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NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2025

CIVIL TECHNOLOGY: CIVIL SERVICES

MARKS: 200

TIME: 3 hours

This question paper consists of 19 pages, including 2 answer sheets.



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REQUIREMENTS:

1. ANSWER BOOK
2. Drawing instruments
3. A non-programmable pocket calculator

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions: TWO questions are generic and FOUR questions are subject specific.
2. Answer ALL the questions.
3. Answer each question as a whole. Do NOT separate subsections of questions.
4. Start the answer to EACH question on a NEW page.
5. Do NOT write in the margins of the ANSWER BOOK.
6. You may use sketches to illustrate your answers.
7. Write ALL calculations and answers in the ANSWER BOOK or on the attached ANSWER SHEETS.
8. Use the mark allocation as a guide to the length of your answers.
9. Make drawings and sketches in pencil, fully dimensioned and neatly finished off with descriptive titles and notes to conform to the *SANS/SABS Code of Practice for Building Drawings*.
10. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
11. Use your own discretion where dimensions and/or details have been omitted.
12. Answer QUESTIONS 2.1 and 6.1 on the attached ANSWER SHEETS using drawing instruments where necessary.
13. Write your NAME on every ANSWER SHEET and hand them in with your ANSWER BOOK, whether you have answered the question or not.
14. Owing to electronic transfer, drawings in the question paper are NOT to scale.

QUESTION 1: SAFETY AND MATERIALS (GENERIC)**Start this question on a NEW page.**

- 1.1 Identify the correct requirements regarding stairways used during construction:
- 1.1.1 Stairways that will not be a permanent part of the building under construction must have landings of at least **800 mm x 600 mm / 760 mm x 560 mm**, (1)
 - 1.1.2 ... for every **2,7 m / 3,7 m** or less vertical rise. (1)
 - 1.1.3 Stairways must be installed at least **30° / 35°**, (1)
 - 1.1.4 ... and no more than **60° / 50°** from the horizontal. (1)
 - 1.1.5 Doors and gates opening directly into a stairway must have a platform that extends at least **510 mm / 910 mm** beyond the swing of the door or gate. (1)
- 1.2 Name any TWO materials that ladders are generally made of. (2 x 1) (2)
- 1.3 Name the TWO characteristics that define a builder's hoist. (2 x 1) (2)
- 1.4 Describe the difference of the surface finish between a *water-based* paint and an *oil-based paint*. (2 x 1) (2)
- 1.5 Name any THREE properties of the curing process of concrete. (3 x 1) (3)
- 1.6 Name the THREE advantages of electroplating. (3 x 1) (3)
- 1.7 Describe the process of powder coating. (2)
- 1.8 What is the main ingredient used in galvanising? (1)

[20]

QUESTION 2: GRAPHICS, JOINING AND EQUIPMENT (GENERIC)

Start this question on a NEW page.

- 2.1 Figure 2.1 on ANSWER SHEET A shows an incomplete floorplan of a building, scale 1 : 100 is used.

Complete the floorplan by using the following information:

- 2.1.1 Outside door 2.1.A (2)
- 2.1.2 Window 2.1.B (2)
- 2.1.3 Water closet 2.1.C (2)
- 2.1.4 Washbasin 2.1.D (2)
- 2.1.5 Wash tub 2.1.E (2)
- 2.1.6 One-way switch-single pole 2.1.F (2)
- 2.1.7 Fluorescent light 2.1.G (2)
- 2.1.8 Socket outlet 2.1.H (2)
- 2.1.9 Grease trap 2.1.I (2)
- 2.1.10 Wall light 2.1.J (2)

- 2.2 FIGURE 2.2 below shows a surveying tool used on a construction site. Study the figure and answer the following questions.

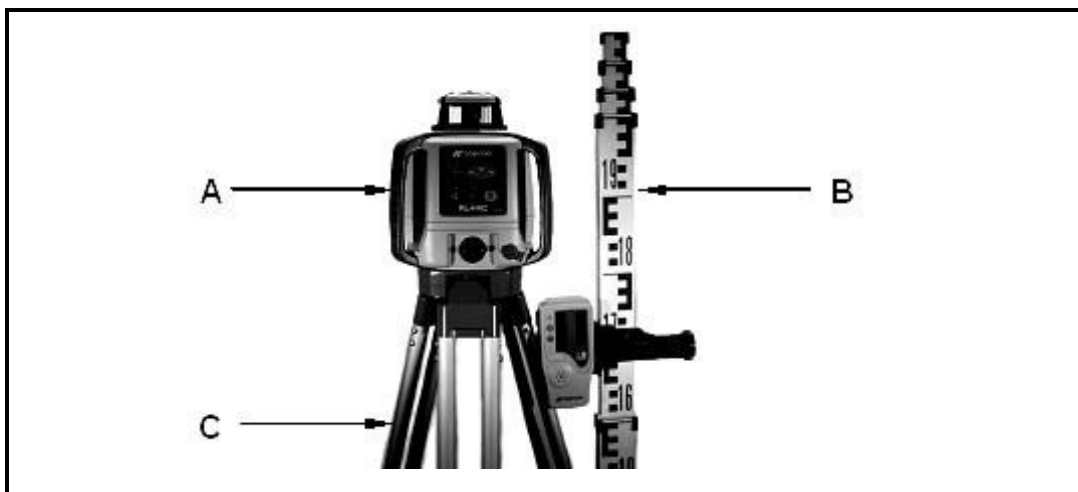


FIGURE 2.2

- 2.2.1 Identify parts **A** to **C**. (3)
- 2.2.2 Explain how will you take care of part **A**. (2)

- 2.3 FIGURE 2.3 below shows the readings of a dumpy level on a telescopic staff. Answer the following questions with regard to the readings.

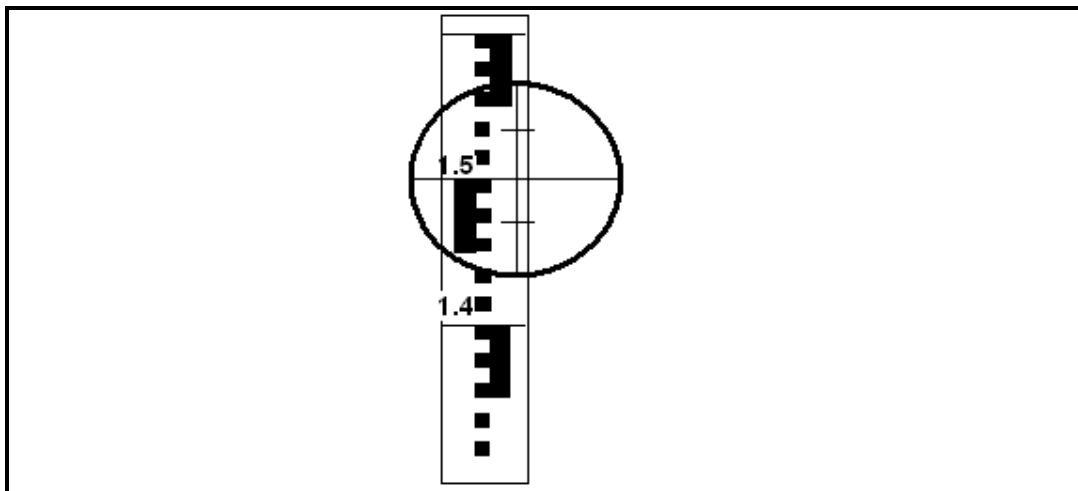


FIGURE 2.3

- 2.3.1 What is the height reading on the staff? (1)
- 2.3.2 What are the minimum and maximum distances that could be determined accurately on the staff? (2)
- 2.4 Name the maintenance measures for the multi-detector with reference to the following facets.
- 2.4.1 Cleaning method (1)
- 2.4.2 Storage over a long period (1)
- 2.5 Identify the types of nuts illustrated in figures A to C.

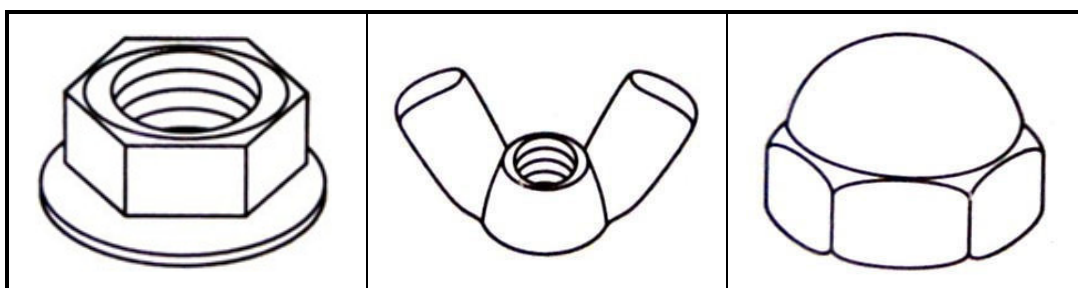


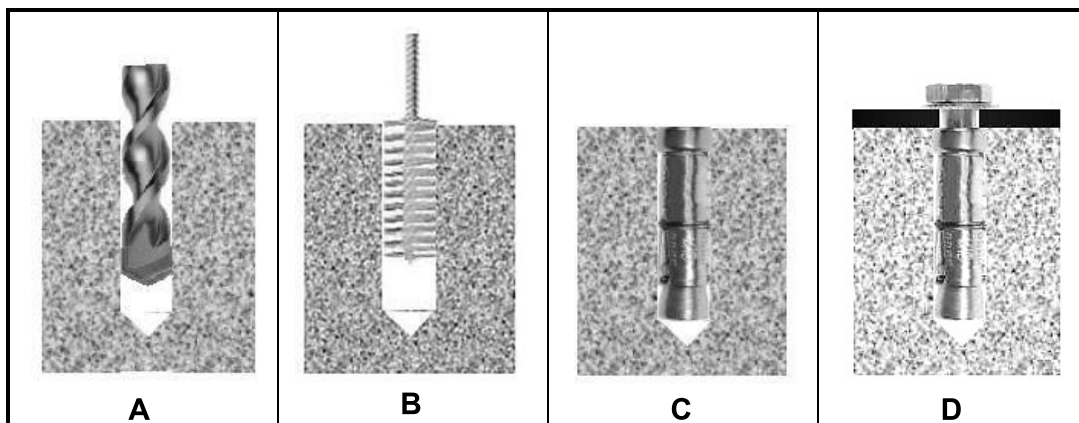
FIGURE A

FIGURE B

FIGURE C

(3)

- 2.6 The pictures below illustrate the steps followed when fixing material to a concrete floor with a fastener.



- 2.6.1 Identify the fastener that is used in step **D**. (1)
- 2.6.2 Describe the steps from **A** to **D** above in your ANSWER BOOK. (4)
- 2.6.3 Justify the use of this fastener when securing the bracket of a heavy gate to a wall. (2)

[40]

TOTAL SECTION A: 60

QUESTION 3: SAFETY, MATERIAL AND CONSTRUCTION (SPECIFIC)

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

- 3.1 FIGURE 3.1 show workers who must work in a manhole. Answer the following questions with regard to the safety measures which must be applied.



FIGURE 3.1

- 3.1.1 What is the purpose of structure **A**? (1)
- 3.1.2 What is the purpose of equipment **B**? (1)
- 3.1.3 Briefly describe in which circumstances equipment **B** will be used. (2)
- 3.1.4 Which personal protective equipment is lacking from the manhole worker should there be dangerous fumes in the manhole? (1)
- 3.2 Name TWO safety measures which must be applied when manhole covers are removed. (2 x 1) (2)
- 3.3 Briefly define *unsafe conditions*. (2)
- 3.4 Indicate if the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number in the ANSWER BOOK.
- 3.4.1 Zink is a highly reactive metal. (1)
- 3.4.2 Zink has a very weak atomic bond relative to other metals. (1)
- 3.4.3 Dezincification is used in the preparation of galvanised metals for soldering. (1)
- 3.4.4 Dezincification enhances the properties of brass objects. (1)
- 3.4.5 Dezincification is an electrochemical reaction between zinc and copper. (1)

- 3.5 What is the effect on galvanised pipes when the water has an acid content? (1)
- 3.6 Briefly describe what *galvanic corrosion* is. (1)
- 3.7 Answer the following questions with regard to the structure in FIGURE 3.7.

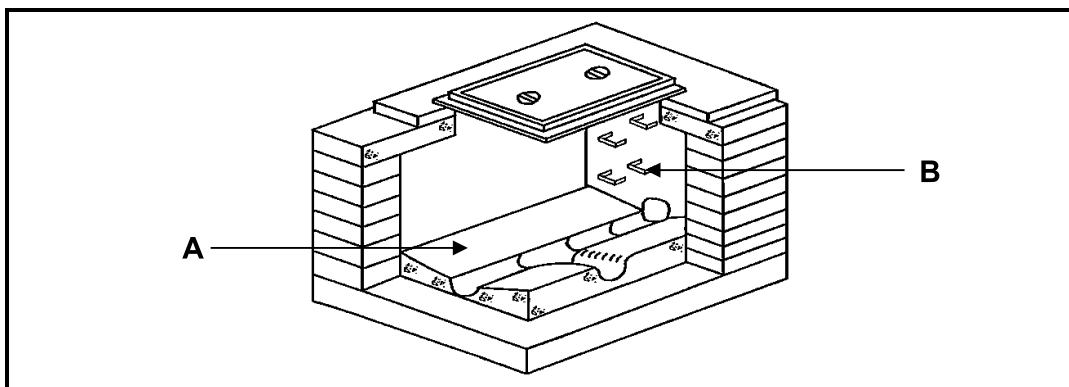


FIGURE 3.7

- 3.7.1 What is this structure called? (1)
- 3.7.2 What is part **A** of this structure called? (1)
- 3.7.3 Describe the TWO purposes of part **A**. (2 x 1) (2)
- 3.7.4 Name THREE positions where this structure must be installed. (3 x 1) (3)
- 3.7.5 What is the purpose of part **B**? (1)
- 3.8 Answer the following questions with regard to the drain excavation in FIGURE 3.8.

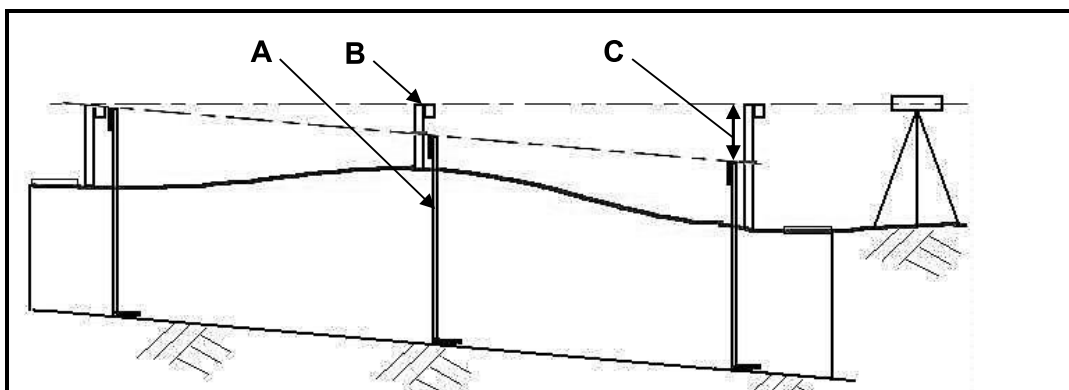


FIGURE 3.8

- 3.8.1 Name parts **A** and **B**. (2)
- 3.8.2 The length of the drain excavation in FIGURE 3.8 is 8 m. Determine the measurement at **C** if a fall of 1:40 is used. Show ALL calculations. (2)

3.9 Name the safety regulation that is applicable to excavations when the following factors are considered.

3.9.1 Heavy machinery (1)

3.9.2 Visible at night (1)

[30]



QUESTION 4: COLD WATER SUPPLY, WARM WATER SUPPLY AND TOOLS (SPECIFIC)

Start this question on a NEW page.

- 4.1 Name THREE properties of water for domestic use. (3 x 1) (3)
- 4.2 Briefly explain the purpose of a water meter in the water supply pipe to a house. (2)
- 4.3 Name the type of tap or valve which is identified by the following descriptions.
- 4.3.1 It is installed on the cold water supply pipe to any water closet cistern. (1)
- 4.3.2 It is shaped like a gate that moves up and down to open and close it. (1)
- 4.3.3 Is used for water regulation to kitchen sinks. (1)
- 4.3.4 It is fitted with a hinged lock valve. (1)
- 4.4 What is the sectional size of the pipes of the following uses?
- 4.4.1 Waste-water pipes from showers. (1)
- 4.4.2 Soil pipes from water closets. (1)
- 4.5 What is the angle of the soil-water bend in FIGURE 4.5? (1)

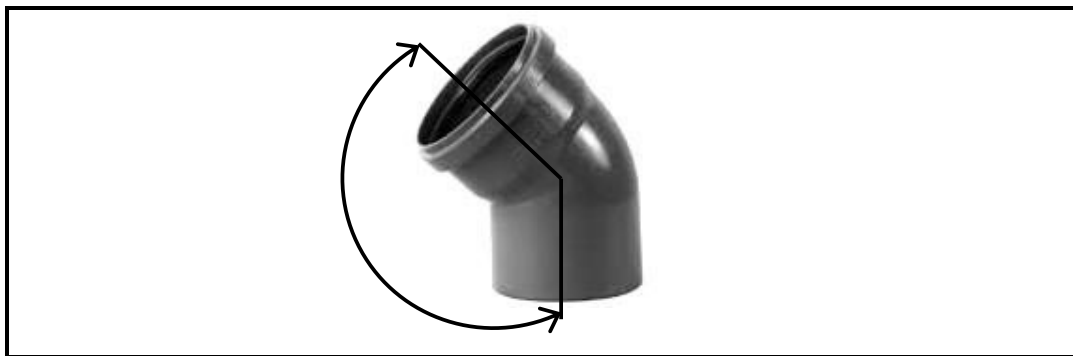


FIGURE 4.5

- 4.6 Answer the following questions with regard to the taps in FIGURE 4.6 A and 4.6 B.

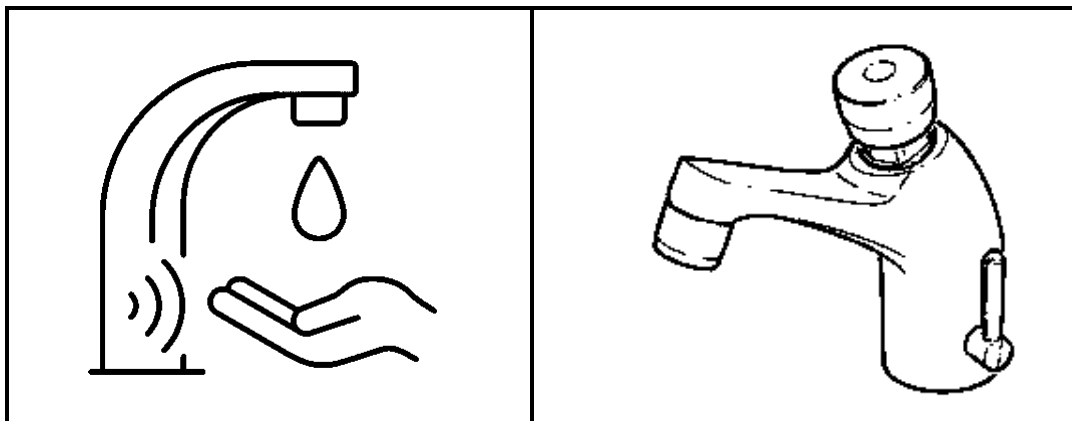


FIGURE 4.6 A

FIGURE 4.6 B

- 4.6.1 Identify the types of taps in FIGURES 4.6 A and 4.6 B. (2)
- 4.6.2 Motivate why these type of taps are used in public bathrooms. (1)
- 4.6.3 Describe the working of the tap in FIGURE 4.6 B. (2)
- 4.7 Identify the coupling in FIGURE 4.7. (1)

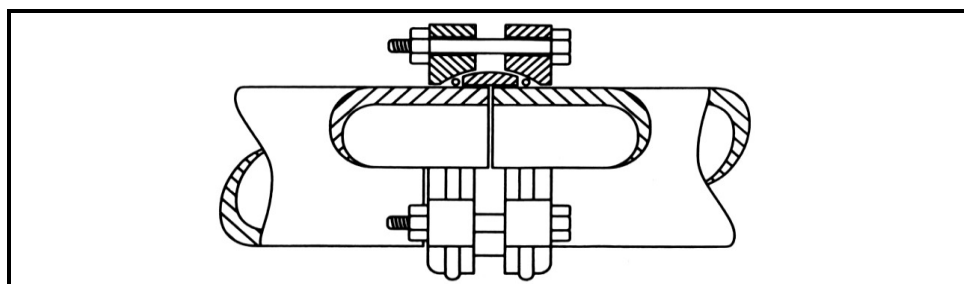


FIGURE 4.7

- 4.8 Make neat sketches to illustrate the symbols of the following hot water systems.
- 4.8.1 Balancing device (2)
- 4.8.2 Non-return valve (2)
- 4.8.3 Shower (2)

- 4.9 Choose a description with regard to a high-pressure geyser from COLUMN B that matches the term in COLUMN A. Write only the correct letter (A–G) next to the question numbers (4.9.1 to 4.9.5) in the ANSWER BOOK, for example 4.9.6 H. (5)

COLUMN A	COLUMN B
4.9.1 Drip tray	A It shuts off the water supply
4.9.2 Vacuum breaker	B It balances the water pressure of the hot- and cold-water
4.9.3 Pressure safety valve	C It regulates the heating of the water inside the geyser
4.9.4 Pressure control valve	D Catches leaking water under the geyser
4.9.5 Thermostat	E Prevents the water from siphoning out of the cylinder when the cold water is shut off
	F It protects the geyser against corrosion
	G The design ability must match that of the pressure ability of the geyser

- 4.10 Identify the correct requirement with regard to high-pressure geysers.
- 4.10.1 The drip tray must be connected to a **40 mm / 50 mm** drain pipe. (1)
- 4.10.2 Vacuum breaker must be installed on **200 mm / 300 mm** copper pipes above the geyser. (1)
- 4.10.3 An electric isolator switch should be installed at least **900 mm / 1 000 mm** from the geyser. (1)
- 4.10.4 The thermostat must be **covered / open**. (1)
- 4.11 Explain the probable cause of hot water flowing from the overflow pipe of a geyser. (2)

4.12 Answer the following questions with regard to the tool in FIGURE 4.12.

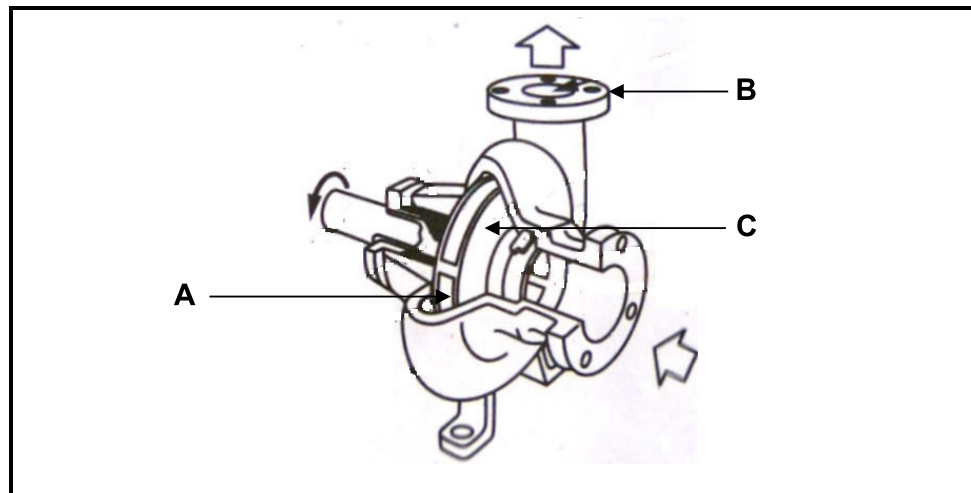


FIGURE 4.12

4.12.1 Name this tool. (1)

4.12.2 Name the parts **A** to **C**. (3)

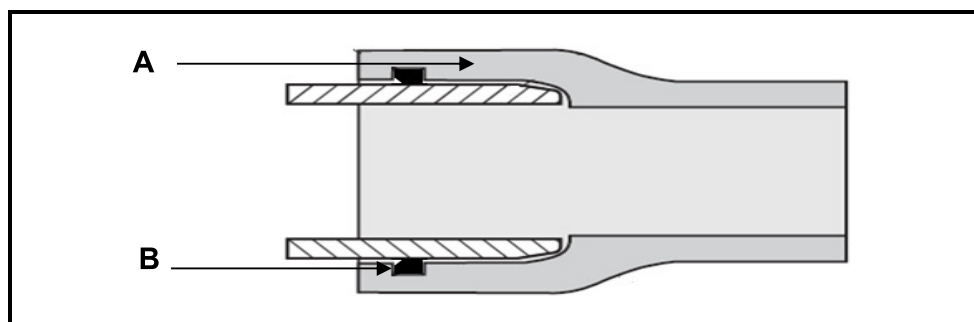
4.12.3 Name ONE use of this tool. (1 x 1) (1)

[40]

QUESTION 5: DRAINAGE AND QUANTITIES (SPECIFIC)

Start this question on a NEW page.

- 5.1 Explain the difference between *waste-water* and *soiled water*. (2)
- 5.2 Indicate if the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number in the ANSWER BOOK.
- 5.2.1 Stormwater is conveyed in drain systems. (1)
- 5.2.2 The flow of drains is entirely dependent of pumps. (1)
- 5.2.3 A manhole must be built where two or more pipes meet. (1)
- 5.2.4 There should be at least one vent pipe in a sewer system. (1)
- 5.3 Briefly motivate why the inside of drain pipes must be smooth. (1)
- 5.4 Name TWO advantages of uPVC drainpipes. (2 x 1) (2)
- 5.5 In which circumstances are cast iron pipes commonly used? (1)
- 5.6 What is the maximum internal water pressure which the pipe fittings in a drainage system must be able to withstand? (1)
- 5.7 Answer the following questions with regard to the uPVC drainpipe joint in FIGURE 5.7.

**FIGURE 5.7**

- 5.7.1 What is this type of joint called? (1)
- 5.7.2 What is part **A** of this joint called? (1)
- 5.7.3 What is the purpose of part **B**? (1)

- 5.8 Answer the following questions with regard to the drainage fitting in FIGURE 5.8.

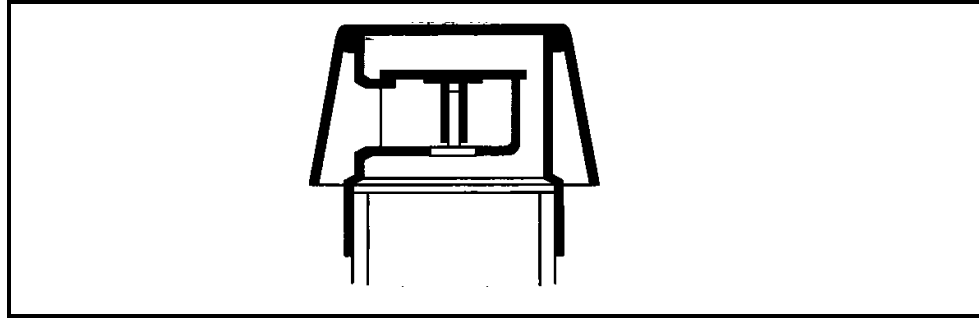


FIGURE 5.8

- 5.8.1 What is this fitment called? (1)
- 5.8.2 Describe the functioning AND purpose of this fitment when waste water is released into a drainage system. (4)
- 5.9 Briefly explain why a manhole ramp should be installed in a drainage system. (1)
- 5.10 Answer the following questions with regard to the plumber appliance in FIGURE 5.10.

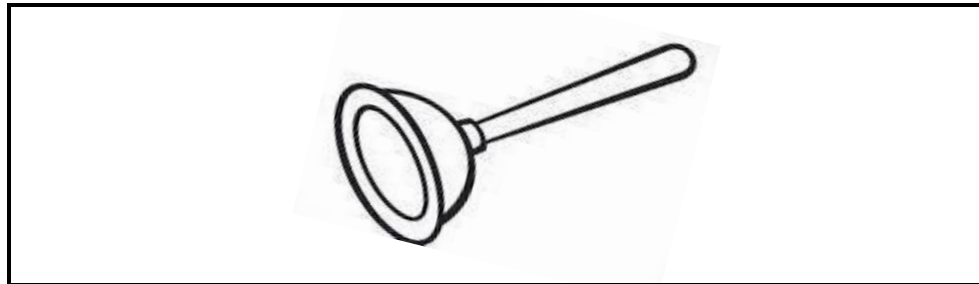


FIGURE 5.10

- 5.10.1 What is this appliance called? (1)
- 5.10.2 Explain step by step how this appliance would be used. (3)
- 5.11 Briefly motivate why the water in a sewerage treatment plant must be chemical treated. (1)

- 5.12 FIGURE 5.12 shows a part of the layout of a drainage system. Use the graphic scale and calculate the following quantities for the drainage system.

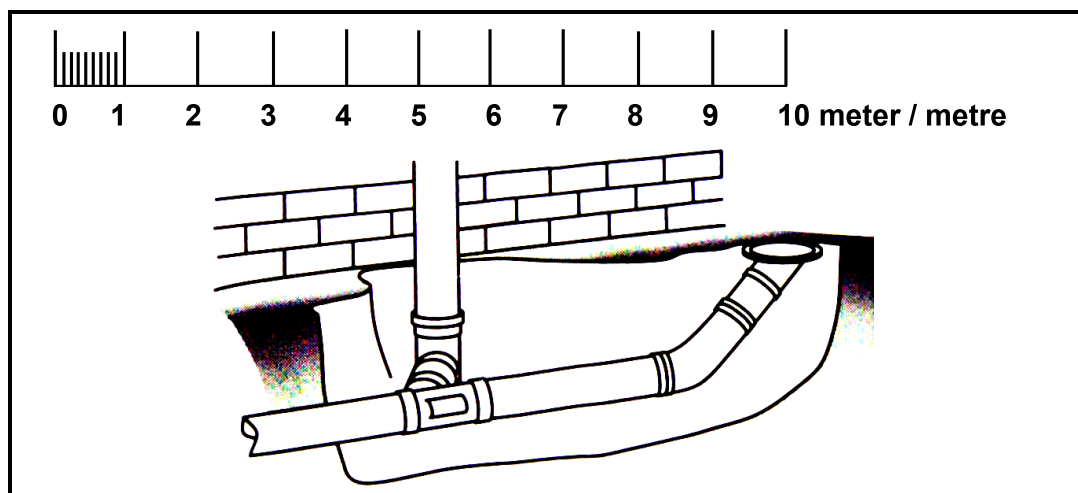


FIGURE 5.12

SANITARY WARE / FITTING	MATERIAL	QUANTITY	SIZE	LENGTH
Main sewer pipe	5.12.1		5.12.6	5.12.9
Branch pipe				5.12.10
Waste junction 135° with inspection eye	5.12.2	5.12.4	5.12.7	
Bend 90° plain		5.12.5		
Bend 135° plain				
Rodding eye	5.12.3		5.12.8	

(10)

- 5.13 The side of a cube water supply tank is 900 mm. Calculate the following.
(Show ALL calculations and formulas)

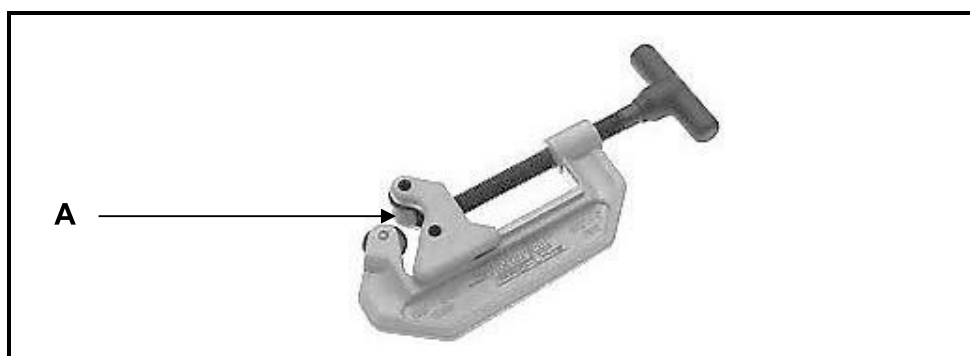
5.13.1 The volume of the tank in m^3 . (3)

5.13.2 The volume water the tank can hold. (2)

[40]

QUESTION 6: GRAPHIC COMMUNICATION, ROOF WORK, STORMWATER AND JOINING (SPECIFIC)**Start this question on a NEW page.**

- 6.1 FIGURE 6.1 on ANSWER SHEET B shows the top and front elevations of a cylindrical pipe with a 45° cut-off.
Draw the development of the pipe on ANSWER SHEET B.
Show ALL construction lines. (21)
- 6.2 What is the purpose of end caps in gutters? (1)
- 6.3 What is the purpose of a gutter shoe underneath a rainwater downpipe? (1)
- 6.4 Briefly motivate why rainwater must be drained away from buildings. (1)
- 6.5 Answer the following questions with regard to the tool in FIGURE 6.5.

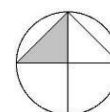
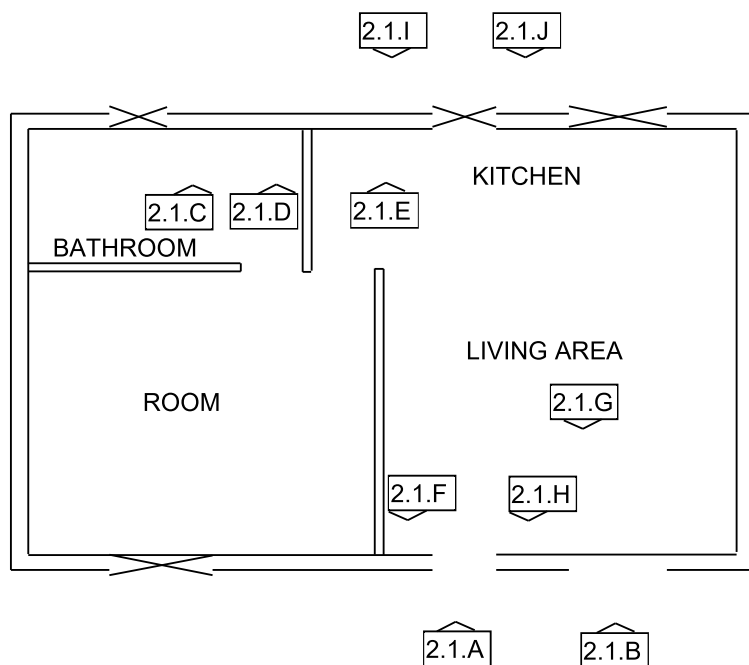
**FIGURE 6.5**

- 6.5.1 What is this tool called? (1)
- 6.5.2 What is part **A** called? (1)
- 6.6 Indicate if the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number in the ANSWER BOOK.
- 6.6.1 uPVC pipes are cut with a hacksaw. (1)
- 6.6.2 Capillary joints are used to join uPVC pipes. (1)
- 6.6.3 Pop rivets are used to fix copper pipes to concrete. (1)
- 6.6.4 Flux must be applied to the pop rivet before it is used. (1)

[30]**TOTAL: 200**

ANSWER SHEET	A	CIVIL TECHNOLOGY (GENERIC)	NAME AND SURNAME:	

- 2.1 Use the information on ANSWER SHEET A and complete the floor plan on scale 1:100. (20)



Outside door 2.1.A	2	
Window 2.1.B	2	
Water closet 2.1.C	2	
Washbasin 2.1.D	2	
Wash tub 2.1.E	2	
One-way switch-single pole 2.1.F	2	
Fluorescent light 2.1.G	2	
Socket outlet 2.1.H	2	
Grease trap 2.1.I	2	
Light wall mounted 2.1.J	2	
TOTAL	20	

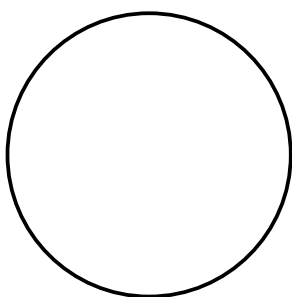
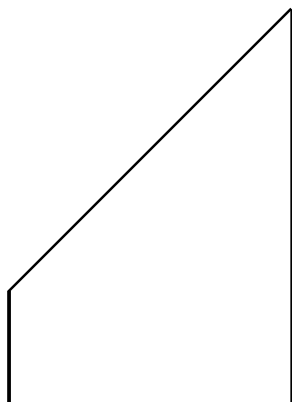
ANSWER SHEET	B	CIVIL TECHNOLOGY (SPECIFIC)	NAME AND SURNAME:	

6.1 FIGURE 6.1 on answer sheet B shows the top and front elevations of a cylindrical pipe with a 45° cut-off.

Draw the development of the pipe on ANSWER SHEET B.

Show ALL construction lines.

(21)



Base line A-B	1	
Seam lines A-C and B-D	1	
Dividing lines 0-12 on top view	6	
Vertical and horizontal construction lines A1-A7	7	
Intersection points and development lines B1-B11	6	
TOTAL	21	

