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REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

CIVIL TECHNOLOGY: CIVIL SERVICES

NOVEMBER 2024

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 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, 3.5, 5.4, 6.5 and 6.6 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.

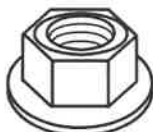
QUESTION 1: OHSA, MATERIALS, TOOLS, EQUIPMENT AND JOINING (GENERIC)

Start this question on a NEW page.

1.1 Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question numbers. (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 Concrete. _

- 1.1.1 Wooden scaffold standards should not be placed more than (4 m/3 m/6 m) apart. (1)
- 1.1.2 Trestle scaffolds must have a maximum height of (3 m/4 m/6 m). (1)
- 1.1.3 The material safety data sheet that accompanies hazardous chemical substances must contain (fire-fighting measures/ flame ratio/combustion rate). (1)
- 1.1.4 When transporting long ladders with a vehicle, (ensure that the ladder does not protrude excessively/mark the end of the ladder with a green flag/place ladder in an upright position). (1)
- 1.1.5 (Galvanising/Powder coating/Electrolysis) is the process of applying a plastic coating to a metal. (1)
- 1.1.6 Electroplating is the process in which (the thickness of undersized parts can be increased/metal becomes extremely hot/metals are coated with paint). (1)
- 1.1.7 The (thread and shank/head and pin/runout and shank) do not form part of the length of a bolt. (1)
- 1.1.8 The purpose of the nylon insert on a hexagonal nut is for (decorative purposes/easy removal from a bolt/preventing backing off). (1)
- 1.1.9 Wooden ladders may be treated with (oil-based paint/ wood preservatives/water-based paint) according to the Occupational Health and Safety Act (OHSA). (1)
- 1.1.10 Workers carrying large equipment may not use (spiral/suspended/ fire escape) stairways that are a temporary part of a structure. (1)

1.2 Which pictorial view below represents a nut with a built-in washer?

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

(1)

1.3 The specifications for a Rawl bolt are R-RBL-M08/25. What does the *M08* represent? (1)

- 1.4 Cured concrete is exposed to elements.
- 1.4.1 Explain the effect of cured concrete on steel reinforcement. (1)
- 1.4.2 Explain the advantages of cured concrete in terms of the weight it can carry. (1)
- 1.5 Differentiate between the *multi-detector* and the *laser level* in terms of the use thereof. (2)
- 1.6 Describe TWO uses of the dumpy level. (2)
- 1.7 Describe how you will take care of a telescopic staff. (2)
- [20]**

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)

Start this question on a NEW page.

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.

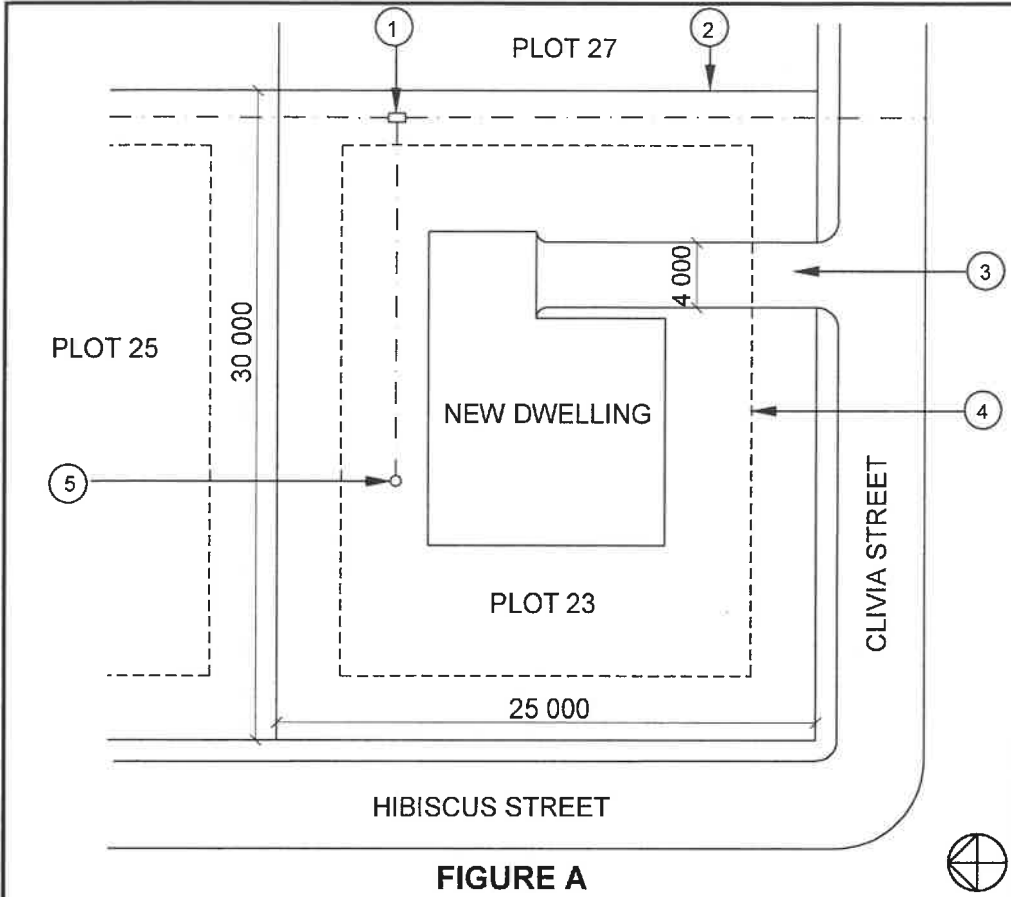


FIGURE A

NOTES:
Contractors must verify all dimensions and levels on site before commencing work.

Architects to be notified of any discrepancies immediately.

Fencing: Clear-view fencing to be used on the boundary

Architect's signature

Client's signature

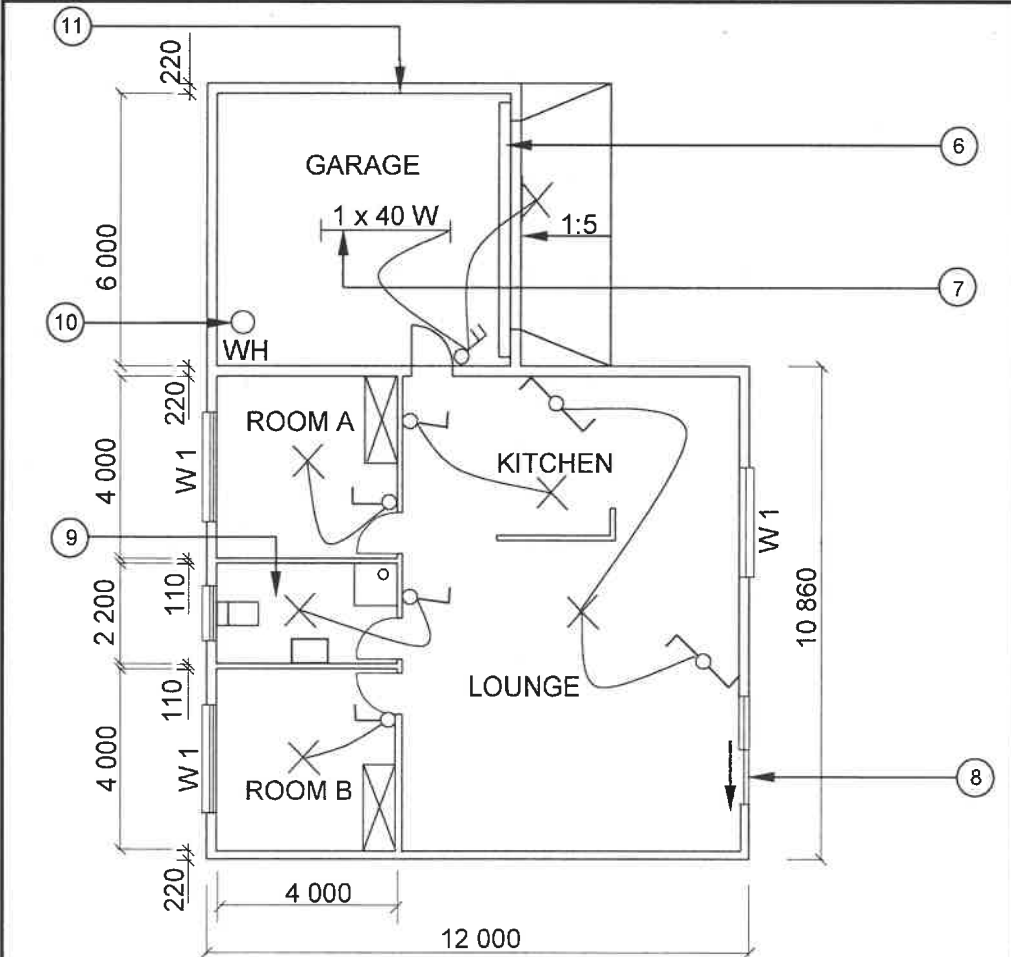
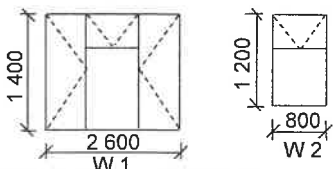


FIGURE B

REVISION 1	DATE: 14/04/2024	DRAWING OF ELECTRICAL FITTINGS
PRINTED BY: FROG PRINTERS		DATE OF PRINT: 16/04/2024
DRAWING TITLE: SITE PLAN AND FLOOR PLAN		
PROJECT: PROPOSED DWELLING OF MS KOCK ON PLOT 23, CLIVIA STREET, MALUBU		
PROJECT NO.: GR 688-646		DRAWING NO.: 446P2
DATE: 07/04/2024	DRAWN: SP JOB	CHECKED: P BOT
SITE PLAN		SCALE 1 : 500
FLOOR PLAN		SCALE 1 : 100
REFERENCE CODE QP 4 – 2024		
WINDOW SCHEDULE 		

[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 Stretcher bond.

1 : 90; incidence board; strut; spirit level; queen closer; datum level; wedge; stopped end; concrete lid; 1 : 40

- 3.1.1 A board with the correct fall on it (1)
- 3.1.2 An accessory used in concrete ring manholes (1)
- 3.1.3 Secures the strut in shoring used for trenches (1)
- 3.1.4 The gradient for a pipe with a diameter of 225 mm (1)
- 3.1.5 A specifically shaped brick used in an English bond (1)

- 3.2 FIGURE 3.2 below shows safety equipment being used in a confined space.

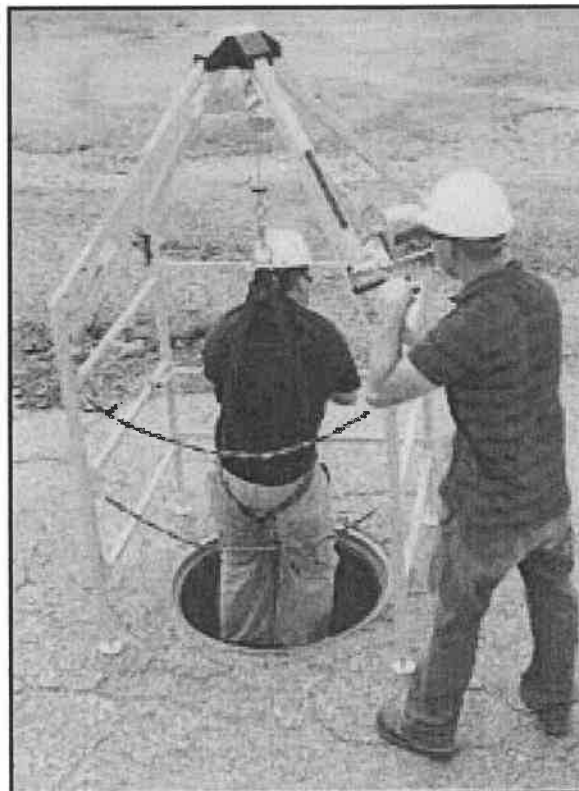
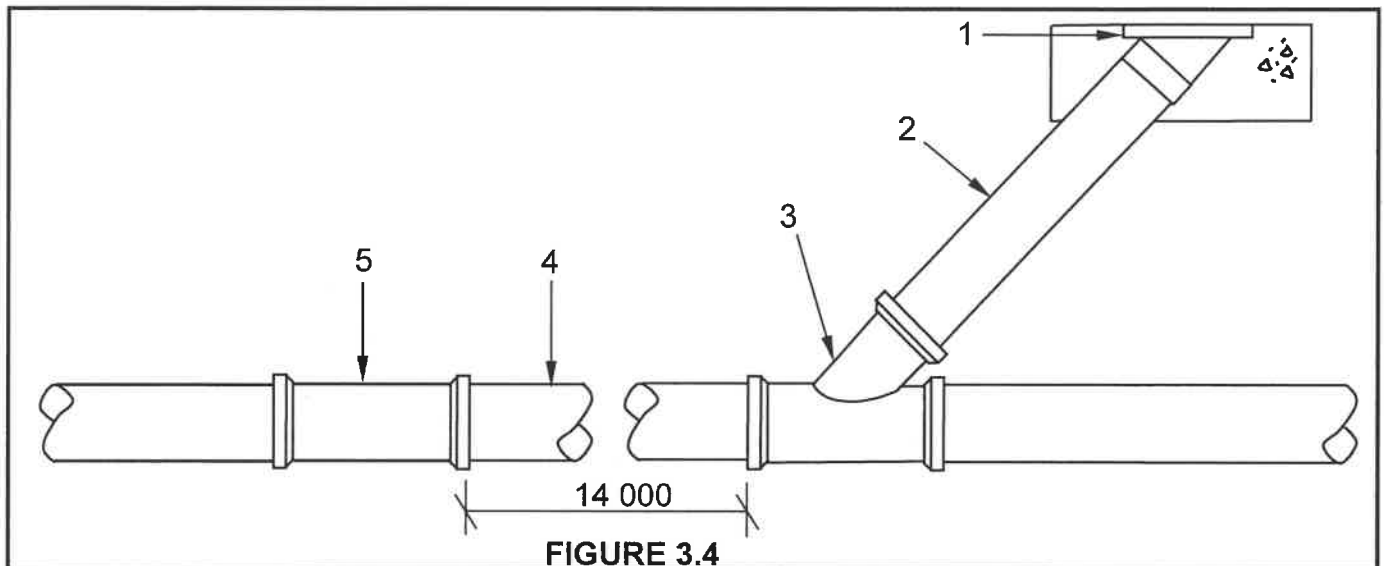


FIGURE 3.2

- 3.2.1 Name the safety equipment that attaches the worker to the safety rope. (1)
- 3.2.2 Name a method that is used to remove harmful gases from a manhole. (1)
- 3.2.3 Name ONE safety item that a worker must wear in order to prevent inhaling of dangerous gases. (1)

- 3.3 Draw on ANSWER SHEET 3.3 a horizontal sectional view of a manhole. Indicate the direction the sewage will flow. Label the benching and any other TWO labels. (8)
- 3.4 Use the information in FIGURE 3.4 below and take off the materials as indicated in the table below. Write only the answer next to the question numbers (3.4.1 to 3.4.7) in the ANSWER BOOK, e.g. 3.4.8 P-trap.



ITEM	NAMES OF PIPES/ SANITARY FITTINGS	MATERIAL	DIAMETER	QUANTITY
1	3.4.1	3.4.2
2	Soil/Sewer pipe	...	3.4.3	...
3	Y-junction 135°	3.4.4	...	3.4.5
4	Main straight pipe	3.4.6 (Indicate the number of 6 m pipes needed)
5	3.4.7	1

NOTE: Sewer pipes are available in 6 metre lengths. (7)

- 3.5 ANSWER SHEET 3.5 shows the top view of the first course of a corner (quoin) with a T-junction half-brick wall. Project and draw the consecutive layer to fit exactly on the given first course. (7)
[30]

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

Start this question on a NEW page.

4.1 FIGURE 4.1 below shows TWO valves.

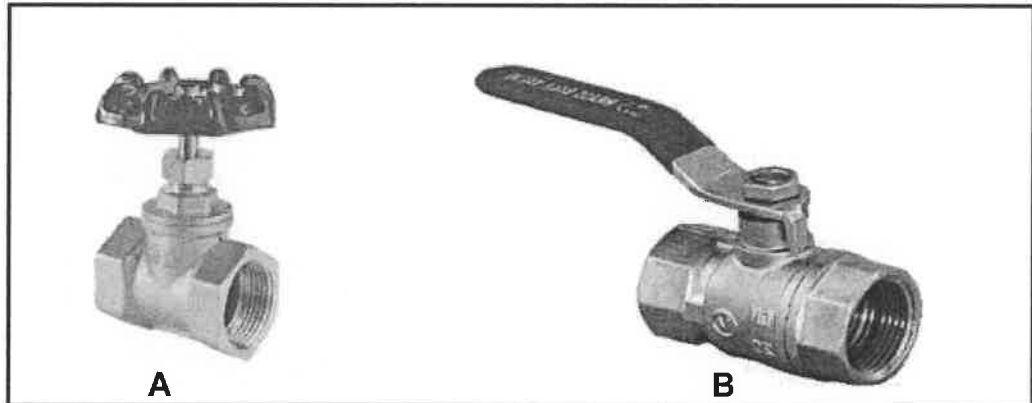


FIGURE 4.1

4.1.1 Differentiate between fullway valves **A** and **B** in terms of the mechanism to open the valves. (2)

4.1.2 Name the movable components inside the fullway valves that will open or close the valves. (2)

4.2 FIGURE 4.2 below shows a machine.



FIGURE 4.2

4.2.1 Identify the machine. (1)

4.2.2 Name TWO uses of this machine. (2)

4.2.3 What type of lubricant should be applied to the cutting parts of the machine to ensure a smooth cut? (1)

- 4.3 FIGURE 4.3 below shows a pipe connected to cold- and hot-water taps, used to solve a fault in the water pipes.

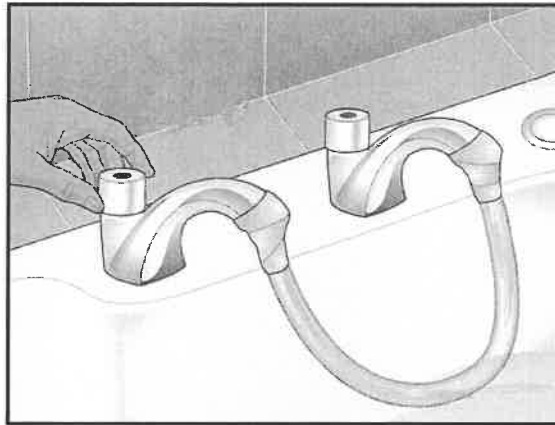


FIGURE 4.3

- 4.3.1 Identify the fault that is being rectified. (1)
- 4.3.2 Explain how you would prevent the type of fault identified in QUESTION 4.3.1. (2)

- 4.4 FIGURE 4.4 below shows a component used inside a geyser to heat the water.



FIGURE 4.4

- 4.4.1 Identify the component. (1)
- 4.4.2 Name the component that protects the geyser inner casing against corrosion. (1)
- 4.4.3 Explain the function of the thermostat in a geyser. (2)
- 4.5 Draw the following symbols that are used in hot-water systems:
- 4.5.1 Pressure switch (2)
- 4.5.2 Expansion-control valve (2)
- 4.5.3 Shower (fixed) (2)

4.6 FIGURE 4.6 below shows an electrical water-heating system.

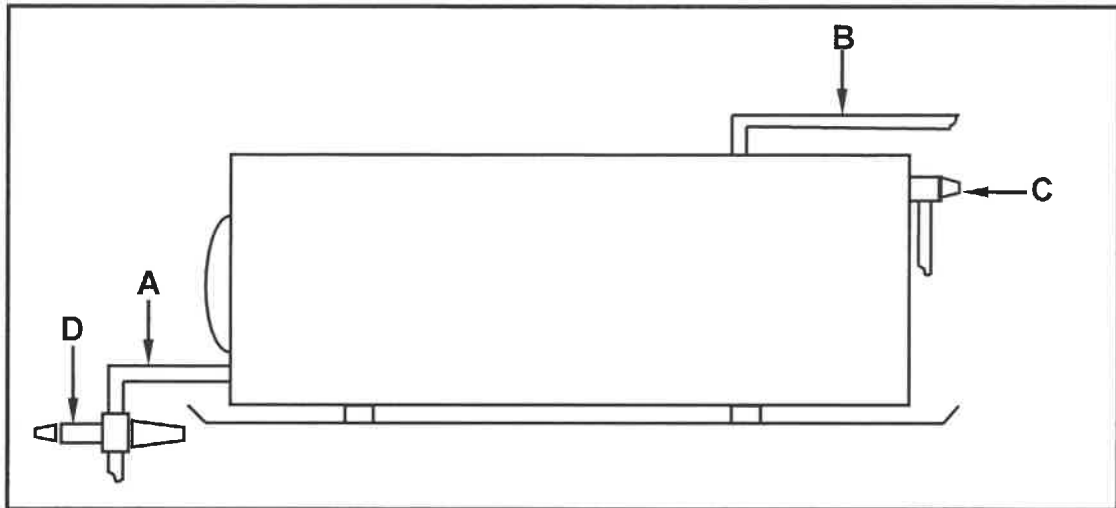


FIGURE 4.6

- 4.6.1 Explain the function of pipes **A** and **B**, as used in the geyser installation. (2)
- 4.6.2 Name and explain ONE purpose of **D**. (2)
- 4.6.3 Identify **C**. (1)
- 4.6.4 Give ONE reason for using a drip tray in a geyser installation. (1)
- 4.6.5 Name the component of the geyser that prevents siphoning. (1)

- 4.7 Choose a description from COLUMN B that matches the item in COLUMN A. Write only the letter (A–H) next to the question numbers (4.7.1 to 4.7.5) in the ANSWER BOOK, e.g. 4.7.6 J.

COLUMN A		COLUMN B	
4.7.1	Heat pump	A	to join galvanised pipes or fix a leak
4.7.2	Flanges	B	is used to connect two steel pipes and keep the components in place
4.7.3	Johnson pipe coupling	C	allows unpleasant odours coming from a sewerage system to escape
4.7.4	Water meter	D	uses the solar to heat water
4.7.5	Demand pillar tap	E	to join PVC pipes or fix a leak
		F	uses warm air to heat water
		G	used by municipal workers to take readings of water used
		H	regulates water flow for a few seconds at a hand wash-basin

(5 x 1) (5)

- 4.8 Name the reaction between two metals when the following processes take place:

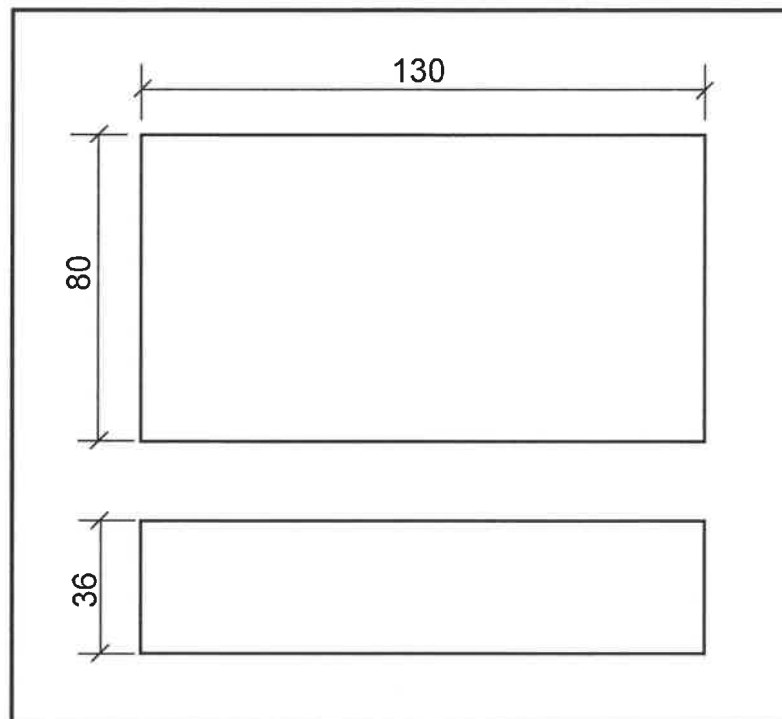
- 4.8.1 The selective removal of the more active zinc from an alloy in an aqueous solution takes place (1)
- 4.8.2 The process is carried out in an electrolytic cell dipped in a solution of positive and negative charged ions (1)
- 4.8.3 One metal corrodes another when both metals are in electrical contact in the presence of an electrolyte (1)

- 4.9 Show, by means of a sketch, a T-junction 90° single reducing inspection eye. (4)
[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 shows the front and top view of a stopped end of a gutter. Draw, in your ANSWER BOOK, the development of the stopped end with a closed top.

**FIGURE 5.1**

- 5.2 Name ONE method of channelling storm water to catchment areas. (6)
- 5.3 Show, by means of a neat pictorial freehand sketch, a precast open channel. (1)
- 5.4 ANSWER SHEET 5.4 shows the front view and top view of a square-based truncated pyramid, with the base not parallel with the axis, to be used as a vent pipe. (4)

Use the views and information given and draw the development of the truncated pyramid. Start the development at A.

The pyramid has a 3 mm seam on both sides.

Show ALL construction and projection lines.

(19)
[30]

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

Start this question on a NEW page.

- 6.1 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 numbers (6.1.1 to 6.1.5) in the ANSWER BOOK, e.g. 6.1.6 D.

- 6.1.1 The slope/gradient/fall of a drain pipe with a diameter of 150 mm is ...
A 1 : 40.
B 1 : 60.
C 1 : 90.
D All the above-mentioned (1)
- 6.1.2 ... is used to join waste-water pipes of the same diameter at corners.
A A coupling
B A T-waste junction 135°
C A 90° bend with Ø110 mm
D A waste bend with inspection eye 90° (1)
- 6.1.3 A cistern forms part of a ...
A water closet.
B bath.
C sink.
D None of the above-mentioned (1)
- 6.1.4 The most suitable tool used to cut a copper pipe is a ...
A hacksaw.
B bench saw.
C pipe cutter.
D side cutter. (1)
- 6.1.5 S-traps must be installed at ...
A showers.
B baths.
C bidets.
D None of the above-mentioned (1)

6.2 FIGURE 6.2 below illustrates a type of urinal.

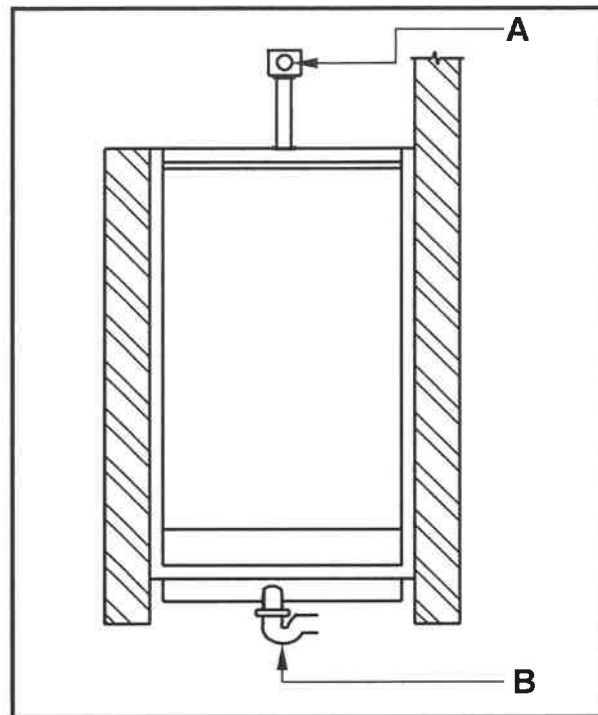


FIGURE 6.2

- | | | |
|-------|--|-----|
| 6.2.1 | Identify the type of urinal. | (1) |
| 6.2.2 | Identify A and B . | (2) |
| 6.2.3 | Explain the function of A . | (1) |
| 6.2.4 | Describe what can be placed on top of the metal grid to prevent paper and other material from entering the outlet. | (1) |

- 6.3 FIGURE 6.3 below illustrates the soldering process. Study the figure and answer the questions that follow.

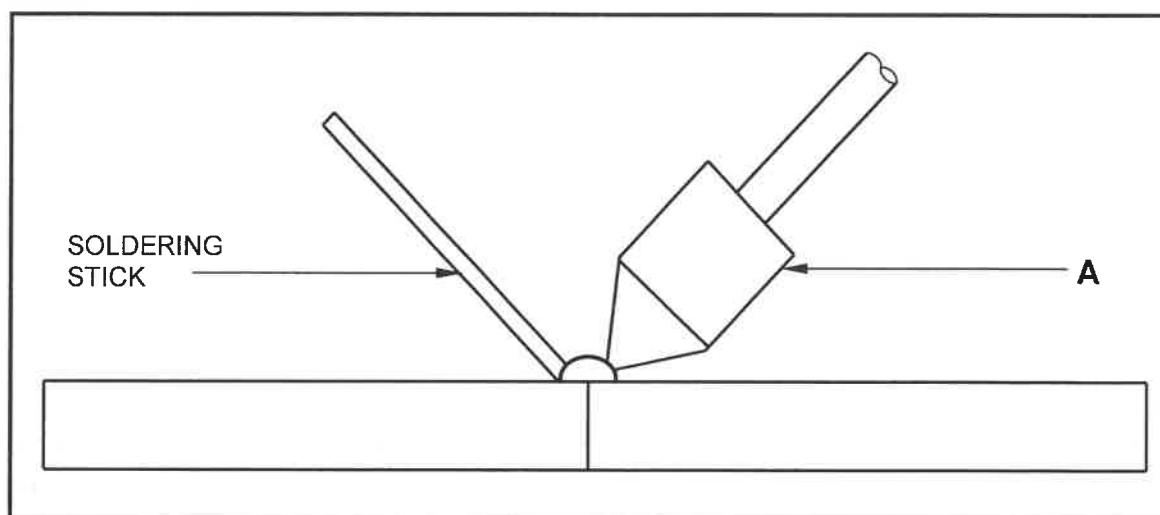


FIGURE 6.3

- 6.3.1 Identify **A**. (1)
- 6.3.2 Explain why **A** is made of copper. (1)
- 6.3.3 Describe the composition of the soldering stick. (1)
- 6.3.4 Discuss TWO reasons for coating the joint with flux prior to soldering. (2)
- 6.4 Describe the process of joining PVC pipes to a straight coupler using a solvent. (4)
- 6.5 ANSWER SHEET 6.5 shows an incomplete vertical sectional view of a septic tank. Use ANSWER SHEET 6.5 and complete the drawing of the septic tank. Label the water level and scum. (10)
- 6.6 ANSWER SHEET 6.6 shows the floor plan of a workshop and the incomplete sewerage layout. Use ANSWER SHEET 6.6 to design and complete a suitable sewerage layout with a gully for the workshop. Print the abbreviations for the inspection eyes and the vent pipe. (11)

[40]

TOTAL: 200

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 2

NO.	QUESTIONS	ANSWERS	MARKS
1.	What is the measurement of the dwelling facing Hibiscus Street?		1
2.	Identify number 1.		1
3.	Identify the number indicating the building line.		1
4.	Identify number 2.		1
5.	Identify number 3.		1
6.	Write down the abbreviation for number 5.		1
7.	Explain the purpose of number 6.		1
8.	How many fluorescent tubes are used in number 7?		1
9.	How many one-way switch single-pole switches are in the dwelling?		1
10.	How many built-in cupboards are in the dwelling?		1
11.	What is omitted in terms of electrical installation in the bedrooms?		1
12.	Name TWO access points into the dwelling.		2
13.	How do you know in which direction the door at number 8 will open?		1
14.	Name ONE other fixture that can be installed in the bathroom indicated by number 9.		1
15.	Identify number 10.		1

CENTRE NUMBER:

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EXAMINATION NUMBER:

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16.	Which plot is on the eastern side of plot number 23?		1
17.	How many inside doors are in the building?		1
18.	How many 2 600 mm x 1 400 mm windows are in the building?		1
19.	Who checked the drawing of the new dwelling?		1
20.	Why will it be difficult to enter the dwelling at number 8 if the NGL is 300 mm lower than the FFL?		1
21.	Who was responsible for the printing of the building plan?		1
22.	Deduce from the notes column the date that revision 1 took place.		1
23.	In which town will the new dwelling be erected?		1
24.	Draw the symbol for a sink unit – double.		5
25.	Draw the symbol for hardcore filling.		2
26.	Calculate the metres of clear-view fencing that would be needed to fence plot number 23, excluding the driveway. Give your answer in metres and show ALL calculations.		6
27.	The internal area of the garage is 39,6 m ² . Calculate the internal length of number 11. Give your answer in mm and show ALL calculations.		3
TOTAL:			40

CENTRE NUMBER:									
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EXAMINATION NUMBER:														
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ANSWER SHEET 3.3

ASSESSMENT CRITERIA		
NO.	MARK	CANDIDATE'S MARK
1	1	
2	1	
3	1	
4	1	
5	1	
6	1	
7	2	
TOTAL:	8	

CENTRE NUMBER:							
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EXAMINATION NUMBER:														
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ANSWER SHEET 3.5

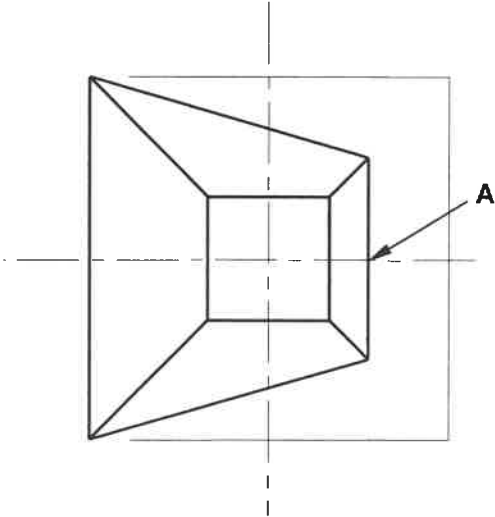
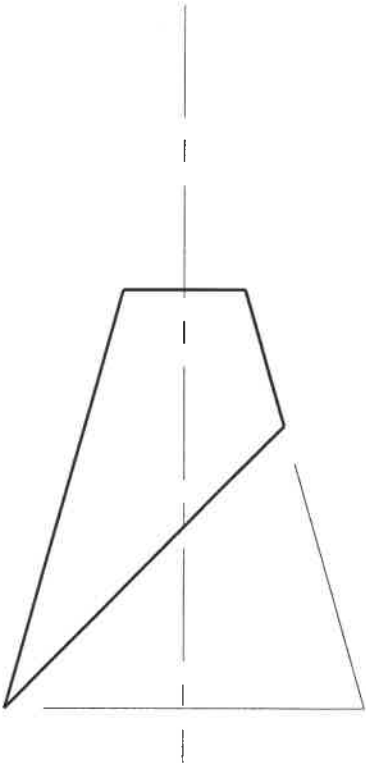
ASSESSMENT CRITERIA		
NO.	MARK	CANDIDATE'S MARK
1	4	
2	2	
3	1	
TOTAL:	7	

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 5.4

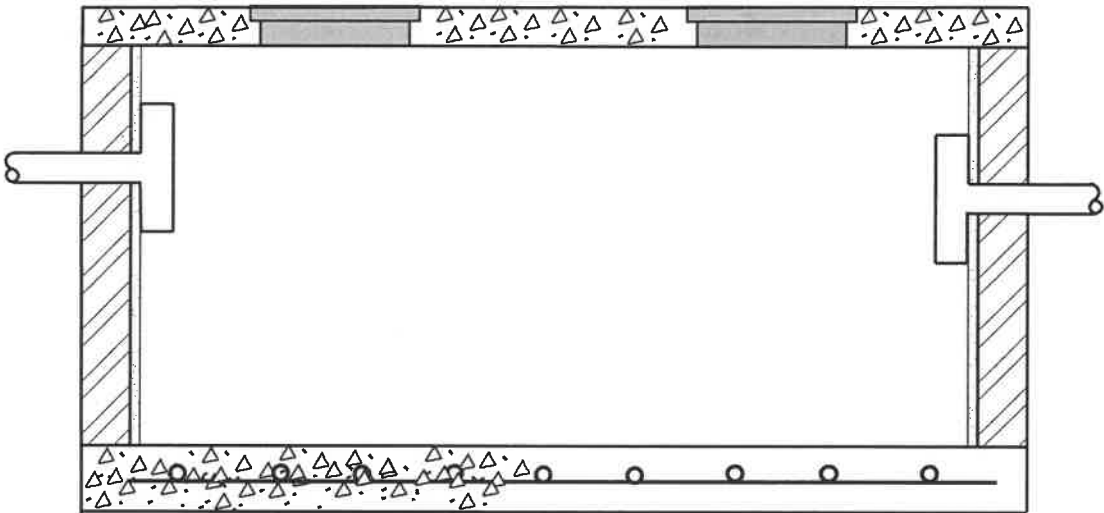
ASSESSMENT CRITERIA		
NO.	MARK	CANDIDATE'S MARK
1	1	
2	2	
3	3	
4	5	
5	5	
6	1	
7	2	
TOTAL:	19	



CENTRE NUMBER:								
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EXAMINATION NUMBER:																	
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ANSWER SHEET 6.5



ASSESSMENT CRITERIA		
NO.	MARK	CANDIDATE'S MARK
1	1	
2	1	
3	2	
4	2	
5	1	
6	1	
7	2	
TOTAL:	10	

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 6.6

ASSESSMENT CRITERIA		
NO.	MARK	CANDIDATE'S MARK
1	3	
2	3	
3	1	
4	1	
5	1	
6	2	
TOTAL:	11	

