Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2022

CIVIL TECHNOLOGY: CIVIL SERVICES

MARKS: **200**

TIME: **3 hours**

This question paper consists of 17 pages, including 2 answer sheets.

REQUIREMENTS:

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

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.
15. Google Images was used as the source of all photographs and pictures.
16. Write neatly and legibly.

Copyright reserved

QUESTION 1: SAFETY AND MATERIALS (GENERIC)

Start this question on a NEW page.

1.1 Define the term *accident*. (2)

1.2 Name the material that scaffolding is made from. (1)

1.3 Choose the correct answer from the words given in brackets that is related to scaffolding:

1.3.1 The safety factor that is used for scaffolding frames is (one / two / three). (1)

1.3.2 The minimum thickness of a wooden scaffold platform is (38 mm / 50 mm / 76 mm). (1)

1.3.3 The minimum height of a suspended scaffold is (900 mm / 1 200 mm / 1 500 mm). (1)

1.4 Give TWO reasons why scaffolding must be inspected before it can be used. (2 x 1) (2)

1.5 What is the maximum distance that a suspended scaffold may hang over the edge of the structure? (1)

1.6 What is the maximum height of a trestle scaffold? (1)

1.7 Answer the following questions with regard to ladders.

1.7.1 Why should only one person at a time use a ladder? (1)

1.7.2 What should the end of a ladder be marked with for visibility when it is transported? (1)

1.7.3 Name any ONE material that ladders can be made from. (1)

1.7.4 Why should ladders be kept clean and free from oil and grease? (1)

1.8 Name TWO advantages of a water-based paint. (2 x 1) (2)

1.9 Name TWO advantages of the curing of concrete. (2 x 1) (2)

1.10 Name TWO methods that can be used to prevent the corrosion of metals. (2 x 1) (2)

[20]

Copyright reserved

QUESTION 2: GRAPHICS, JOINING AND EQUIPMENT (GENERIC)

2.1 FIGURE 2.1 on ANSWER SHEET A shows the outer lines of a structure which must be built on a site. Draw the site plan on scale 1 : 200 on ANSWER SHEET A so that the structure is in the middle of the site.

The site plan must comply with the following requirements.
Use the points table on SHEET A as reference.

2.1.1 Site size is 30 m wide from east to west and 40 m long from south to north. (2)

2.1.2 Pavement of 2 m and the street of 6 m on the south side. (3)

2.1.3 Building boundaries are 2 m on the east, north and west sides and 4 m on the south side. (4)

2.1.4 3 m wide entrance to the site. (2)

2.1.5 Datum level in the north-west corner of the site. (2)

Draw in the sewer lay-out for the structure and show the following:

2.1.6 Water closet symbol at the abbreviation (1)

2.1.7 Sewer pipes connections (2)

2.1.8 Rodding eye with the abbreviation (2)

2.1.9 Inspection eye with the abbreviation (2)

2.1.10 Manhole with the abbreviation (2)

Indicate the following measurements:

2.1.11 Length and width of the site (4)

2.1.12 South and west building boundaries (2)

2.2 What is the advantage of the square shoulder bolt? (1)

2.3 Name parts **A** to **D** of the bolt in FIGURE 2.3.

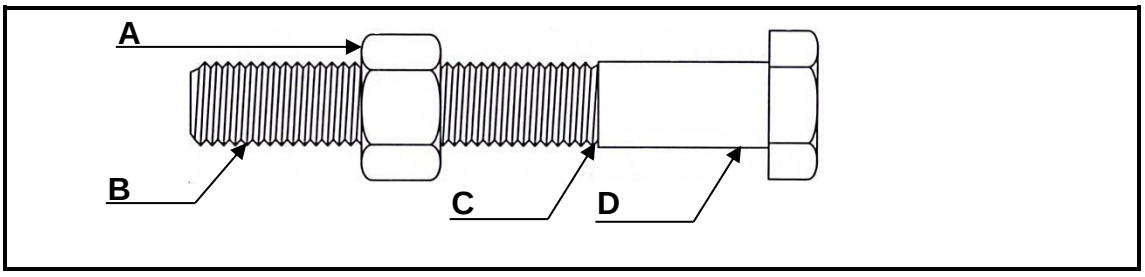


FIGURE 2.3 (4 x 1) (4)

Copyright reserved

2.4 What is the purpose of the nylon insert of a hexagonal nut? (1)

2.5 What is the advantage of a wing nut? (1)

2.6 FIGURE 2.6 shows the dumpy level reading which is taken on the telescopic staff. Answer the following questions with regard to the reading.

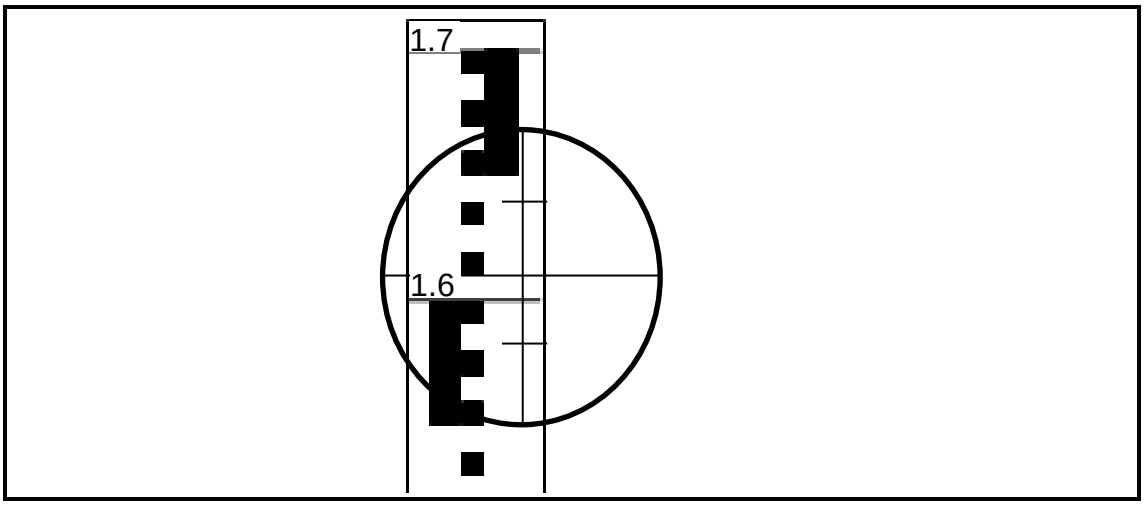


FIGURE 2.6

2.6.1 What is the height reading on the staff? (1)

2.6.2 Determine the distance between the dumpy level and the staff. Show ALL calculations, formulae and units. (4)

[40]

TOTAL SECTION A: 60

QUESTION 3: SAFETY, MATERIAL AND CONSTRUCTION (SPECIFIC)

Start the question on a NEW page.

3.1 Indicate if the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number in the ANSWER BOOK.

3.1.1 A mouth-nose mask provides sufficient protection when working in manholes with dangerous gasses. (1)

3.1.2 An extractor fan can be used to displace dangerous gasses in a manhole. (1)

3.1.3 Open manholes must be cordoned off before it is entered. (1)

3.1.4 The person entering a manhole must have medical training. (1)

3.2 Describe the purpose of safety nets above door openings of a structure which are repaired. (2)

3.3 Describe TWO responsibilities of the contractor when working in high places. (2 x 2) (4)

3.4 Fully motivate why zinc is seen as a highly reactive metal. (4)

3.5 Complete the following descriptions of the factors that determine galvanic corrosion through thermodynamic and kinetic conditions.

- The difference between the …3.5.1 … potential of the two metals. (1)
- Contact resistance at the …3.5.2 … between the two metals. (1)
- Electrical resistance of the …3.5.3 ... solution. (1)
- The presence of a …3.5.4 … film. (1)

3.6 Answer the following questions with regard to the structure in FIGURE 3.6.

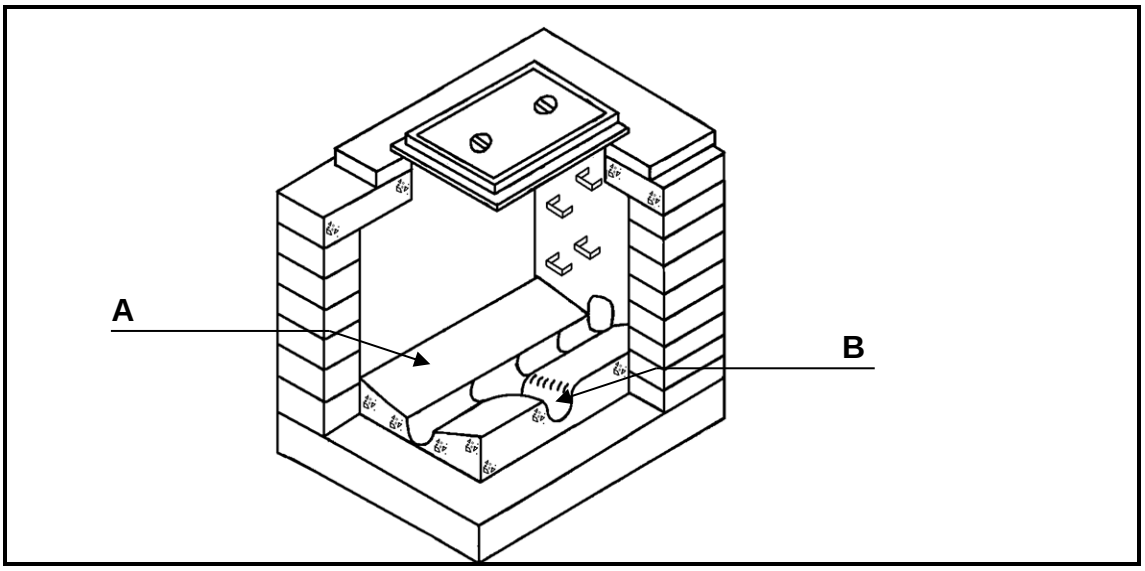


FIGURE 3.6

3.6.1 What is this structure called? (1)

3.6.2 Name parts **A** and **B**. (2 x 1) (2)

3.6.3 Briefly motivate why part **A** is built with an incline. (2)

Copyright reserved

3.7 A drain line for a 100 mm drain pipe must be laid for a house. A gradient of 1 : 40 over a distance of 20 m is specified.
Determine the height of the pitch at the end. Show ALL calculations. (3)

3.8 FIGURE 3.8 shows the shoring for a trench. Answer the following questions with regard to the shoring.

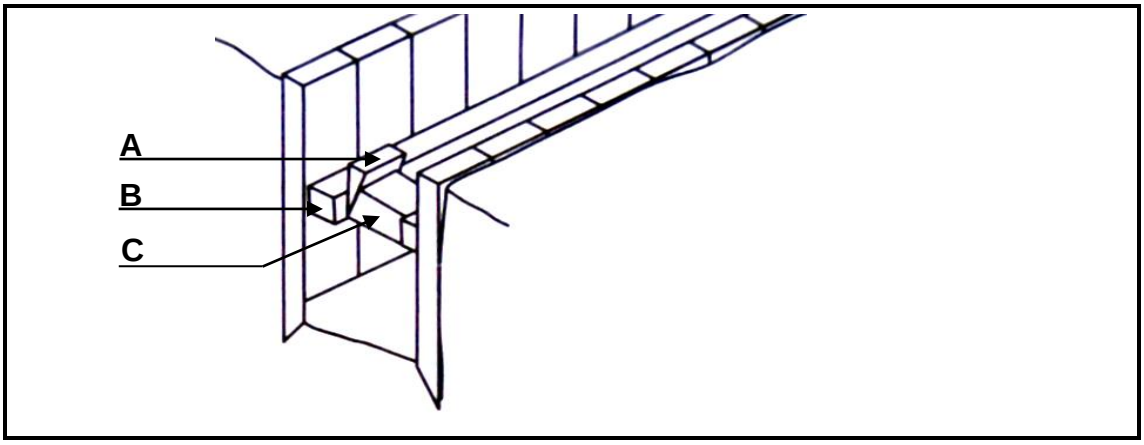


FIGURE 3.8

3.8.1 In which type of ground will this shoring be used? (1)

3.8.2 Name parts **A** to **C** of the shoring. (3 x 1) (3)

[30]

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

4.1 Answer the following questions with regard to the water supply system in FIGURE 4.1.

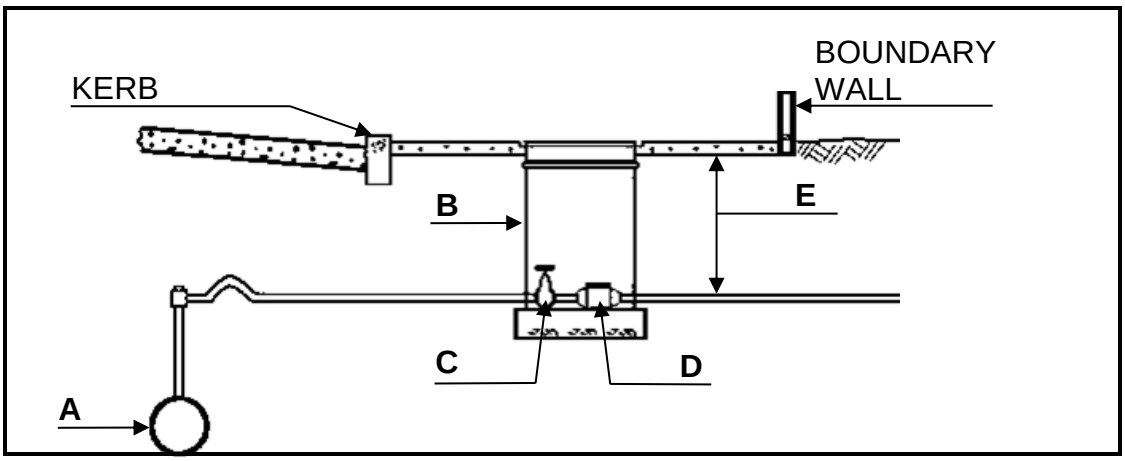


FIGURE 4.1

4.1.1 Name components **A** to **D**. (4 x 1) (4)

4.1.2 What is the minimum dimension at **E**? (1)

4.1.3 Who is responsible for the installation of component **B**? (1)

4.2 Answer the following questions with regard to the valve in FIGURE 4.2.

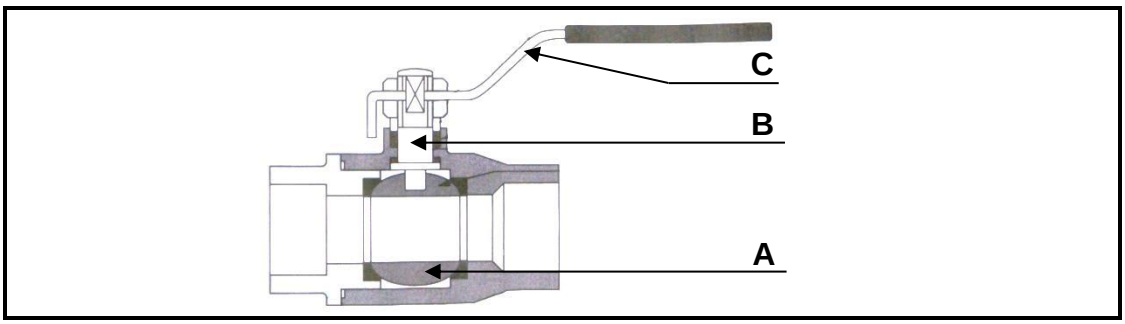


FIGURE 4.2

4.2.1 Name the valve in FIGURE 4.2. (1)

4.2.2 Name the parts **A** to **C**. (3 x 1) (3)

4.2.3 Where will this type of valve be used? (1)

Copyright reserved

4.3 Answer the following questions with regard to the soil water fitting in FIGURE 4.3.

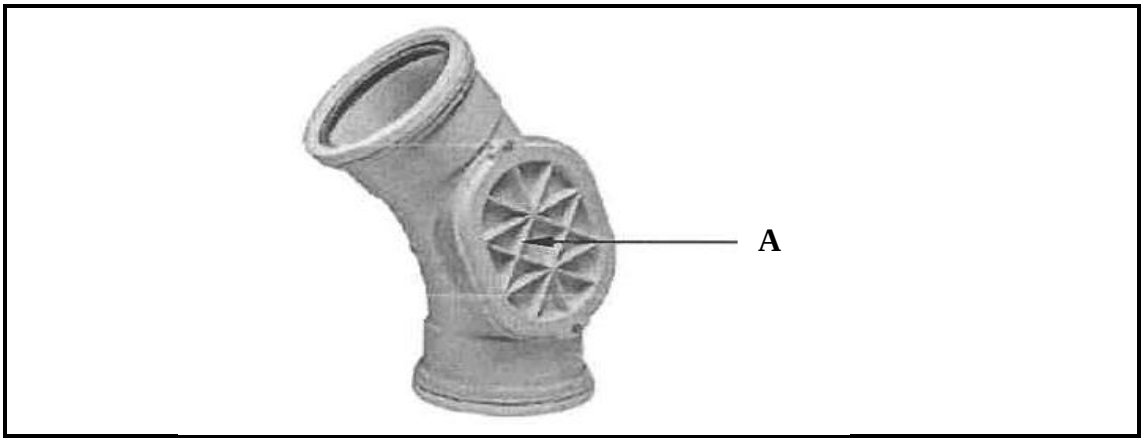


FIGURE 4.3

4.3.1 What is the sectional size of this pipe? (1)

4.3.2 What is the fitting in FIGURE 4.3 called? (1)

4.3.3 What is the purpose of part **A**? (1)

4.4 Briefly motivate why gaskets are used in the flange joints of cast iron pipes. (2)

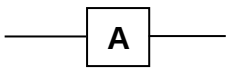
4.5 What is the purpose of a low-flow shower head? (1)

4.6 Explain the operation and advantages of a red water diverter. (6)

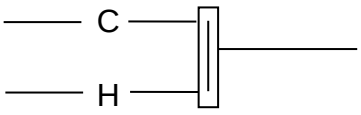
4.7 Identify the following symbols and abbreviations for hot water systems.

4.7.1

(1)

4.7.2 

(1)

4.7.3 

(1)

4.7.4 PCV (1)

4.7.5 V (1)

4.8 Indicate the water flow direction of the water in the pipes 4.8.1 to 4.8.5 of the hot water system in FIGURE 4.8.
Write the correct arrow letter against the number for example 4.8.6 – B.

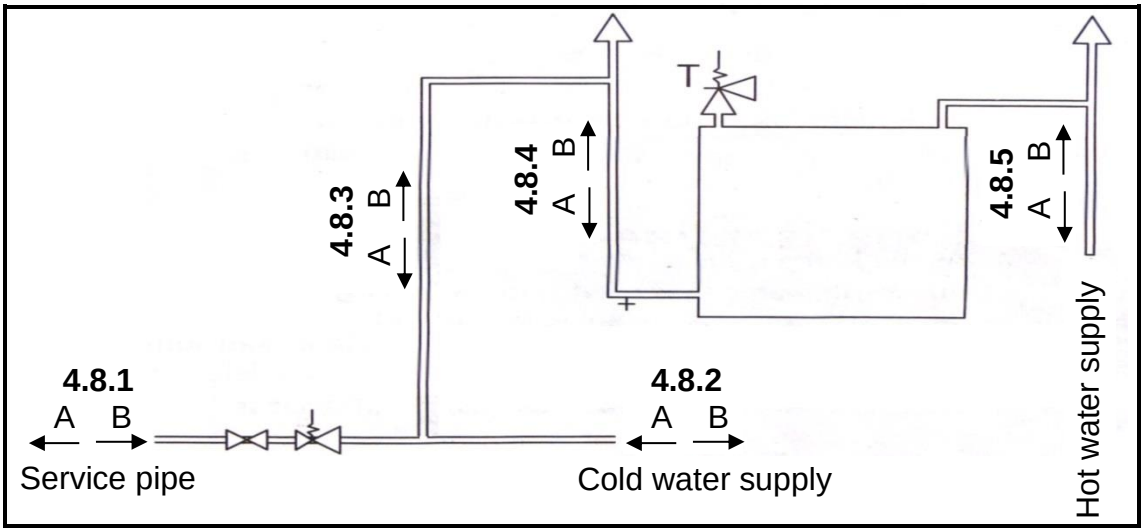


FIGURE 4.8 (5 x 1) (5)

4.9 Indicate if the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question numbers (4.9.1 to 4.9.3) in the ANSWER BOOK.

4.9.1 The safety tray of a geyser prevents the pressure in a geyser getting too high. (1)

4.9.2 A low-pressure solar geyser is installed lower than the taps. (1)

4.9.3 A non-return valve is installed at high pressure solar geysers. (1)

4.10 Name FOUR caring measures for the compressed-air test apparatus. (4 x 1) (4)

[40]

QUESTION 5: DRAINAGE AND QUANTITIES (SPECIFIC)

5.1 Answer the following questions with regard to the drainage fitment in FIGURE 5.1.

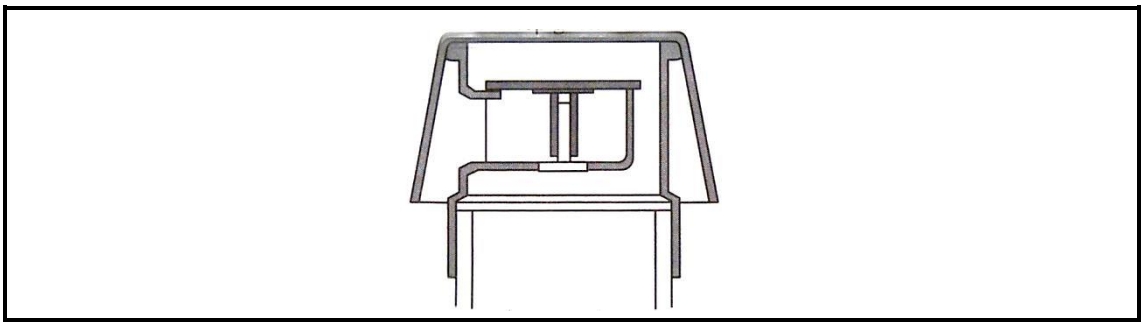


FIGURE 5.1

5.1.1 What is this fitment called? (1)

5.1.2 Describe the functioning AND purpose of this fitment when waste water is released into a drainage system. (4)

5.2 Answer the following questions with regard to the drainage fixture in FIGURE 5.2.

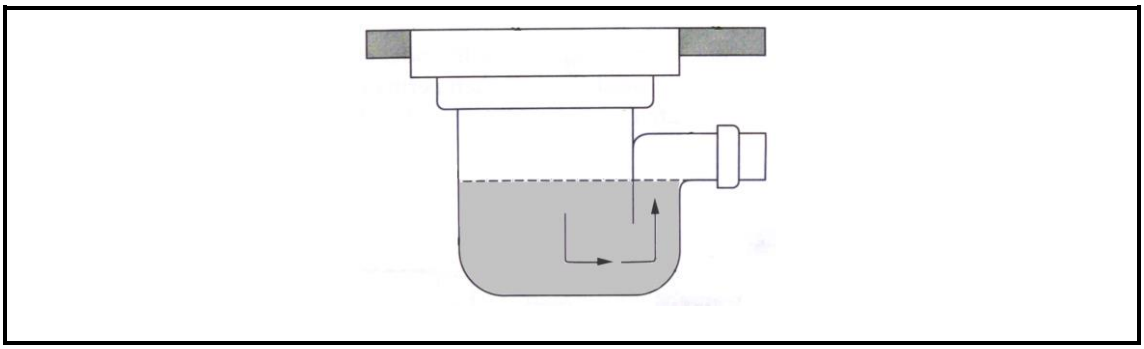


FIGURE 5.2

5.2.1 What is this drainage fixture in FIGURE 5.2 called? (1)

5.2.2 Where is this fixture installed? (1)

5.2.3 Name TWO disadvantages of this fixture. (2 x 1) (2)

5.2.4 Briefly describe the purpose of the water at the bottom of the fixture. (2)

Copyright reserved

5.3 Answer the following questions with regard to the drainage structure in FIGURE 5.3.

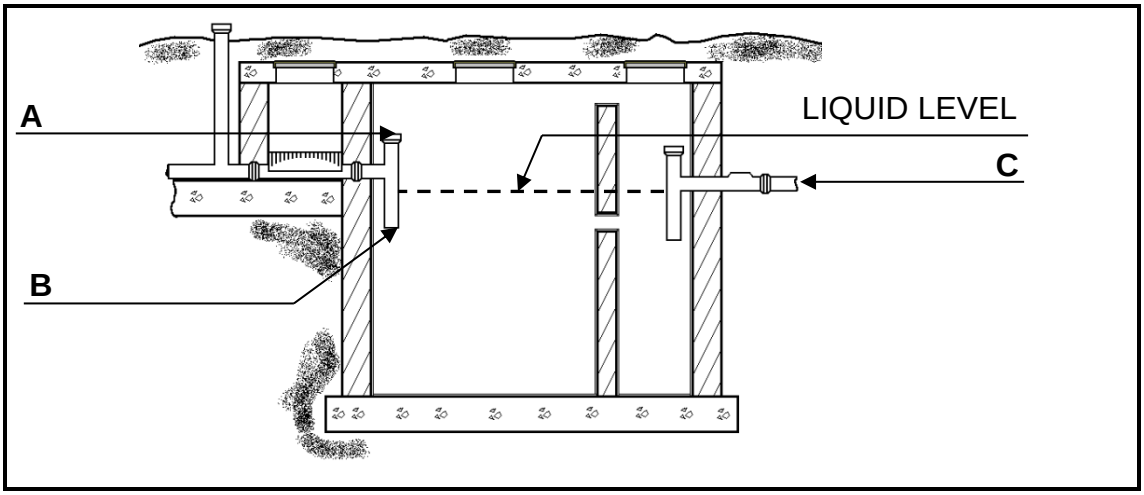


FIGURE 5.3

5.3.1 What is the structure called? (1)

5.3.2 Briefly describe how the organic matter decomposes in the structure. (2)

5.3.3 What is the purpose if the inlet pipe opening at **A**? (1)

5.3.4 Briefly motivate why the inflow at **B** must be lower than the liquid level. (2)

5.3.5 To which structure is the effluent at **C** discharged? (1)

5.4 Make neat sketches to illustrate the following drainage symbols:

5.4.1 Sink (2)

5.4.2 Bidet (2)

5.5 Choose the correct answer from those in brackets for the sewer treatment process and write only the question numbers (5.5.1 to 5.5.2) in your ANSWER BOOK with the correct answer.

5.5.1 The waste-water goes through (stormwater channels / underground sewerage pipes) to the treatment plant. (1)

5.5.2 The separation process filters out (bigger solids / garden waste). (1)

Copyright reserved

5.6 FIGURE 5.6 shows the front elevation of the cold-water supply from the water meter to a house on scale 1 mm = 100 mm. The main cold-water pipe has a diameter of 22 mm and the branch pipes have a diameter of 15 mm. Study the drawing and determine the material needed for the plumbing installation by completing the table.

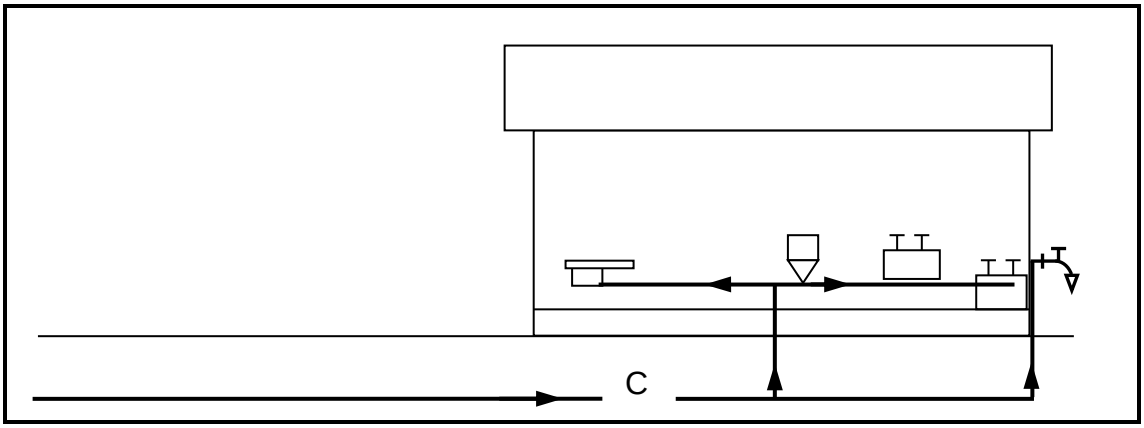


FIGURE 5.6

WATER SUPPLY APPLIANCES	MATERIAL	SIZE	QUANTITY	LENGTH
Cold-water pipe	5.6.1	22 mm	1	5.6.2
Cold-water pipe	5.6.3	15 mm	1	5.6.4
Reducing elbow 90°	5.6.5	22 mm x 15 mm	5.6.6	
Elbow 90°	5.6.7	15 mm	5.6.8	
Reducing tee	5.6.9	22 mm x 22 mm x 15 mm	5.6.10	
Tee	5.6.11	15 mm x 15 mm	5.6.12	

(12)

5.7 A cylindrical water tank is 2 400 mm high and has a diameter of 2 100 mm.
Calculate the volume of the tank.
Show ALL calculations, formulae and units. (4)

[40]

Copyright reserved

QUESTION 6: GRAPHIC COMMUNICATION, ROOF WORK, STORMWATER AND JOINING (SPECIFIC)

6.1 FIGURE 6.1 on ANSWER SHEET C shows the top and front elevation of a cone. Draw the development of the cone according to the radial-line method on ANSWER SHEET C. Add an allowance for the seam.
Show ALL construction lines. (14)

6.2 Choose a description with regard to a high-pressure geyser from COLUMN A that matches the correct item in COLUMN B.
Write only the correct letter (A–H) next to the question numbers (6.2.1 to 6.2.5) in the ANSWER BOOK, for example 6.2.6 I.

COLUMN A		COLOMN B	
6.2.1	Main function of gutters	A	Brackets
6.2.2	Gutters are fixed to it	B	Offset
6.2.3	Bottom end of the downpipe	C	Outlet
6.2.4	Gutters are supported with it	D	To channel water off the roof
6.2.5	Connection between the gutter and downpipe	E	To channel soil water of the roof
		F	Facia board
		G	Rain water shoe
		H	Roof covering

(5 x 1) (5)

6.3 Explain where flashings are installed. (2)

6.4 What is the purpose of surface channels? (1)

6.5 Name THREE negative consequences of poor stormwater constructions.
(3 x 1) (3)

6.6 What is the purpose of the grill on top of stormwater openings? (1)

6.7 Indicate if the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number in the ANSWER BOOK.

6.7.1 The teeth of a hacksaw are facing forward. (1)

6.7.2 The burr of a cut pipe must be removed with a hacksaw. (1)

Copyright reserved

6.8 Answer the following questions with regard to the joint in FIGURE 6.8.

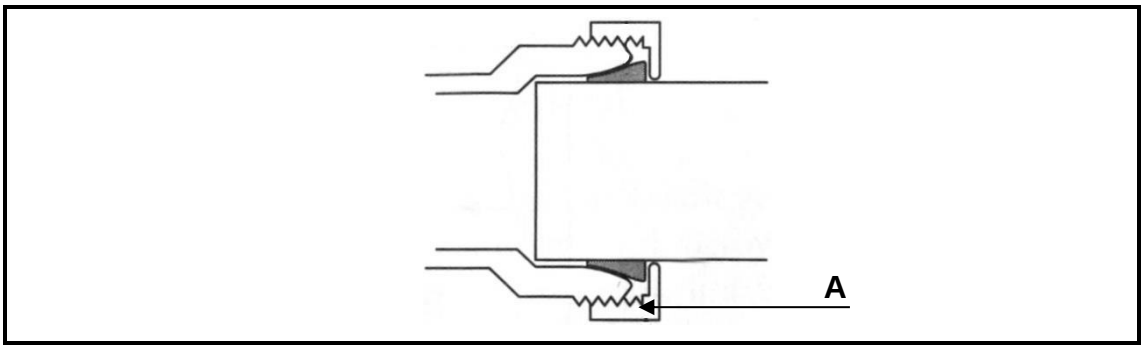


FIGURE 6.8

6.8.1 What is this joint called? (1)

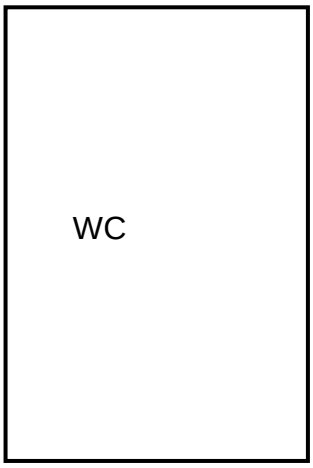
6.8.2 What is part **A** called? (1)

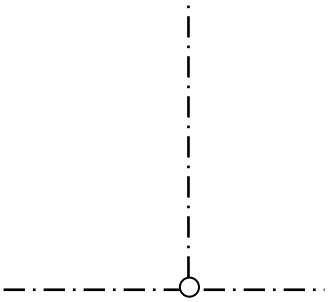
[30]

TOTAL: 200

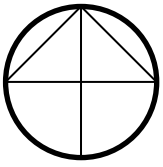
ANSWER SHEET **A**	**CIVIL TECHNOLOGY GENERIC**	**NAME:** _____

2.1 FIGURE 2.1 on ANSWER SHEET A shows the outer lines of a structure which must be built on a site. Draw the site plan on scale 1 : 200 on ANSWER SHEET A so that the structure is in the middle of the site. (28)



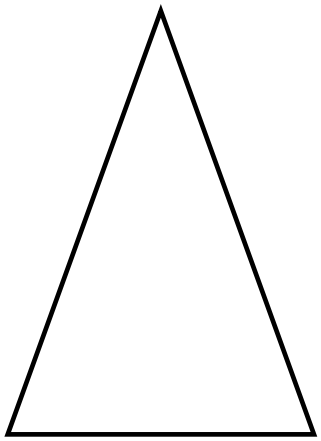


Plot size	2	
Pavement + street	3	
Building boundaries	4	
Entrance	2	
Datum level	2	
Water closet	1	
Sewer connections	2	
Inspection eye	2	
Rodding eye	2	
Manhole	2	
Measurements	6	
TOTAL	**28**	

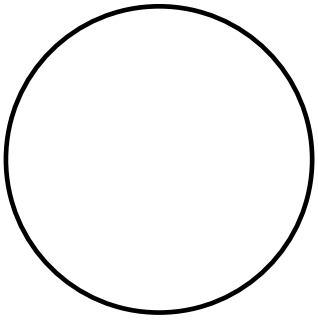


ANSHER SHEET **B**	**CIVIL TECHNOLOGY CIVIL SERVICES**	**NAME:** _____

6.1 FIGURE 6.1 on ANSWER SHEET B shows the top and front elevation of a cone.
Draw the development of the cone according to the radial-line method on ANSWER SHEET B. Add an allowance for the seam. Show ALL construction lines. (14)



FRONT ELEVATION



TOP ELEVATION

Dividing lines 0-6 on top view	4	
Halve circle B-C	2	
Seam lines A–B and A–C	2	
Construction lines A0–A12	6	
TOTAL	**14**	

Copyright reserved