basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY: CIVIL SERVICES

NOVEMBER 2021

MARKS: 200

TIME: 3 hours

This question paper consists of 15 pages and 6 answer sheets.

REQUIREMENTS:

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

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions.
2. Answer ALL the questions.
3. Read all questions carefully.
4. Answer each question as a whole. Do NOT separate subsections of questions.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Start the answer to EACH question on a NEW page.
7. Do NOT write in the margins of the ANSWER BOOK.
8. You may use sketches to illustrate your answers.
9. Write ALL calculations and answers in the ANSWER BOOK or on the attached ANSWER SHEETS.
10. Use the mark allocation as a guide to the length of your answers.
11. 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.*
12. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
13. Use your own discretion where dimensions and/or details have been omitted.
14. Answer QUESTIONS 2, 3.7, 3.8.3, 5.2, 5.3 and 6.8 on the attached ANSWER SHEETS using drawing instruments, where necessary.
15. Write your CENTRE NUMBER and EXAMINATION NUMBER on every ANSWER SHEET and hand them in with your ANSWER BOOK, whether you have used them or not.
16. Drawings in the question paper are NOT to scale due to electronic transfer.
17. Google Images was used as the source of all photographs and pictures.
18. Write neatly and legibly.

QUESTION 1: OHSA, SAFETY, MATERIALS, TOOLS, EQUIPMENT AND JOINING (GENERIC)

Start this question on a NEW page.

1.1 Give ONE word/term for each of the following descriptions by choosing a word/term from the list below. Write down only the word/term next to the question numbers (1.1.1. to 1.1.5) in the ANSWER BOOK, e.g. 1.1.6 casement.

damp seal; powder coating; galvanising; sanding; paint; electroplating; curing; plastering; silicone

1.1.1 To cover steel or iron with a layer of zinc (1)

1.1.2 Available in a water and oil base (1)

1.1.3 Improves mechanical and engineering properties of metals (1)

1.1.4 Process of keeping fresh concrete moist (1)

1.1.5 Applying as a finish to materials to resist extreme temperatures (1)

1.2 FIGURE 1.2 below shows scaffolding that is used on a construction site to reach the upper parts of a building.

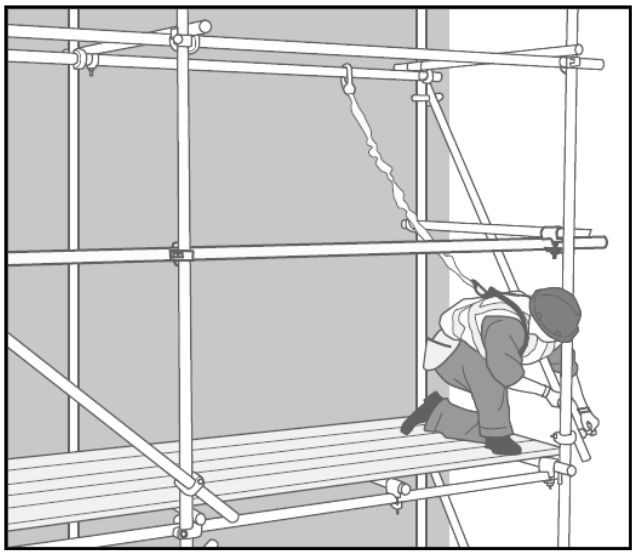


FIGURE 1.2

1.2.1 Describe TWO aspects the scaffolding must adhere to before it is used. (2)

1.2.2 Name the omitted part in FIGURE 1.2 that should be fixed to the platform of the scaffold to prevent tools from falling off. (1)

1.2.3 Explain TWO safety precautions that have to be adhered to when working on scaffolding. (2)

1.3 State TWO methods that can be used to remove waste material safely from high places. (2)

1.4 Describe TWO regulations regarding the safe use of trestle scaffolds. (2)

1.5 Describe ONE precautionary measure you would apply when hoisting material and equipment in a builder's hoist. (1)

1.6 Explain in THREE chronological steps how you will join TWO solid 4 mm metal plates with a bolt and nut after the positions of the holes have been marked on the plates. (3)

1.7 Complete in your ANSWER BOOK the information in the table below by indicating ONE use and ONE way to care for the tool.

NAME OF TOOL	USE	WAY TO CARE
Multi-detector	To locate …	Protect the multi-detector against …

(2)
[20]

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)

FIGURE **A** and **B** on the next page shows drawings that appear on a building plan. Analyse the drawings and complete the table on ANSWER SHEET 2.

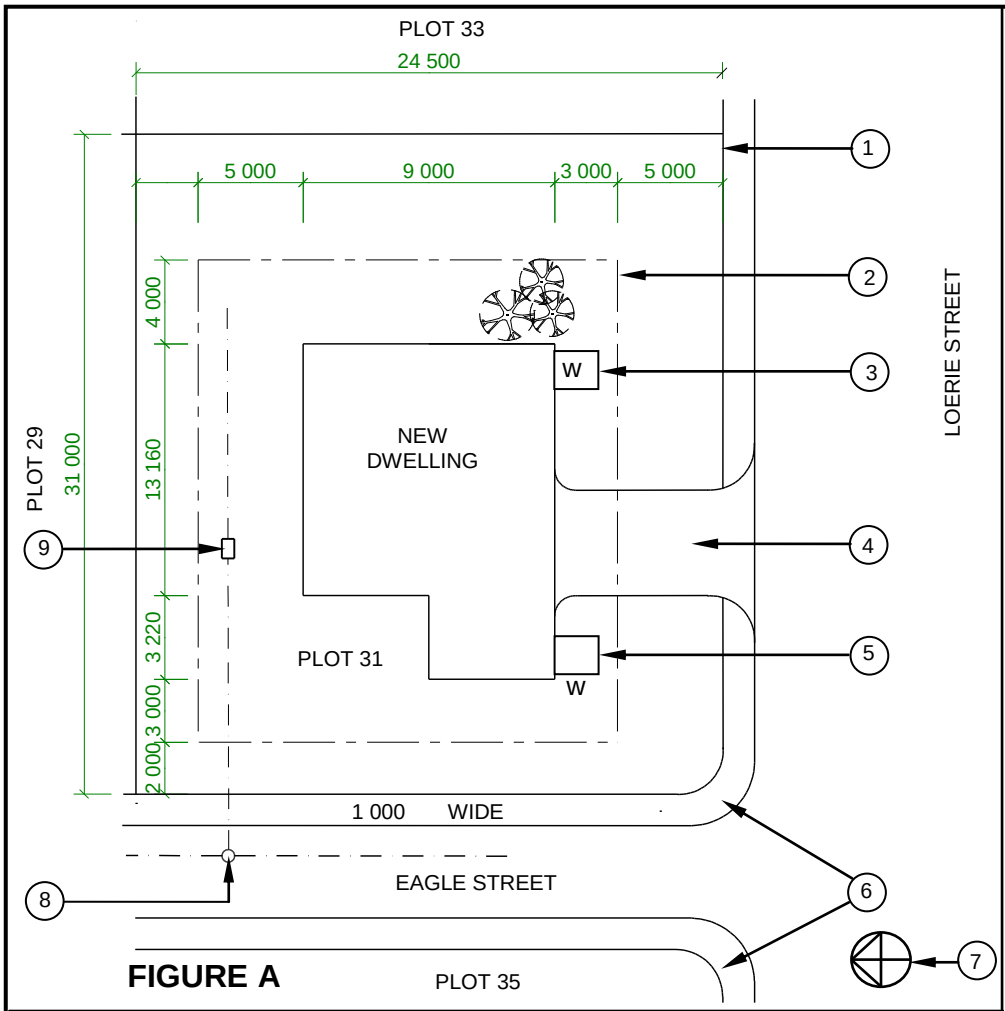


FIGURE A

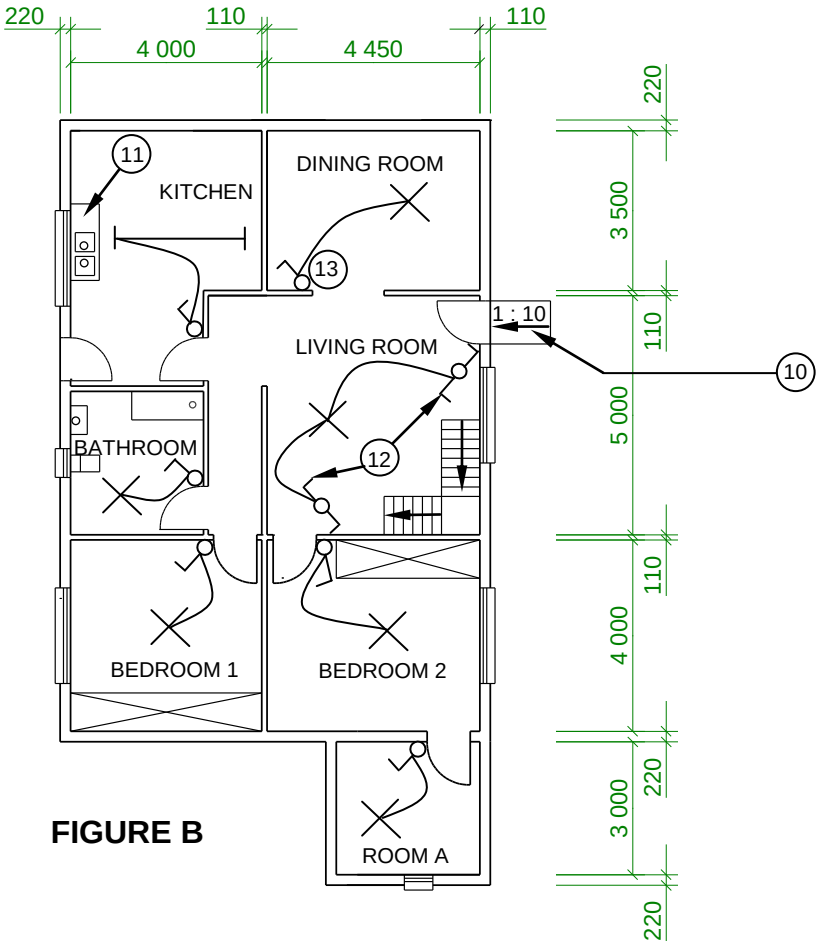


FIGURE B

NOTES:
Contractors must verify all dimensions and levels on site before commencing work. Architects must be notified immediately of any discrepancies.

Wall thickness: External = 220 mm
Internal = 110 mm

Architect's signature ……..

Client's signature ……

Palisade fencing must be erected on the boundary of the new dwelling.

REVISION 1	DATE 20/06/2021	DESCRIPTION CONTOUR LINES
PRINTED BY: GEMINI PRINTERS	DATE OF PRINT: 01/06/2021	
DRAWING TITLE: SITE AND FLOOR PLAN PLOT 31		
PROJECT: PROPOSED DWELLING ON PLOT 31, HEROLDS BAY		
PROJECT NO. GR 228-510	DRAWING NO. 339P7	
DATE 18/05/2021	DRAWN JP BLOM	CHECKED G BOK
SITE PLAN	SCALE: 1 : 200	
FLOOR PLAN	SCALE 1 : 100	
REFERENCE CODE QP 2 - 2021		

[40]

QUESTION 3: CONSTRUCTION ASSOCIATED WITH CIVIL SERVICES, OHSA, AND QUANTITIES (SPECIFIC)

Start this question on a NEW page.

3.1 State TWO methods that are used to prevent inhaling dangerous fumes in a manhole. (2)

3.2 Describe TWO aspects that must be determined when setting out and excavating a trench for sewer pipes. (2)

3.3 Name the member that keeps the poling boards apart when the shoring for a trench is set up. (1)

3.4 FIGURE 3.4 below shows a manhole.

FIGURE 3.4

3.4.1 Identify the type of manhole. (1)

3.4.2 Name ONE manhole accessory that is needed in the construction of the manhole in FIGURE 3.4. (1)

3.4.3 Describe the process for installing the base of the manhole in FIGURE 3.4 in chronological order. (3)

3.5 State ONE condition according to the OHS building regulations, under which the slope of cuttings in permanent excavations can be vertical. (1)

3.6 Explain TWO regulations regarding permanent excavations. (2)

3.7 FIGURE 3.7 below shows an incomplete sectional view through the bricks and concrete floor slab of a manhole.

Use ANSWER SHEET 3.7 and answer the question that follows.

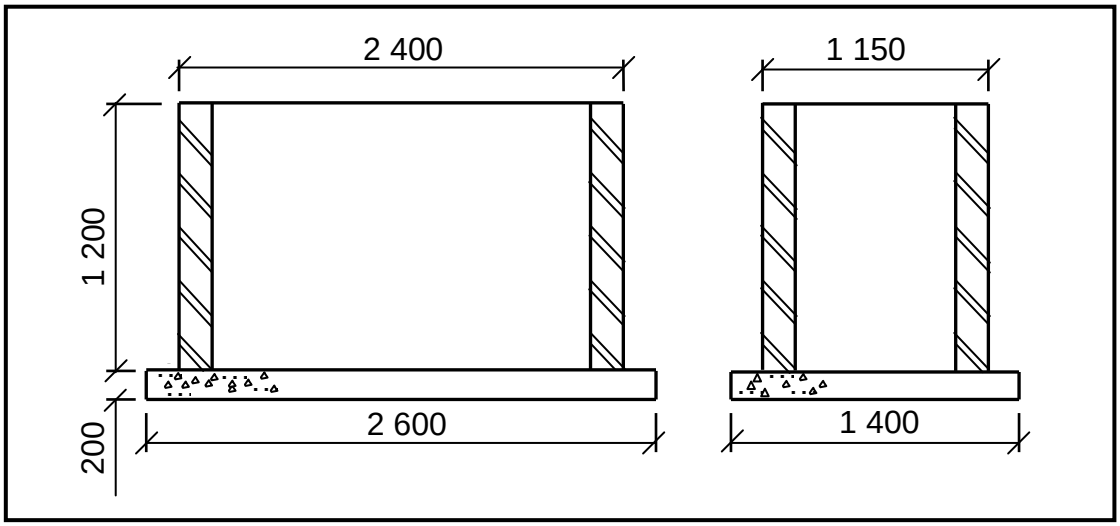


FIGURE 3.7

Calculate the number of bricks required for the manhole using the specifications listed below:

Specifications:

- The centre line of the walls is 6,22 m.
- It is a one-brick wall.
- 50 bricks per square metre (m^2). (8)

3.8 FIGURE 3.8 below shows the first course of a corner junction of a ONE-brick wall.

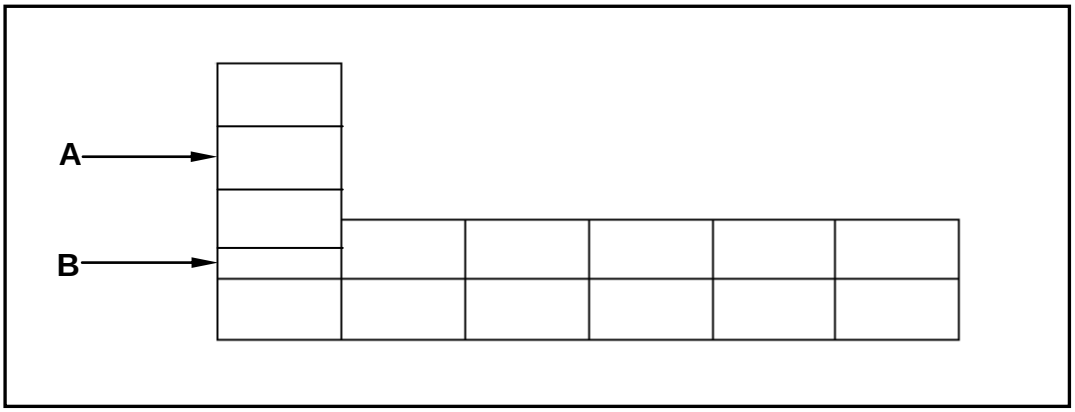


FIGURE 3.8

3.8.1 Identify the brick course at **A**. (1)

3.8.2 Identify **B**. (1)

3.8.3 Use ANSWER SHEET 3.8.3, project and draw, in good proportion, the second plan course of the wall. (7)

[30]

QUESTION 4: HOT- AND COLD-WATER SUPPLY, TOOLS, EQUIPMENT AND MATERIALS (SPECIFIC)

Start this question on a NEW page.

4.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–L) next to the question numbers (4.1.1 to 4.1.8) in the ANSWER BOOK, e.g. 4.1.9 M.

COLUMN A	COLUMN B
4.1.1 Jumper	A prevents leaks when joining galvanised pipes
4.1.2 Stopcock	B absorbs sunlight and heats the water that flows through it
4.1.3 Vacuum tube	C the device that allows steam and water to escape from a geyser when the pressure becomes dangerously high
4.1.4 Vacuum breaker	D used to remove water from a geyser so that repairs can be done
4.1.5 Drain cock	E component that is connected to a threaded spindle that allows the valve in a stopcock to open and close
4.1.6 Safety valve	F hot-water outlet of a solar geyser
4.1.7 Gasket	G cold-water intake of a solar geyser
4.1.8 Plumbers' tape	H prevents the siphoning of water out of the high-pressure geyser when the cold-water supply is shut off
	I device that allows water to flow in one direction only
	J prevents leaks when pipes with flanges are joined
	K used to remove burr
	L the device that controls the temperature of water in a high-pressure geyser

(8 x 1) (8)

4.2 State TWO methods that are used to prevent electrolytic reaction. (2)

4.3 FIGURE 4.3 below is a picture of a ball valve commonly found in cisterns.

FIGURE 4.3

4.3.1 What role does the ball valve play in a cistern? (1)

4.3.2 Describe how the ball valve functions. (3)

4.4 FIGURE 4.4 below is a picture of a pipe fitting.

FIGURE 4.4

4.4.1 Identify the pipe fitting. (1)

4.4.2 Explain the purpose of part **A**. (2)

4.5 Describe how an electronic water-saving shower head works to prevent water wastage. (2)

4.6 Draw the following symbols that are used in hot-water systems:

4.6.1 Storage water heater (domestic type) (2)

4.6.2 Pipe carrying water with different/mixed temperatures (2)

4.7 The working sequence of a high-pressure geyser is given in random order.

Analyse and rearrange the steps in logical order. Write ONLY the number corresponding with the statement below one another in your ANSWER BOOK.

1. Hot water flows from the geyser outlet to the taps in the bathroom and kitchen.

2. The thermostat regulates the temperature of the water.

3. Cold water flows into the geyser through the pressure-control valve.

4. The element in the geyser heats the water.

5. Hot water rises to the top of the geyser while cold water fills the geyser at the bottom. (5)

4.8 Differentiate between an *air lock* and a *water hammer* in a hot-water installation. (2)

4.9 State ONE solution to EACH of the following faults in a plumbing installation:

4.9.1 Hot water flowing from the overflow pipe (1)

4.9.2 Poor hot-water pressure (1)

4.10 Differentiate between a *solar geyser* and a *high-pressure electric geyser* in terms of its location in a dwelling. (2)

4.11 FIGURE 4.11 below shows a machine that is used in the plumbing industry.

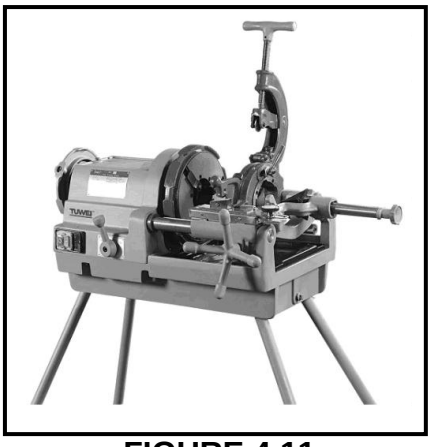


FIGURE 4.11

4.11.1 Identify the machine. (1)

4.11.2 Explain the use of the reamer in the machine. (1)

4.11.3 Why must the foot switch of the machine be locked? (1)

4.12 Name the instrument commonly used to unclog/clean a drain system. (1)

4.13 When cleaning a blocked drain, how will you know that the system is cleaned? (1)

4.14 Name ONE machine that can be used to clean a blocked drain. (1)
[40]

QUESTION 5: GRAPHICS AS MEANS OF COMMUNICATION, ROOF WORK AND STORM WATER (SPECIFIC)

Start this question on a NEW page.

5.1 Predict TWO consequences of poorly constructed storm-water systems. (2)

5.2 ANSWER SHEET 5.2 shows the elevation of a building with the fascia board in position. No roof members above the fascia board are shown.

Use ANSWER SHEET 5.2 and draw to scale 1 **:** 10 a square gutter attached to the fascia board.

Use the following specifications in your drawing:

- PVC box gutter – 125 mm wide x 80 mm high
- Stopped end – 125 mm wide x 80 mm high
- Gutter clips (Indicate TWO on your drawing)
- 60 mm gutter outlet
- 60 mm square down pipe (9)

5.3 ANSWER SHEET 5.3 shows the front view of a cylindrical pipe elbow as well as the top view of one of the cylindrical pipes.

Use the drawing on ANSWER SHEET 5.3 and draw the development of pipe **A**, with a 3 mm seam on the short side.

Show ALL construction lines. Project the development from the given views. (19)
[30]

QUESTION 6: SEWERAGE, SANITARY FITTINGS AND JOINING (SPECIFIC)

Start this question on a NEW page.

6.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (6.1.1 to 6.1.5) in the ANSWER BOOK, e.g. 6.1.6 D.

6.1.1 A pipe arrangement that prevents the breaking of the water seal of a water closet:

A Sewage pipes
B Anti-siphon pipes
C Waste-water pipes
D PVC pipes (1)

6.1.2 Pipes that are NOT suitable for continuous hot-water discharge and liquids that contain chemicals:

A PVC pipes
B Fibre pipes
C Cast-iron pipes
D Copper pipes (1)

6.1.3 Water that contains human waste is known as … water.

A waste-
B contaminated
C soil
D grey (1)

6.1.4 The colour … is used to indicate waste-water pipes on a drainage plan.

A green
B brown
C blue
D red (1)

6.1.5 Which ONE of the following prevents odours from entering the atmosphere?

A Water seal
B Soil vent pipe
C Vent valves
D All of the above (1)

6.2 FIGURE 6.2 below shows the process of joining a copper pipe to a copper elbow.

FIGURE 6.2

6.2.1 Explain a reason for applying flux to the joint before soldering. (1)

6.2.2 Explain the process of soldering the joint after the flux has been applied. (2)

6.3 FIGURE 6.3 below shows a compression joint used to join copper pipes.

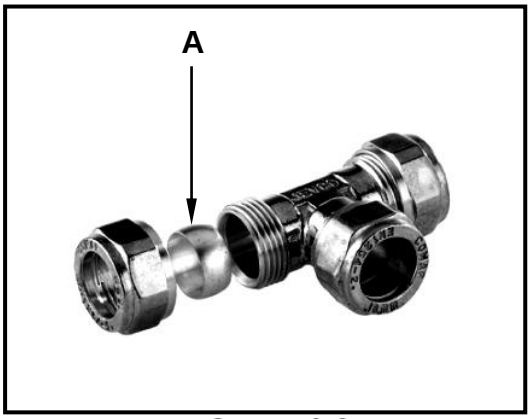


FIGURE 6.3

6.3.1 Identify the type of compression joint. (1)

6.3.2 Identify **A**. (1)

6.3.3 Explain the function of **A**. (1)

6.4 Name the adhesive used to join PVC pipes. (1)

6.5 Describe ONE regulation that should be adhered to when laying pipes for sanitary fitments. (1)

6.6 FIGURE 6.6 below shows a septic tank. Study the illustration and answer the questions that follow.

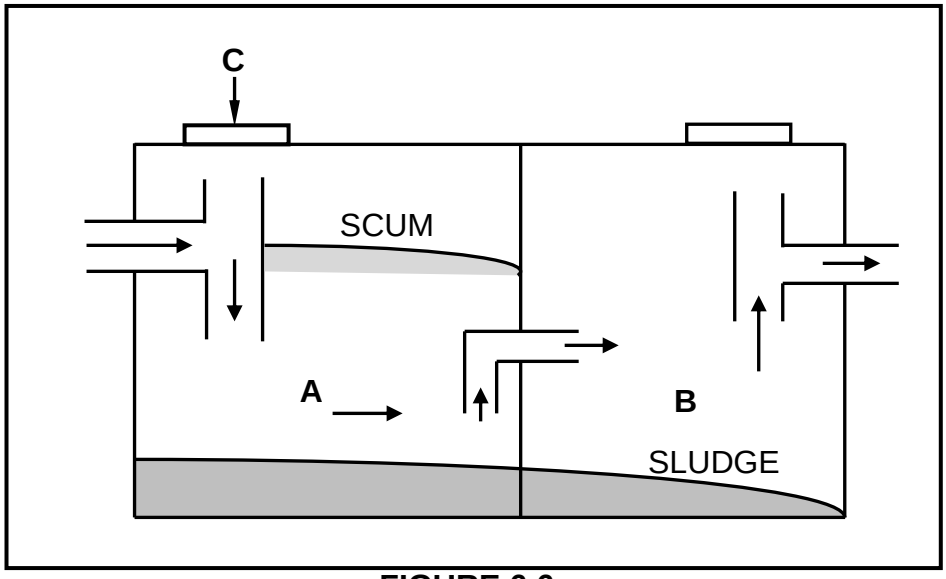


FIGURE 6.6

6.6.1 Differentiate between the functions of chambers **A** and **B**. (2)

6.6.2 Explain the purpose of **C**. (1)

6.6.3 Name the organism that decomposes the solid waste in a septic tank. (1)

6.6.4 Predict the consequence of allowing water from the bath and wash basin to flow into the septic tank. (1)

6.6.5 Name the installation into which the liquid from chamber **B** flows. (1)

6.7 Describe TWO criteria that pipe fittings should meet when they are connected to pipes. (2)

6.8 ANSWER SHEET 6.8 shows the line diagram of part of a dwelling with an outbuilding and sanitary fitments with an incomplete sewerage system.

Use ANSWER SHEET 6.8 and complete the sewerage layout using the correct installation principles with the correct abbreviations and symbols. (13)

6.9 Draw a neat line diagram in your ANSWER BOOK showing the connection of the hot-water and cold-water supply to the shower head (rose).

Specifications:

- The hot- and cold-water supply must come from the ceiling.
- Show the direction of flow in ALL pipes.
- Show ALL relevant pipes and fittings. (6)

[40]

TOTAL: 200

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 2

NO.	QUESTIONS	ANSWERS	MARKS
1.	Identify the scale you will use for the site plan and the floor plan respectively.		2
2.	Who is responsible to verify all dimensions and levels on site before commencing work?		1
3.	What type of fencing does the architect recommend for the new dwelling?		1
4.	State the colour that you would use to indicate the new dwelling on the site plan.		1
5.	Identify number **1**.		1
6.	Identify number **2**.		1
7.	Identify number **3**.		1
8.	Identify number **4**.		1
9.	Identify number **5**.		1
10.	Identify number **6**.		1
11.	Identify number **7**.		1
12.	Identify number **8**.		1
13.	Identify number **9**.		1
14.	Determine the distance between number **2** and the new dwelling on the eastern side of the building.		1
15.	Deduce the plot number of the new dwelling from FIGURE **A**.		1
16.	Which elevation is the closest to Loerie Street?		1
17.	What is the plot number of the property on the western side of the dwelling?		1

18.	Deduce TWO faults on FIGURE **B**.		2
19.	Which natural feature is indicated on the site plan?		1
20.	What is wrong with the electrical installation in the bathroom in FIGURE **B**?		1
21.	Identify number **10**.		1
22.	Identify number **11**.		1
23.	Identify number **12**.		1
24.	Identify number **13**.		1
25.	Draw the symbol of a socket outlet.		2
26.	Draw the symbol for a shower.		2
27.	Draw the symbol for a wall-mounted light.		2
28.	Recommend TWO uses for ROOM **A**.		2
29.	Calculate the omitted horizontal dimension on the site plan. Give your answer in mm. Show ALL calculations.		6
		TOTAL:	**40**

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 3.7

3.7

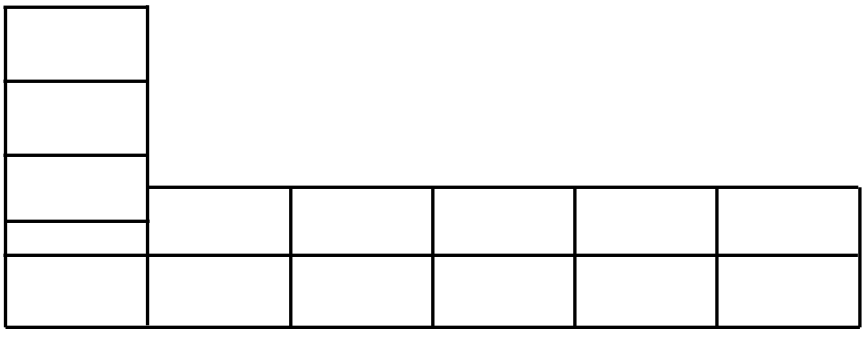
A	B	C	D

(8)

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 3.8.3

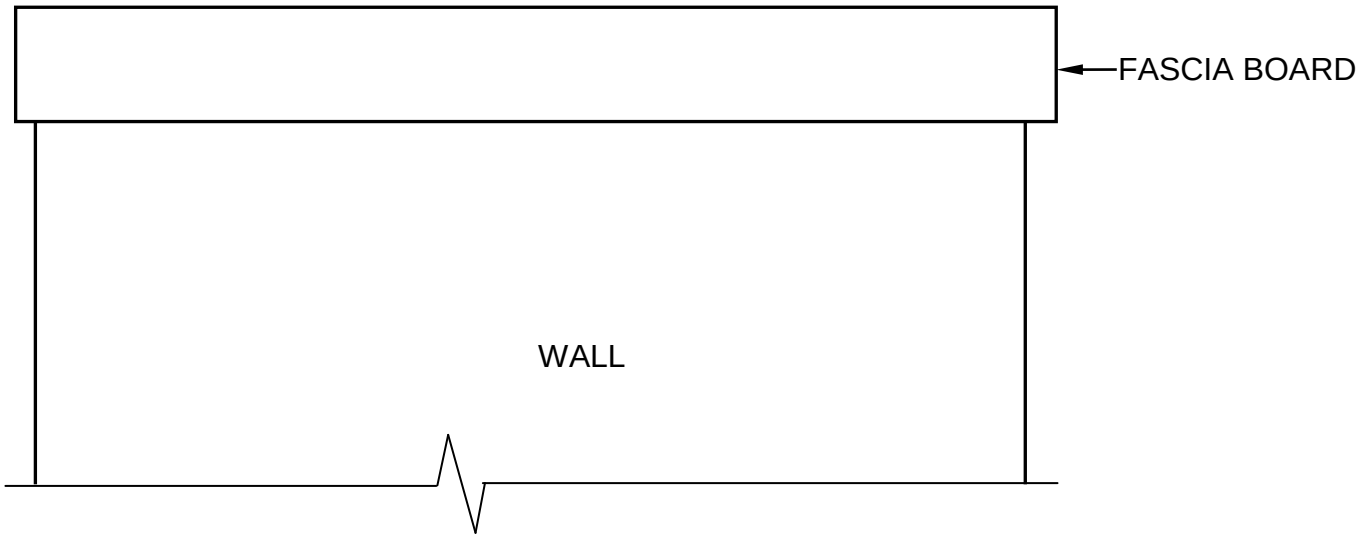


ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing	7	
TOTAL:	**7**	

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 5.2

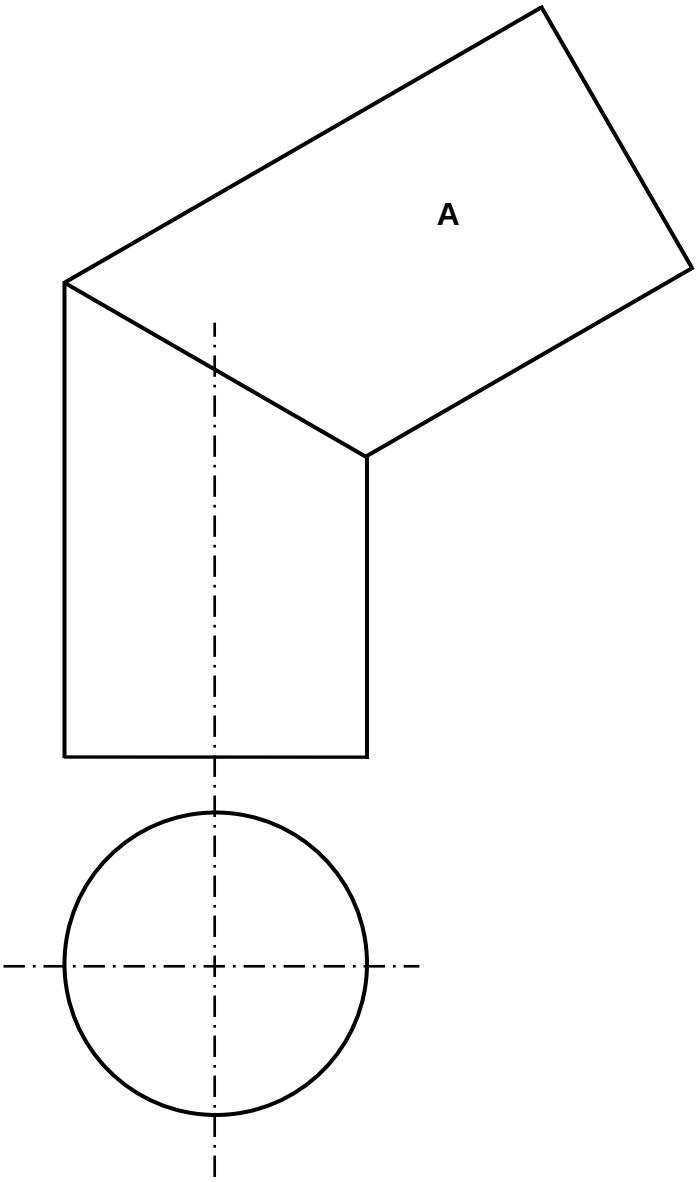


ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing	8	
Application of scale	1	
TOTAL:	**9**	

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 5.3

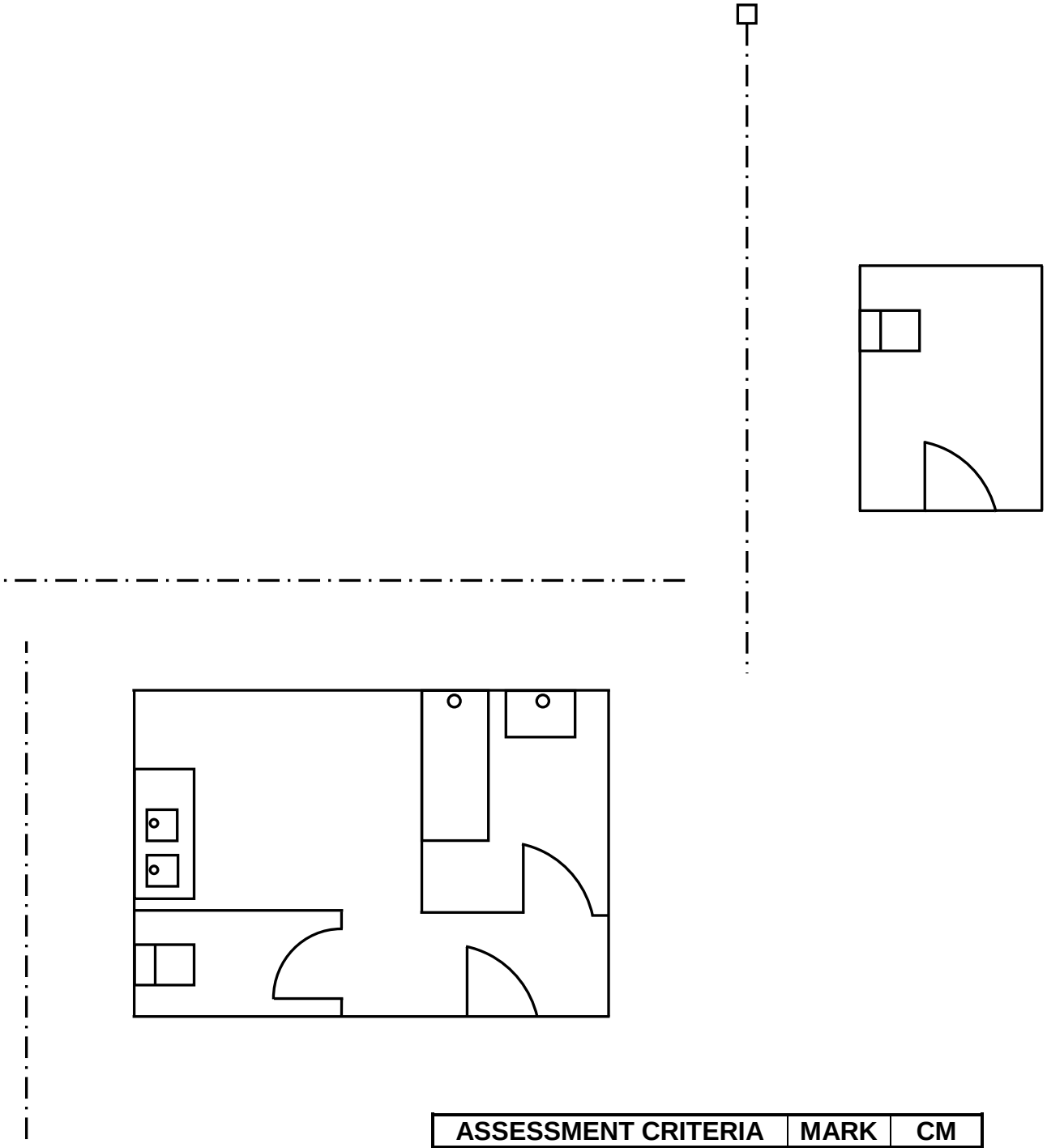


ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing	19	
TOTAL:	**19**	

CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 6.8



ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing	13	
TOTAL:	**13**	