



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

CIVIL TECHNOLOGY: CIVIL SERVICES

2022

MARKS: 200

TIME: 3 hours



This question paper consists of 14 pages and 8 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 the 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, 3.3, 3.4, 3.5, 5.2, 5.3, 6.8 and 6.9 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 were used as the source of all photographs and pictures.
18. Write neatly and legibly.



QUESTION 1: OHS&A, 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. Write 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 preservative.

- 1.1.1 Can be melted again because no chemical process is involved (1)
- 1.1.2 The coating of a metal by using the process of electrolysis (1)
- 1.1.3 The process of keeping freshly cast concrete moist/damp for a specific period (1)
- 1.1.4 Available in a matt and gloss finish (1)
- 1.1.5 A process used to coat steel with a layer of zinc (1)

1.2 FIGURE 1.2 below shows a ladder that is used on a construction site.



FIGURE 1.2

- 1.2.1 Why should non-skid material be fitted to the bottom end of the stiles of a ladder? (1)
- 1.2.2 Explain why it is better to use a wooden ladder when working near electrical cables. (1)
- 1.2.3 Explain why you would prefer to use an aluminium ladder instead of a wooden ladder. (1)
- 1.2.4 Name TWO methods that can be used to treat wooden ladders. (2)



- 1.3 Describe TWO safety regulations that a scaffold platform must adhere to. (2)
- 1.4 Name TWO places on a building site where safety nets should be erected to ensure the safety of the workers. (2)
- 1.5 FIGURE 1.5 below shows a joining fixture.



FIGURE 1.5

- 1.5.1 Identify the joining fixture. (1)
- 1.5.2 Explain the first THREE steps you would follow to attach a bracket to a brick wall by using the fixture above after the position of the hole has been marked. (3)
- 1.6 Complete in your ANSWER BOOK the information in the table below by indicating ONE use and ONE way to care for the tool.

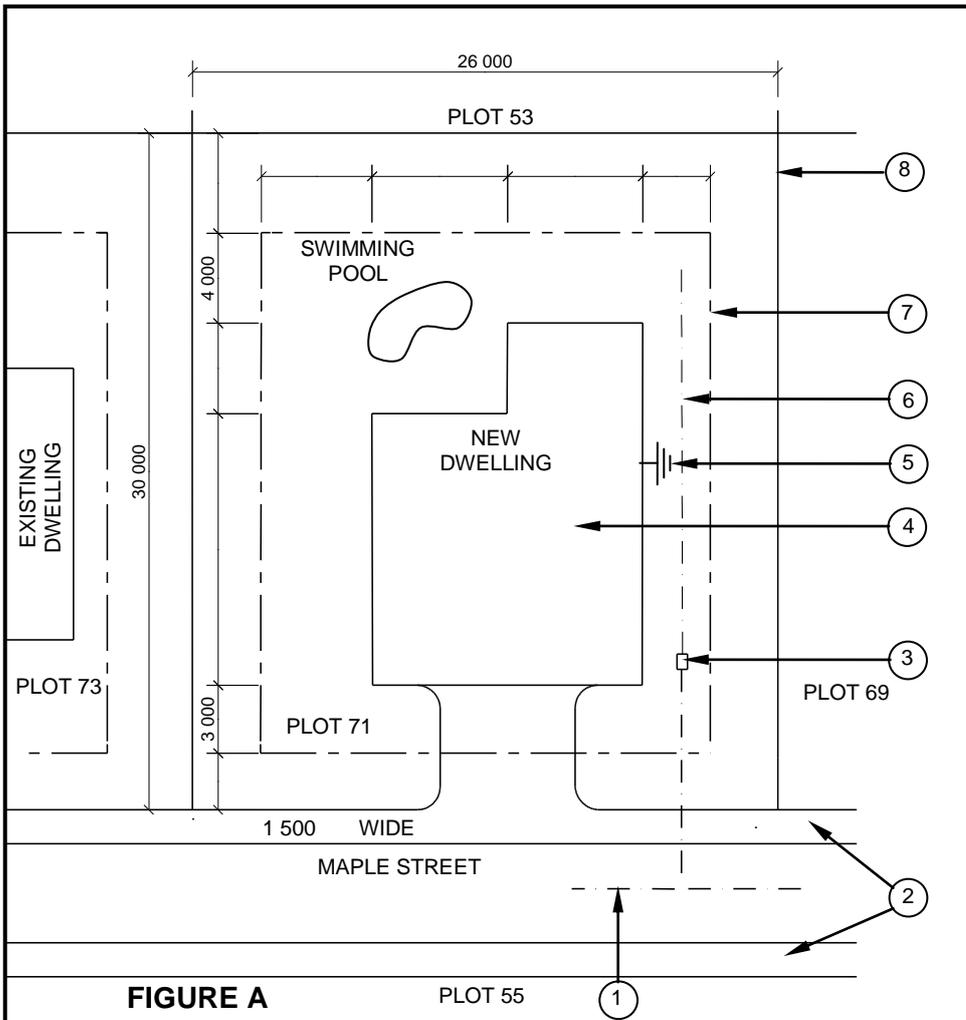
| NAME OF TOOL | USE | WAY TO CARE |
|--------------|------------------|--------------------------------|
| Dumpy level | To determine ... | Protect the dumpy level by ... |

(2)
[20]

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)

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





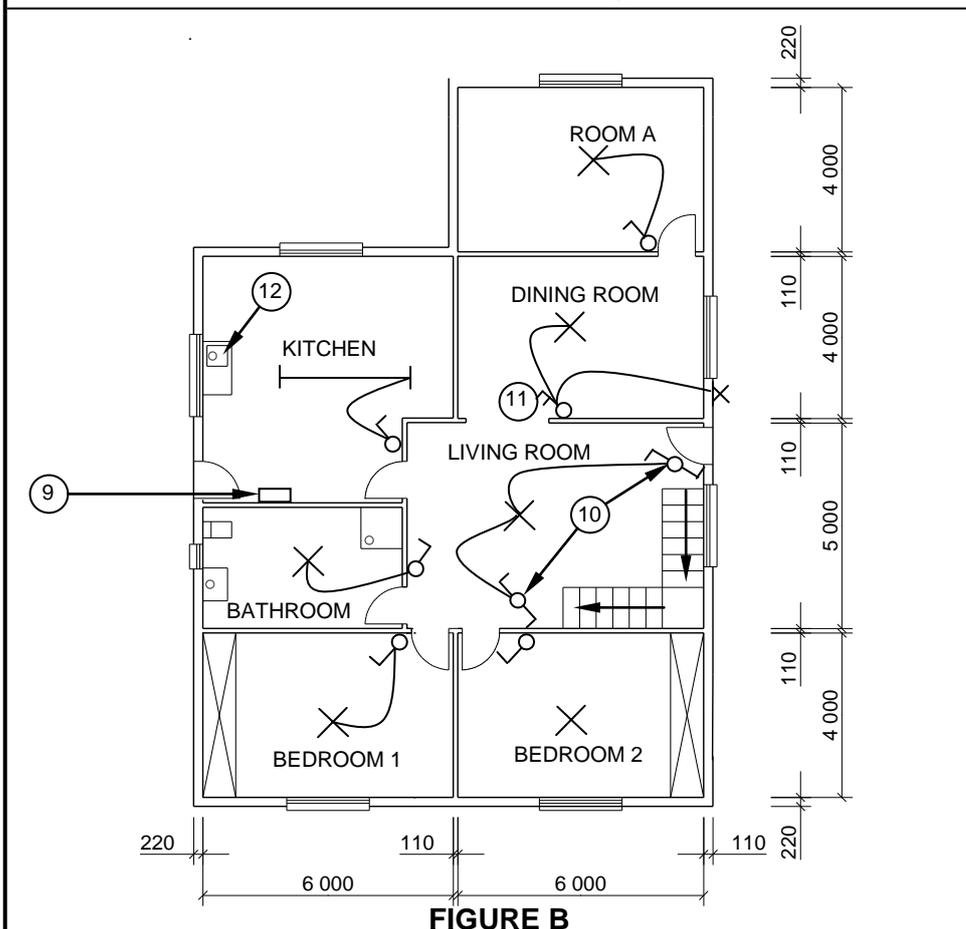
NOTES:
Contractors must verify all dimensions and levels on site before commencing work. Architects must be notified of any discrepancies immediately.

Wall thickness: External = 220 mm
Internal = 110 mm

Architect's signature

Client's signature

Precast concrete fencing must be erected on the boundary of the new dwelling.



| | | |
|---|---------------------|----------------------------------|
| REVISION: 1 | DATE: 18/04/2022 | DESCRIPTION: WINDOW IN ROOM A |
| PRINTED BY: TEXON PRINTERS | | DATE OF PRINT: 24/04/2022 |
| DRAWING TITLE: SITE AND FLOOR PLAN PLOT 71 | | |
| PROJECT: PROPOSED DWELLING ON PLOT 71, JEFFREYS BAY | | |
| PROJECT NO.: GR 339-670 | | DRAWING NO.: 443P8 |
| DATE: 12/02/2022 | DRAWN: JP COX | CHECKED: C LEE |
| SITE PLAN | | SCALE: 1 : 500 |
| FLOOR PLAN | | SCALE 1 : 100 |
| REFERENCE CODE QP 4 - 2022 | | |



[40]

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

Start this question on a NEW page.

- 3.1 Give ONE word/term for each of the following descriptions by choosing a word/term from the list below. Write only the word/term next to the question numbers (3.1.1 to 3.1.5) in the ANSWER BOOK, e.g. 3.1.6 gutter

1 : 40; solid ground; spirit level; 228 mm x 38 mm; 150 mm;
76 mm x 50 mm; 144 mm x 38 mm; surveyor's site level; 1 : 90;
boning rod; 1 : 60; water-logged ground; 400 mm

- 3.1.1 The dimensions of struts used for shoring (1)
- 3.1.2 Excavation conditions requiring the presence of an engineer at all times (1)
- 3.1.3 The slope at which a 225 mm diameter pipe is laid (1)
- 3.1.4 The device which could be used for setting out drain levels on shorter distances (1)
- 3.1.5 The recommended basic thickness of layers for backfilling (1)
- 3.2 FIGURE 3.2 below is a picture of a worker who is removing a manhole cover.



FIGURE 3.2

- 3.2.1 Describe ONE precaution that should be taken to safeguard the area around the opened manhole. (1)
- 3.2.2 Name TWO ways that can be used to enter a manhole. (2)



3.3 On ANSWER SHEET 3.3, draw to scale 1 : 10, the horizontal sectional top view of a brick manhole and indicate the flow of sewage by means of arrows.

Specifications:

- Walls are 220 mm thick
- Pipes are 110 mm in diameter

(8)

3.4 FIGURE 3.4 below shows the incomplete sectional views through the bricks and concrete floor slab of a manhole.

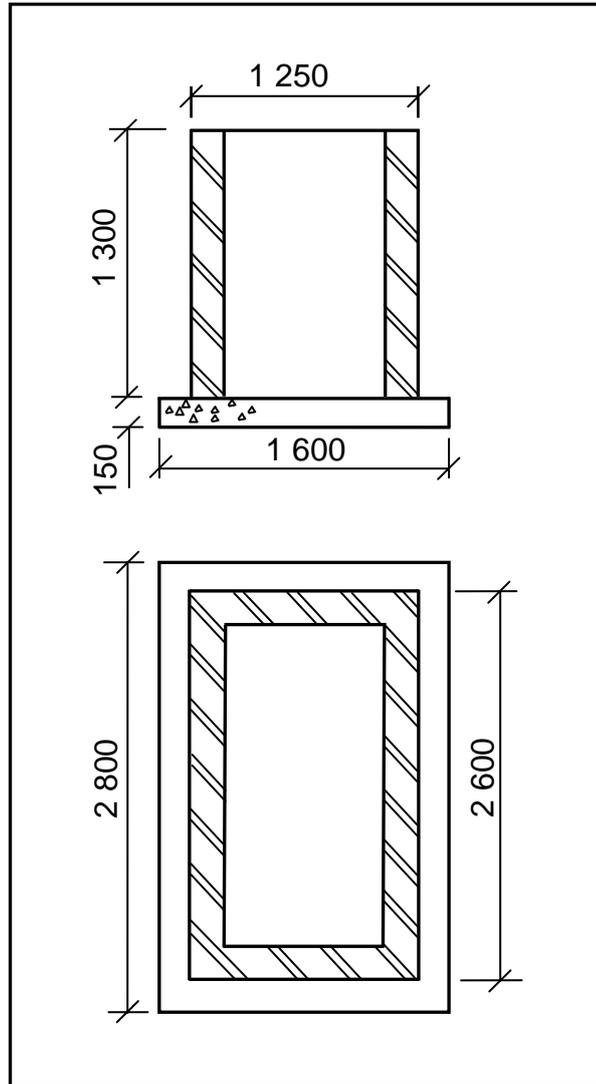


FIGURE 3.4

Use ANSWER SHEET 3.4 and calculate the number of bricks required for the manhole using the specifications below:

Specifications:

- The centre line of the walls is 6,82 m.
- The wall is a one-brick wall.
- 50 bricks per square metre (m²) are needed for a half-brick wall.

(8)

3.5 ANSWER SHEET 3.5 shows the first course of a one-brick wall with stopped ends in English bond. Project and draw, in good proportion, the second course of the wall.

(6)

[30]



QUESTION 4: COLD AND HOT 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 | Anode | A | must be installed at least 300 mm above the geyser |
| 4.1.2 | Element | B | used to release the water from a geyser so that repairs can be performed |
| 4.1.3 | Drip tray | C | releases excess steam and water from a high-pressure geyser |
| 4.1.4 | Thermostat | D | heats the water in a geyser |
| 4.1.5 | Drain cock | E | device that is installed within 1 metre of a geyser |
| 4.1.6 | Vacuum breaker | F | regulates the heating of water in a geyser |
| 4.1.7 | Heat pump | G | prevents siphoning of water out of the geyser |
| 4.1.8 | Safety valve | H | the device that uses a refrigerant to produce heat |
| | | I | protects the geyser against corrosion |
| | | J | collects and drains the water when the geyser overflows |
| | | K | component mounted on the opposite side of the drain cock of the geyser |
| | | L | balances the water pressure of the cold- and hot-water supply |

(8 x 1) (8)

- 4.2 What do the following abbreviations that are used in hot-water systems stand for? Give a description.

4.2.1 PCV (1)

4.2.2 HSTO (1)



4.3 Describe ONE fault when cold water flows from the hot-water tap. (1)

4.4 FIGURE 4.4 below shows a copper pipe joint that has a leak because the compression ring/ferrule is damaged. (1)



FIGURE 4.4

4.4.1 Explain, in FOUR logical steps, how you would fix the leak taking into consideration that the water supply has been shut off. (4)

4.4.2 How would you test for any further leakages? (1)

4.5 Name TWO types of water-saving washbasin taps. (2)

4.6 FIGURE 4.6 below shows a solar heating unit. (1)

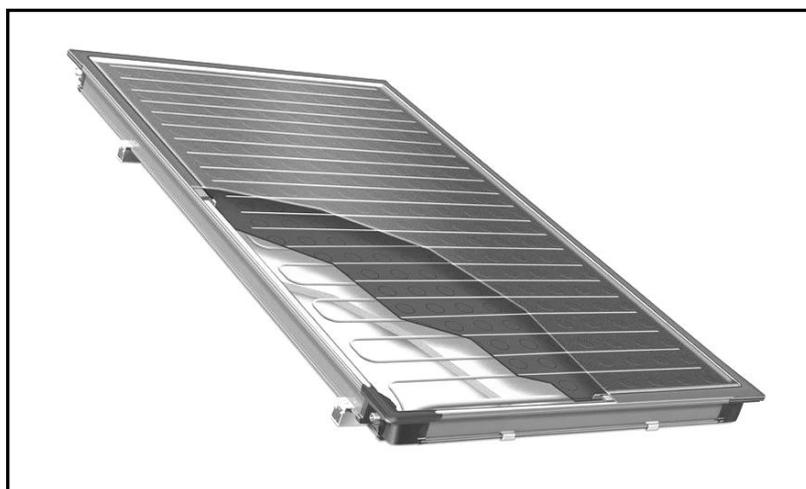


FIGURE 4.6

4.6.1 Identify the type of solar heating unit shown above. (1)

4.6.2 Explain why the unit must be positioned so that it faces north. (1)

4.6.3 Name the component that is installed at the cold-water inlet of the solar heater to prevent the backflow of water. (1)

4.6.4 Discuss THREE disadvantages of solar heating panels. (3)



4.7 FIGURE 4.7 below shows a fitting that is used in a plumbing installation.

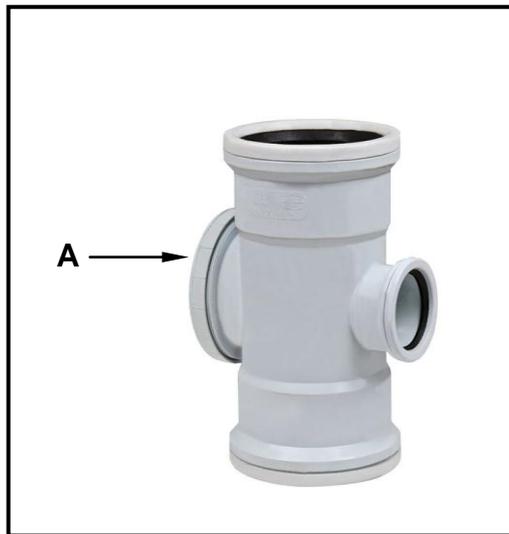


FIGURE 4.7

- 4.7.1 Identify the fitting. (1)
- 4.7.2 Name the material that is used to manufacture the fitting. (1)
- 4.7.3 Recommend where you would install this type of fitting in the plumbing system. (1)
- 4.7.4 Explain the purpose of **A**. (1)

4.8 FIGURE 4.8 below shows a pillar tap mechanism.

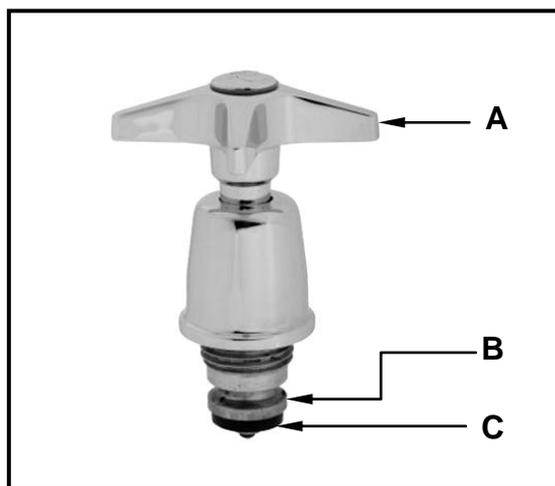


FIGURE 4.8

- 4.8.1 Identify part **A**. (1)
- 4.8.2 Explain the purpose of part **B**. (1)
- 4.8.3 Describe what will happen if part **C** is not fitted. (1)
- 4.8.4 Name ONE sanitary fitting where a pillar tap may be used. (1)



4.9 FIGURE 4.9 below shows a machine with an attachment.



FIGURE 4.9

- 4.9.1 Identify the machine in FIGURE 4.9. (1)
- 4.9.2 State TWO elements that will ensure the efficient removal of a blockage when using the machine. (2)
- 4.10 Describe the reason for cleaning drain rods after use. (1)
- 4.11 Why is it NOT recommended that copper and galvanised pipes are joined to one another in a water-pipe system? (1)
- 4.12 Name TWO visible signs of dezincification. (2)
- 4.13 Name the solution you would use to remove the zinc from galvanised sheet metal before soldering. (1)

[40]



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

Start this question on a NEW page.

- 5.1 FIGURE 5.1 below shows a pre-fabricated surface channel **A** and concrete shoe **B**.

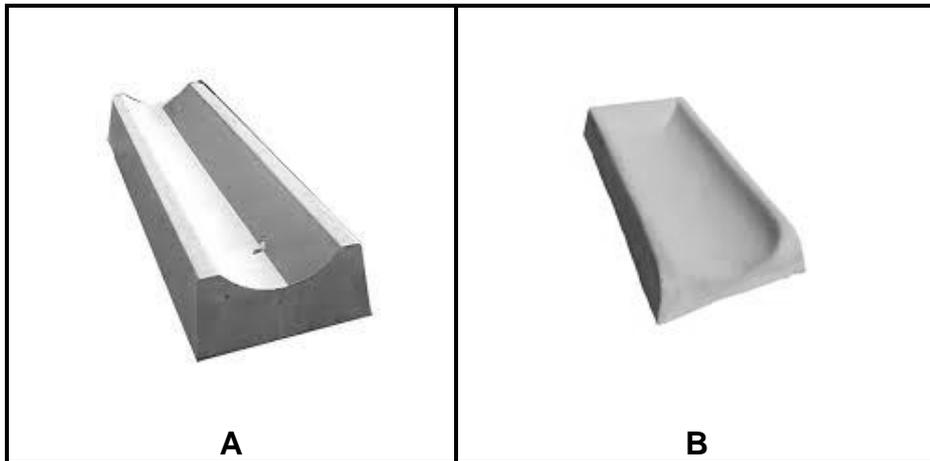


FIGURE 5.1

- 5.1.1 Explain why reinforced concrete is preferred in the manufacturing of **A**. (2)
- 5.1.2 Describe the logic for having a fall/slope when positioning **B**. (1)
- 5.2 ANSWER SHEET 5.2 shows the incomplete sectional view of a roof and wall. Use this answer sheet and complete the fascia board, gutter and downpipe installation. Use good proportions. (8)
- 5.3 ANSWER SHEET 5.3 shows the front view and auxiliary view of two cylindrical pipes. Use the drawing and the information to draw the development of pipe **A**. Show the 3 mm seam on both sides and ALL construction lines. Do NOT redraw the given views. 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 disadvantage of this system is that the top can be blocked by greasy residue or by leaves:
- A Manhole
 - B Inspection chamber
 - C Gully
 - D Water closet
- (1)
- 6.1.2 A ... stores sewage until it can be pumped out by the local authority.
- A septic tank
 - B vacuum tank
 - C inspection chamber
 - D All the above-mentioned
- (1)
- 6.1.3 ... is also called soil water.
- A Sewage
 - B Ground water
 - C Sewerage
 - D Waste-water
- (1)
- 6.1.4 A ... is a conduit for the conveyance of storm, surface, subsoil, spring or rain water from one location to dams and rivers.
- A gully
 - B drain
 - C sewerage
 - D All the above-mentioned
- (1)
- 6.1.5 A ... mm pipe is used to discharge waste-water from sanitary fittings to the gully.
- A 100/110
 - B 75
 - C 40/50
 - D 25/30
- (1)



6.2 FIGURE 6.2 below shows a sectional view of a sanitary installation.

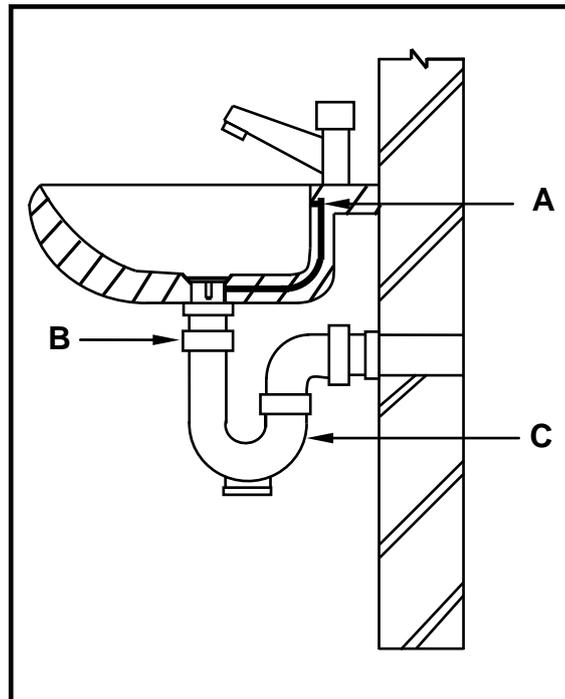


FIGURE 6.2

- 6.2.1 Identify **A**, **B** and **C**. (3)
- 6.2.2 Describe the function of **C**. (2)
- 6.2.3 What is the purpose of **A**? (1)
- 6.3 Make a freehand sketch of a solid lapped joint in your ANSWER BOOK. (2)
- 6.4 What is the correct angle for holding the soldering iron when two pieces of metal are soldered together? (1)
- 6.5 Why should flux be applied to the edges of the metal before soldering? (1)
- 6.6 State the purpose of a French drain. (1)
- 6.7 Predict what would happen to borehole water if a French drain is built too close to a borehole. (1)
- 6.8 ANSWER SHEET 6.8 shows an incomplete vertical section of a septic tank. Complete the drawing. (10)
- 6.9 ANSWER SHEET 6.9 shows the line diagram of a granny flat with an outbuilding and the sanitary fitments with an incomplete sewerage system. Design and draw the complete sewerage layout. (13)

[40]

TOTAL: 200



CENTRE NUMBER: EXAMINATION NUMBER: **ANSWER SHEET 2**

| NO. | QUESTIONS | ANSWERS | MARKS |
|-----|---|---------|-------|
| 1. | Identify the scale that was used for the site plan and the floor plan respectively. | | 2 |
| 2. | Who is responsible for checking the building plan? | | 1 |
| 3. | What type of fencing does the architect recommend for the new dwelling? | | 1 |
| 4. | Name the town where the new dwelling will be erected. | | 1 |
| 5. | What was done as revision 1? | | 1 |
| 6. | Identify number 1. | | 1 |
| 7. | Identify number 3 by giving the abbreviation. | | 1 |
| 8. | Identify number 4. | | 1 |
| 9. | Identify number 5. | | 1 |
| 10. | Identify number 9. | | 1 |
| 11. | Identify number 11. | | 1 |
| 12. | Identify number 12. | | 1 |
| 13. | Identify the number that indicates the boundary line. | | 1 |
| 14. | Describe the purpose of number 2. | | 1 |
| 15. | Deduce the plot number of the existing dwelling from FIGURE A. | | 1 |
| 16. | What is omitted in Maple Street with reference to number 6? | | 1 |



| | | | |
|-----|--|---------------|-----------|
| 17. | What leisure feature is located on the site plan? | | 1 |
| 18. | Draw the north symbol to show that the driveway side is facing east. | | 3 |
| 19. | What is the purpose of the north symbol on a house plan? | | 1 |
| 20. | Which feature indicates that this is a double-storey building? | | 1 |
| 21. | Deduce THREE faults from bedroom 2. | | 3 |
| 22. | Draw the symbol for a wash tub. | | 2 |
| 23. | Draw the symbol for a bath. | | 2 |
| 24. | Draw the symbol for a water meter. | | 2 |
| 25. | Describe TWO reasons why the local municipality would not approve FIGURE A. | | 2 |
| 26. | Calculate the length of the house. Give your answer in m. Show ALL calculations. | | 6 |
| | | TOTAL: | 40 |



| | | | | | | | | |
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| CENTRE NUMBER: | | | | | | | | |
|-----------------------|--|--|--|--|--|--|--|--|

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ANSWER SHEET 3.3

| ASSESSMENT CRITERIA | MARK | CM |
|----------------------------|-------------|-----------|
| Correctness of drawing | 8 | |
| TOTAL: | 8 | |



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ANSWER SHEET 3.5

SECOND COURSE

| | | | | | |
|--|--|--|--|--|--|
| | | | | | |
| | | | | | |

FIRST COURSE

| ASSESSMENT CRITERIA | MARK | CM |
|----------------------------|-------------|-----------|
| Correctness of drawing | 6 | |
| TOTAL: | 6 | |



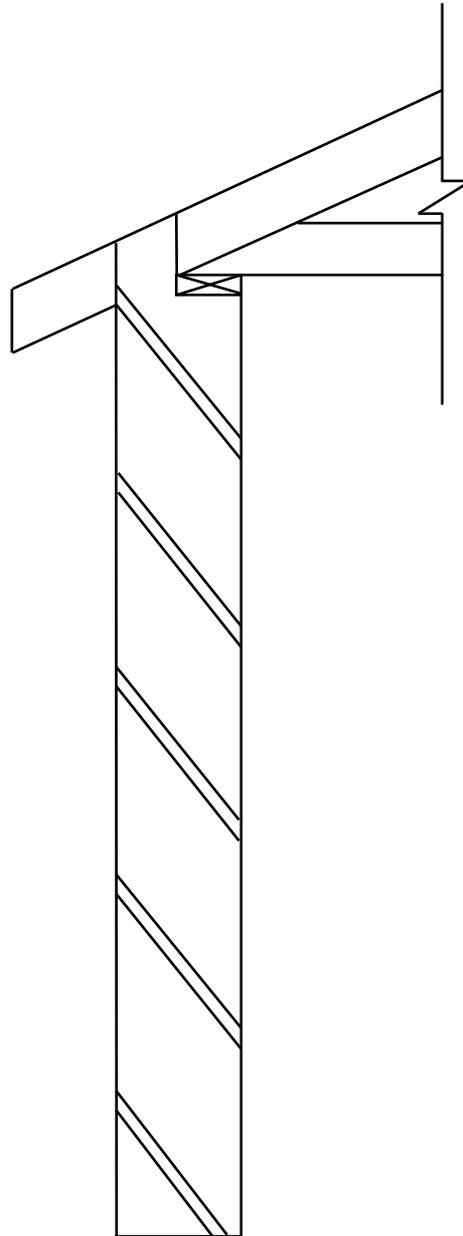
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ANSWER SHEET 5.2



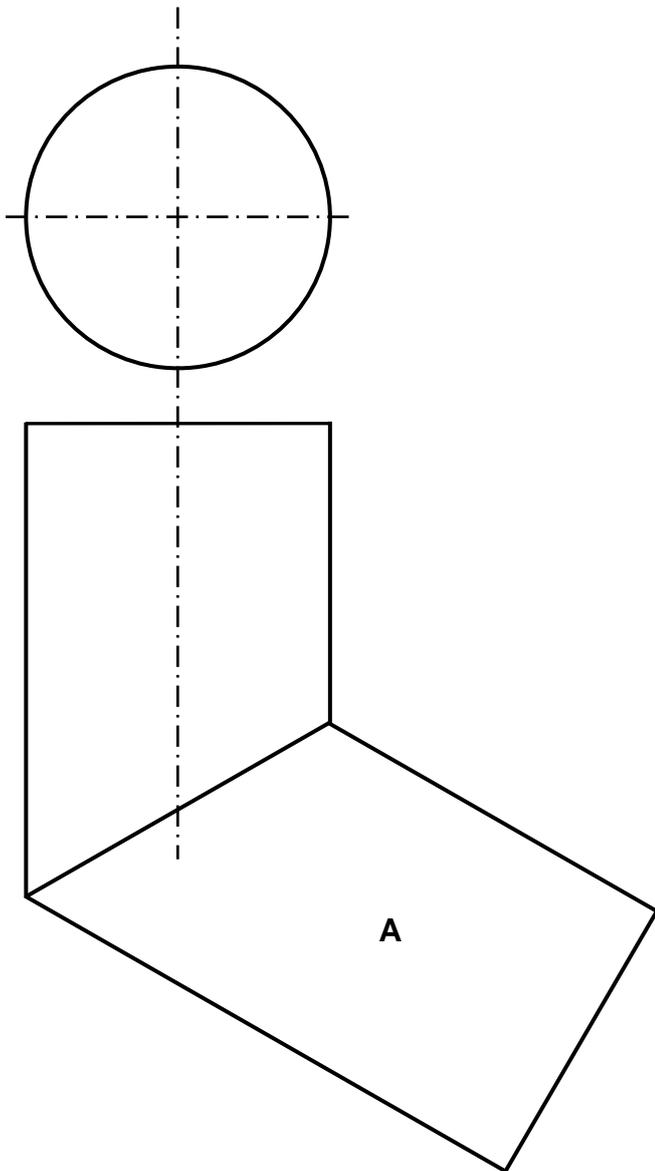
| ASSESSMENT CRITERIA | MARK | CM |
|------------------------|----------|----|
| Correctness of Drawing | 8 | |
| TOTAL: | 8 | |



CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 5.3



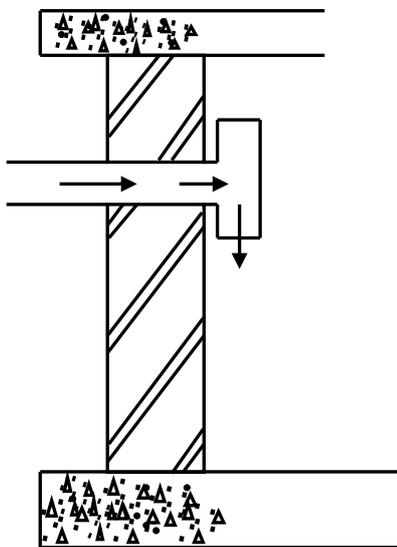
| ASSESSMENT CRITERIA | MARK | CM |
|------------------------|-----------|----|
| Correctness of drawing | 19 | |
| TOTAL: | 19 | |



CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 6.8



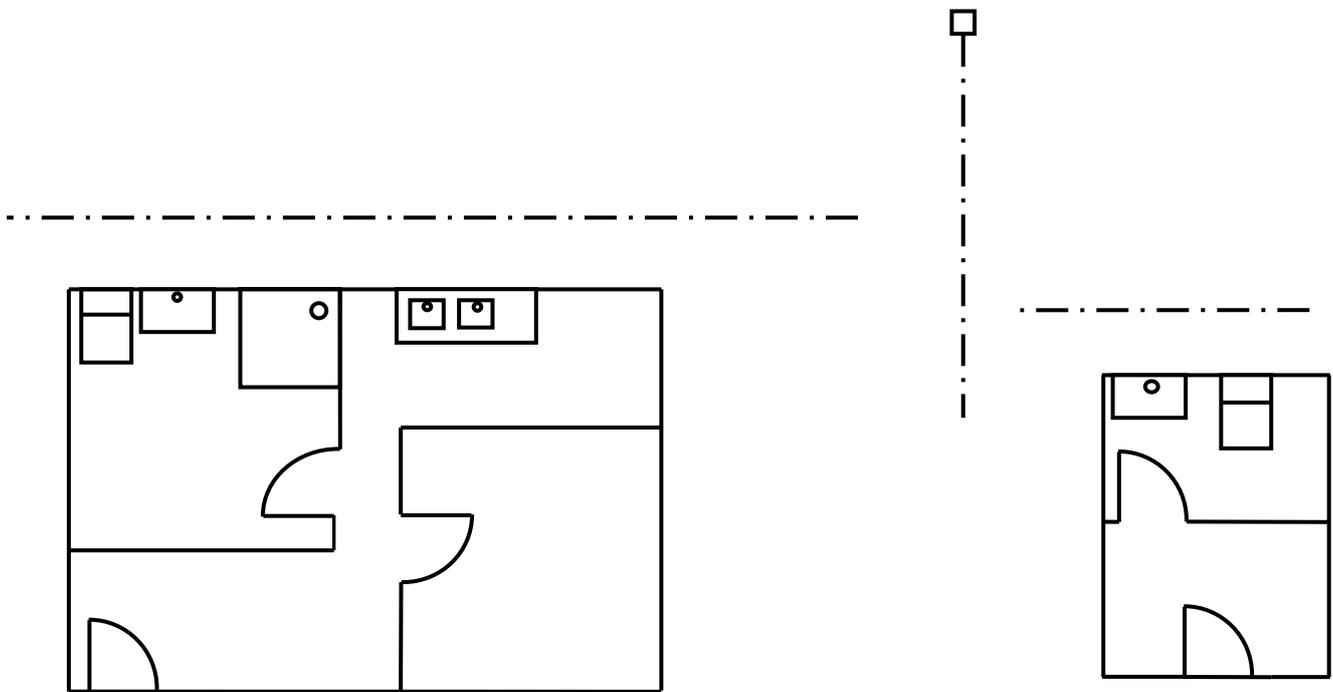
| ASSESSMENT CRITERIA | MARK | CM |
|------------------------|-----------|----|
| Correctness of drawing | 10 | |
| TOTAL: | 10 | |



CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 6.9



| ASSESSMENT CRITERIA | MARK | CM |
|------------------------|-----------|----|
| Correctness of drawing | 13 | |
| TOTAL: | 13 | |

