage drop in the electric fence circuit. (3)
- 2.5 The wire of an electric fence must be very strong because of the high tension in the wire.
- 2.5.1 Indicate the correct type of fence wire used to erect an electric fence. (1)
- 2.5.2 State the prescribed minimum thickness of the wire used for an electric fence. (1)
- 2.5.3 Suggest TWO methods that can be used to protect the bare wires of an electric fence against corrosion. (2)
- 2.6 Insulating material used on the ceiling of a farm building to keep the building cool during summer and warm during winter must adhere to certain safety requirements.
- List FOUR of these safety requirements. (4)

2.7 The photos below show four components that provide the energy needed for the energiser of an electric fence.

Re-arrange the components in a logical sequence of use.

 <p>Solar regulator</p>	 <p>DC/AC inverter</p>
 <p>Solar panel</p>	 <p>Battery</p>

(4)
[35]

QUESTION 3: ENERGY

Start this question on a NEW page.

- 3.1 The wind turbine below is used to produce electricity where no electricity is available or to supplement the national electricity network.



Briefly describe the function of each of the following wind turbine parts:

- 3.1.1 Propeller blades (1)
- 3.1.2 Main shaft (1)
- 3.1.3 Gearbox (1)
- 3.1.4 Generator (1)
- 3.2 The sun emits huge amounts of sun energy to the earth every day. Ninety-nine per cent of the sun's energy is lost due to people's limited ability to convert sun energy into electrical energy.
- 3.2.1 State the TWO types of energy that sun rays consist of and name a method that can be used to utilise each. (4)
- 3.2.2 State TWO factors that determine the efficiency of a solar electric panel. (2)
- 3.2.3 Name the device that is used to change the direct current of a solar panel into useful alternating current. (1)

- 3.3 A geothermal power plant uses the earth's heat energy to generate electricity.
Identify TWO problems that can be associated with geothermal energy. (2)
- 3.4 Plant and animal matter, such as canola, algae and animal fats, can be combusted to be used as biofuel.
Name THREE disadvantages of biofuel. (3)
- 3.5 Briefly describe the terms *ethanol* and *methanol* as alternative fuels in the agricultural industry. (4)

[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

Start this question on a **NEW** page.

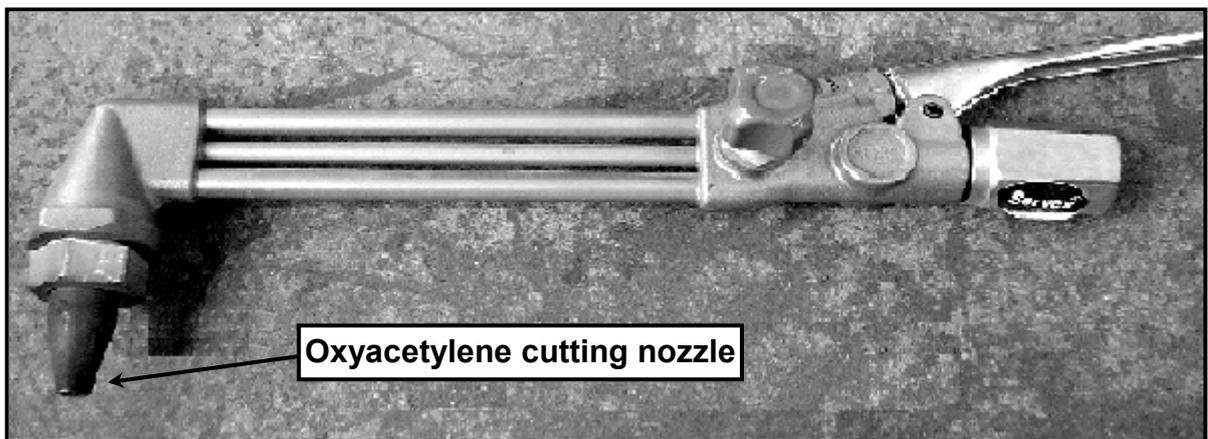
4.1 The photo below shows a farm worker welding with an arc-welding machine.

Name **THREE** safety hazards that you can identify in the picture which are ignored by the worker and that can result in injury.



(3)

4.2 A photo of an oxyacetylene cutting apparatus is shown below.



4.2.1 Name the type of metal that the cutting nozzle is manufactured from. (1)

4.2.2 Give **FOUR** hints to ensure high quality welding joints when oxyacetylene welding is done in the overhead welding position. (4)

4.3 A welding operator can make certain mistakes when welding with a MIG welding machine.



Name the welding defect that could be caused by the following during MIG welding. Write only the defect next to the question number (4.3.1–4.3.4) in the ANSWER BOOK.

PROBABLE CAUSE	DEFECT
<ul style="list-style-type: none"> - Draughty conditions - Painted, wet or oily plate - Wet or rusty filler wire 	4.3.1
<ul style="list-style-type: none"> - Preparation too narrow - Root gap too small - Worn contact tip causing irregular arc 	4.3.2
<ul style="list-style-type: none"> - Inadequate inductance - Voltage too low - Rusty or primed plate 	4.3.3
<ul style="list-style-type: none"> - Welding speed too fast - Current too high - Poor technique 	4.3.4

(4)

4.4 Describe the MIG welding process from the moment the arc is struck until the trigger is released.

(5)

4.5 Name TWO gases that can be used as a shielding gas for the welding joint area during the MIG welding process.

(2)

4.6

SCENARIO

You have been requested to manufacture a safety gate for the store room on the farm where hazardous materials are stored. The outside measurements of the gate are 2 000 mm (height) by 900 mm (width). The outer frame of the gate must be constructed with 19 mm square tubing. The price of the square tubing is R25,00 per metre. The inside of the gate should be made with Ø 12 mm mild steel rods. The spaces between adjacent rods must be 100 mm. The price of the Ø 12 mm rods is R6,00 per metre. The price of the lock is R80,00 and the two hinges are R10,00 each.

- 4.6.1 Prepare a materials list of all the materials needed to manufacture the safety gate. (4)
- 4.6.2 Calculate the total cost of the materials used for manufacturing the safety gate. Show ALL calculations. (5)
- 4.6.3 Draw a neat sketch of the safety gate with the parts mentioned in the SCENARIO.

Marks will be allocated for the following:

Hinges	(1)
Lock	(1)
Measurements	(1)
Neatness	(1)

(4)

4.7 The gases in the list below are all used in plasma cutting for the cutting of various types of metals.

Indicate which gas will be used for each of the following applications. Write only the gas next to the question number (4.7.1–4.7.3) in the ANSWER BOOK.

air/oxygen; hydrogen; nitrogen; argon

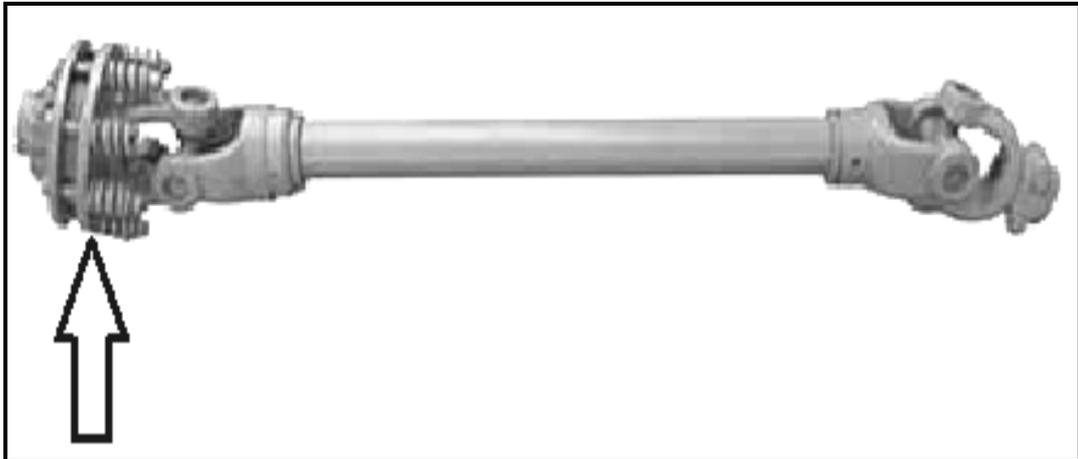
APPLICATION	GAS
Best quality cut for mild aluminium, stainless steel or carbon steel	4.7.1
Used to cut thick steel and metal and is the hottest gas available	4.7.2
Cuts with a consistent speed and lengthens the life of the machine	4.7.3

(3)
[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

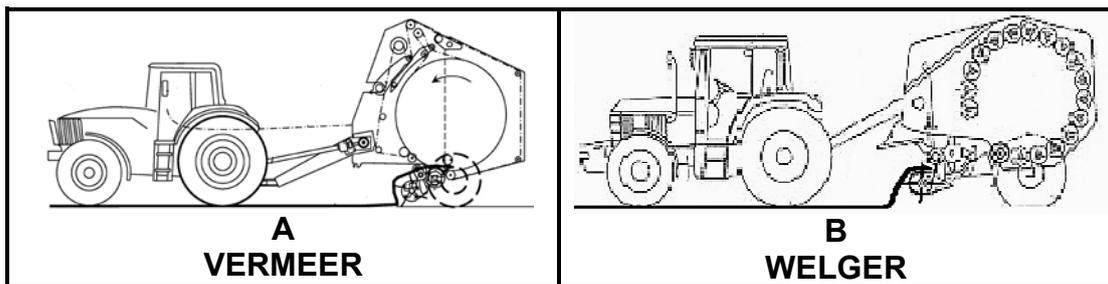
Start this question on a NEW page.

5.1 Study the photo of a power take-off shaft below that is used in the drive system of a cutting machine and answer the questions that follow.



- 5.1.1 Name the mechanism indicated by the arrow in the above photo. (1)
- 5.1.2 Give TWO reasons for installing the mechanism indicated by the arrow in the drive system of the cutting machine. (2)
- 5.1.3 Describe TWO procedures to follow when the cutting machine is to be stored for a long period. (2)

5.2 The illustration below shows two types of round balers.



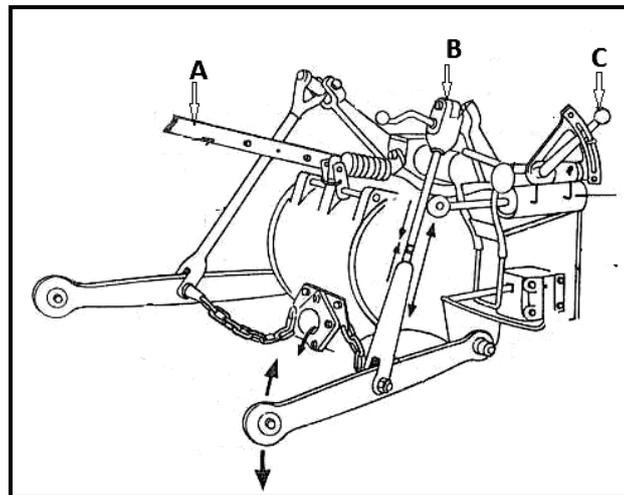
- 5.2.1 Briefly explain the bale-forming mechanism of each baler. (2)
 - 5.2.2 Name TWO safety precautions that a labourer must consider when baling is done on a slope or hillside. (2)
- 5.3 Describe the role of advanced technological devices, like computers and satellite positioning systems, in modern tractors. (2)

5.4 The hydraulic oil in the transmission system of a tractor needs to be replaced during a service.

5.4.1 Where can you find reliable information to choose the correct grade of oil for the tractor? (1)

5.4.2 Name THREE advantages of the use of automatic transmission oil in tractor hydraulic systems. (3)

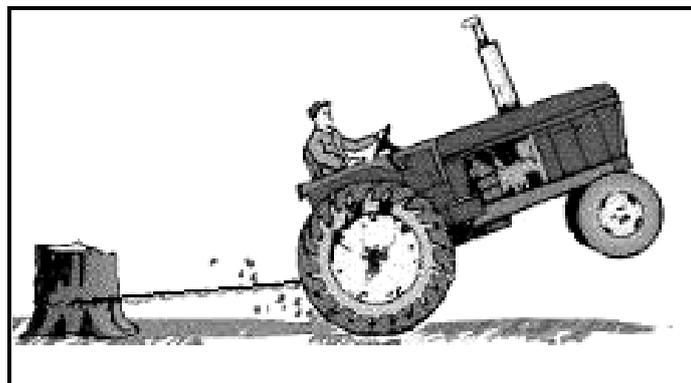
5.5 Study the illustration below of the three-point hydraulic system of a tractor and answer the questions that follow.



5.5.1 Label parts **A** and **B** as shown in the above illustration. (2)

5.5.2 Describe the working of part **C** as shown in the illustration above. (2)

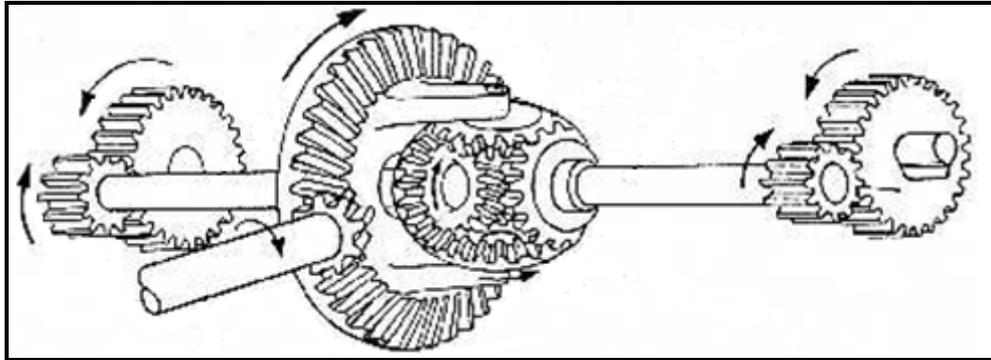
5.6 The illustration below shows a tractor attempting to pull a tree stump from the ground.



5.6.1 State TWO ways in which a tractor's mass displacement can be positively counteracted, thus preventing the tractor from falling backwards. (2)

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

- 5.7 State THREE requirements of the screens used to safeguard all moving parts of implements. (3)
- 5.8 The rear axle of a tractor consists of two main parts, namely the differential and the final drive, as shown below.



- 5.8.1 Name the TWO main functions of a tractor's rear differential. (2)
- 5.8.2 Explain the following statement:

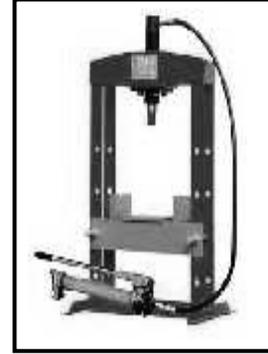
A locked differential has a significant traction advantage over an open differential. (2)

- 5.9 Suggest a viable solution to overcome jerky rotation when using the type of universal joint in the picture below.



(2)

5.10 Write the names of the farm workshop apparatus, **A**, **B** and **C**, below.

**A****B****C**

(3)

5.11 All farm implements and tractor spares should comply with certain requirements.

Name **THREE** advantages of standardising farm implements and tractor spares.

(3)

5.12 What is wrong with a diesel tractor if black smoke is detected at the exhaust outlet?

(1)

[40]

QUESTION 6: WATER MANAGEMENT

Start this question on a NEW page.

- 6.1 The photos below show different methods of irrigation. Write down the name of each irrigation method and state ONE advantage of that type of irrigation system.

**A****B****C**

- (6)
- 6.2 Describe the steps that you must follow in selecting a suitable pump for a new irrigation system. (6)
- 6.3 Give TWO reasons why a farmer needs to determine the water flow rate of a pipe delivery system. (2)
- 6.4 Recommend TWO preventative measures a farmer must keep in mind to prevent theft when installing electrical irrigation cables. (2)
- 6.5 Indicate how computer software can help to effectively regulate an irrigation system to ensure a better harvest. (2)
- 6.6 Name TWO devices used to determine evaporation in a field of maize. (2)

6.7 An irrigation sprayer is shown below.



- 6.7.1 Impurities like rust and lime deposits in irrigation pipes can cause blockages in sprayers. How can these impurities be removed effectively without dismantling the whole system? (1)
- 6.7.2 Describe the internal construction of the sprinkler head of an irrigation sprayer and explain the reason for the design. (3)
- 6.8 Name the drainage method that can be used in each of the following situations:
- 6.8.1 Sewerage water from a toilet (1)
- 6.8.2 Water from a kitchen sink (1)
- 6.8.3 Excess garden water (1)
- 6.9 Briefly describe how a septic tank functions. (3)

[30]

TOTAL SECTION B: 160
GRAND TOTAL: 200