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**SENIOR CERTIFICATE/
NATIONAL SENIOR CERTIFICATE**

GRADE 12

CIVIL TECHNOLOGY: CIVIL SERVICES

NOVEMBER 2020

MARKS: 200

TIME: 3 hours

This question paper consists of 14 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, 3.6, 3.7, 4.1, 5.7 and 6.5 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: OHS, SAFETY, MATERIALS, TOOLS, EQUIPMENT AND JOINING
(GENERIC)**

Start this question on a NEW page.

- 1.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–K) next to the question numbers (1.1.1 to 1.1.8) in the ANSWER BOOK, e.g. 1.1.9 L.

COLUMN A		COLUMN B	
1.1.1	Powder coating	A	must be inclined slightly towards a building
1.1.2	Rungs	B	is used with the dumpy level to measure heights accurately
1.1.3	Wing nut	C	allows a worker to climb up or down a ladder
1.1.4	Rawl bolts	D	can be tightened or loosened without using a spanner
1.1.5	Telescopic staff	E	suitable for outdoor furniture
1.1.6	Accident	F	result of an unsafe act or unsafe condition
1.1.7	Putlog scaffold	G	must not be placed where it may obstruct the access to or the exit from a building site
1.1.8	Building rubble	H	resists pull-out failure
		I	must be secured firmly when there is any sagging
		J	prevent(s) workers from falling off a scaffold
		K	disposal of waste materials and debris

(8 x 1) (8)

- 1.2 Explain ONE advantage of galvanising. (1)
- 1.3 Name the document on hazardous chemical substances which the OHS Act requires employers to provide to interested or affected persons. (1)
- 1.4 Describe TWO methods that can be used to move building material around the site. (2)

- 1.5 State TWO specific advantages of water-based paint. (2)
- 1.6 You were tasked to locate steel bars and copper pipes placed into a wall.
- 1.6.1 Name the tool you would use to detect these materials. (1)
- 1.6.2 Describe how you would take care of this tool after using it. (2)
- 1.7 FIGURE 1.7 below shows a joining fixture that is commonly used.

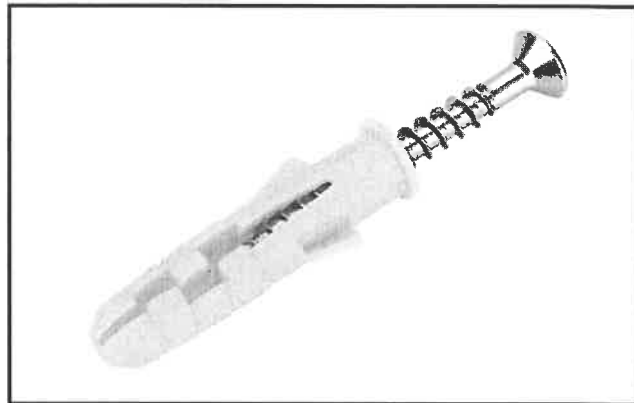


FIGURE 1.7

Explain how this joining fixture can be used to secure a bracket to a wall.

(3)
[20]

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)

Start this question on a NEW page.

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

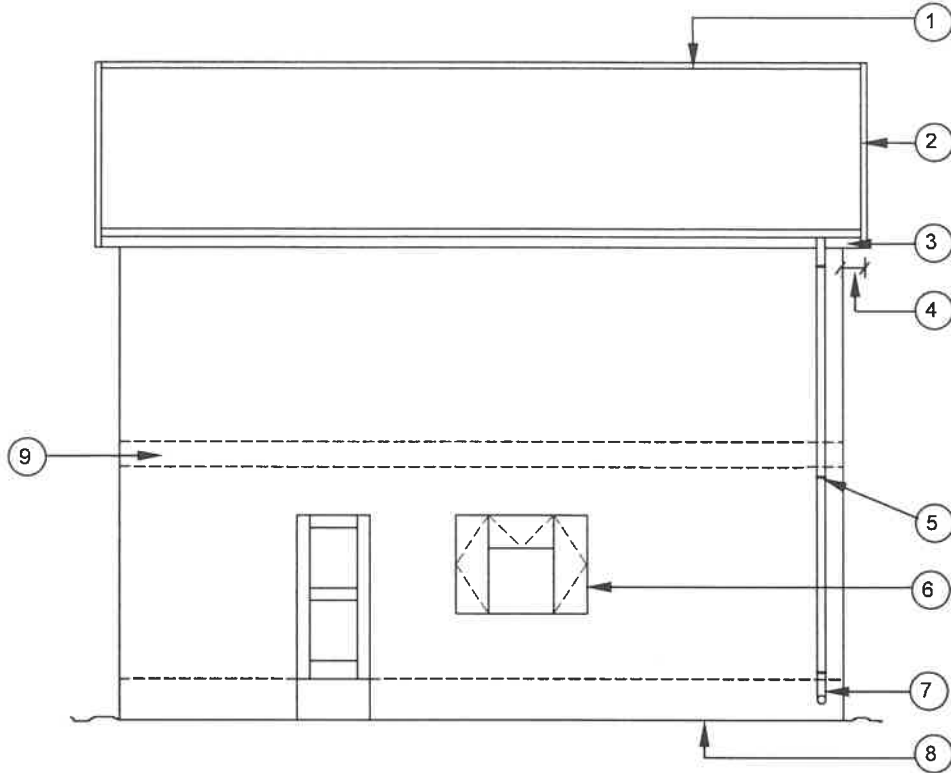


FIGURE A
SCALE 1 : 100

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

ARCHITECT'S SIGNATURE
CLIENT'S SIGNATURE

Brick force must be installed every third course up to window height. From the top of the window, brick force must be installed between every course up to wall plate height.

DPM must be fitted under the floor slab to prevent water from penetrating from the substructure.

The following electrical fittings must be installed in the kitchen:

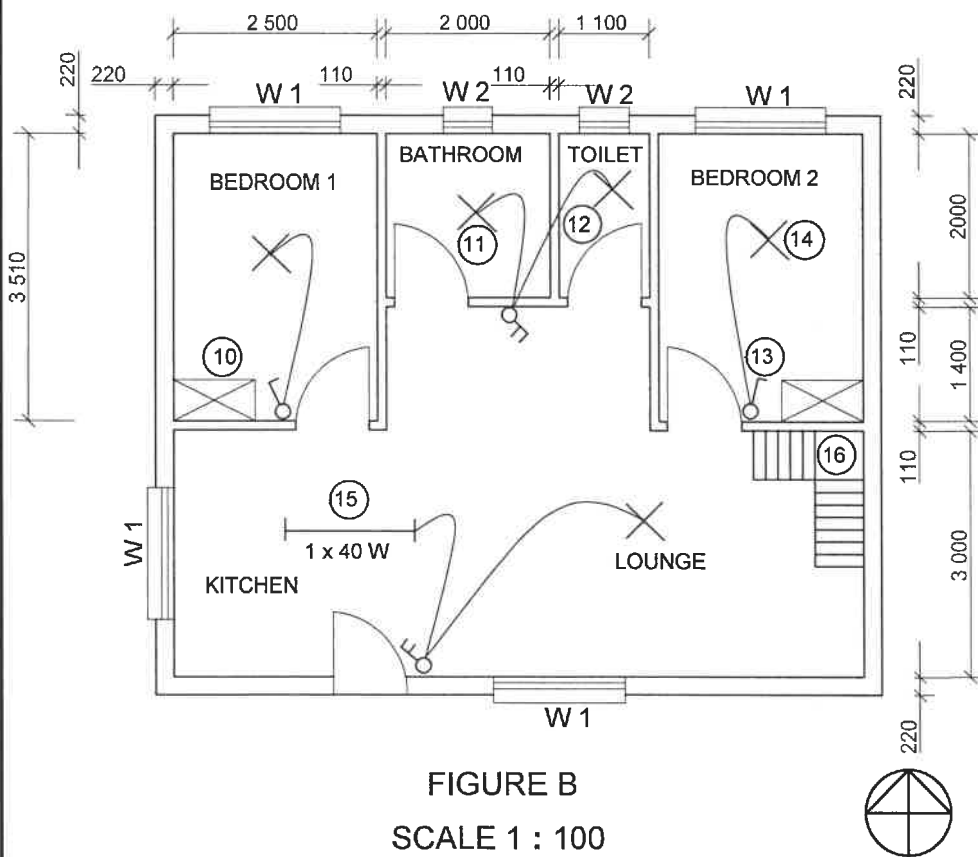
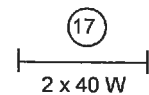


FIGURE B
SCALE 1 : 100

REVISION	DATE	DESCRIPTION
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PRINTED BY: MTANDO PRINTERS
DATE OF PRINT: 01/04/2020

DRAWING TITLE:
SITE PLAN STAND 101

PROJECT:
PROPOSED DWELLING ON STAND 101,
JABULANI STREET, CRADOCK

PROJECT NO. GR 448-210
DRAWING NO. 559P7

DATE	DRAWN	CHECKED	SCALE
27/03/2020	N DAMON	P HENSLO	1 : 100

REFERENCE CODE
QP 4-2020

WINDOW 1	WINDOW 2

FIGURE 2

[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 statements 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 rock.

moderately firm ground; clay; water; loose and waterlogged ground;
hard ground; top soil; OHS; PPE

- 3.1.1 The sides of the excavations are firm enough to support the soil. (1)
- 3.1.2 The sides of the excavations may cave in and must be supported by poling boards. (1)
- 3.1.3 The sides of the excavations must be supported by waling boards and struts if the soil has loose patches. (1)
- 3.1.4 Solid timbering or shutter board panels must be placed very close together so that muddy soil does not filter through the openings. (1)
- 3.1.5 Orange warning signals must be visible at all times at excavations. (1)
- 3.2 Name TWO methods of backfilling trenches. (2)
- 3.3 FIGURE 3.3 below is a drawing of a face brick wall. Study the drawing and answer the questions that follow.

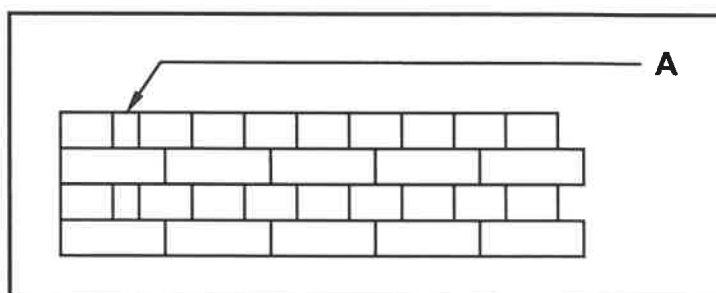


FIGURE 3.3

- 3.3.1 Identify the type of bond used to build the wall. (1)
- 3.3.2 Name the brick indicated by A. (1)
- 3.3.3 Give the width of brick A in mm. (1)
- 3.4 Workers are required to clean out a manhole that is overflowing with raw sewage.
- State any TWO safety and hygiene measures that they must adhere to in order to prevent infections. (2)

- 3.5 Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question numbers (3.5.1 to 3.5.2) in the ANSWER BOOK.
- 3.5.1 The Occupational Health and Safety Act, 1993 (Act 85 of 1993) (protects/prohibits) workers who enter confined spaces, such as manholes. (1)
- 3.5.2 Only (competent/educated) persons are allowed to work in a manhole. (1)
- 3.6 Use ANSWER SHEET 3.6 and complete the sectional view of a manhole.
Use the assessment criteria on the ANSWER SHEET as a guide. (8)
- 3.7 A cylindrical water supply tank is 2 800 mm high and has a diameter of 1 800 mm.
Use ANSWER SHEET 3.7 and calculate the:
- 3.7.1 Volume of the tank in m³ (5)
- 3.7.2 Volume of water in the tank in litres (3)
- Show ALL calculations and round off your answers to TWO decimal places.

[30]

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

Start this question on a NEW page.

- 4.1 ANSWER SHEET 4.1 shows two incomplete drawings of an open and a closed non-return valve without the spring and ball in place.

Use ANSWER SHEET 4.1 and explain, by means of a drawing, the respective positions of the ball and the spring.

Use the assessment criteria on the ANSWER SHEET as a guide.

(6)

- 4.2 FIGURE 4.2 below is a photograph of a device used in cold-water systems.

**FIGURE 4.2**

- 4.2.1 Identify the device above. (1)
- 4.2.2 Explain the function of this device. (1)
- 4.2.3 Who is responsible for the maintenance of this device? (1)
- 4.3 Explain the term *soil water*. (2)
- 4.4 Describe ONE function of the following pipe fittings:
- 4.4.1 Straight pan collar (1)
- 4.4.2 T-junction 135° (1)
- 4.4.3 Bend 135° (1)
- 4.5 Name ONE tool that can be used to test for leakages in sewer pipes. (1)
- 4.6 New inventions help to reduce water usage. One of these inventions is a red-water.
- Explain THREE advantages of a red-water diverter. (3)

- 4.7 Recommend ONE coupling that can be used to repair a leak in a galvanised steel pipe. (1)
- 4.8 FIGURE 4.8 below is a drawing of a faulty installation of a high-pressure geyser. Analyse the drawing and answer the questions that follow.

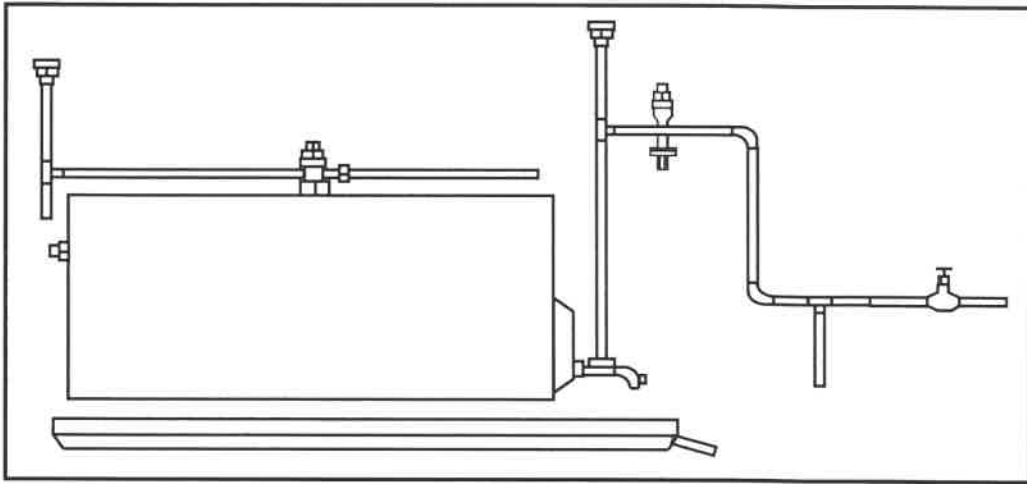


FIGURE 4.8

- 4.8.1 Name TWO components that are installed INCORRECTLY. (2)
- 4.8.2 Recommend solutions to rectify the incorrectly placed components that you named in QUESTION 4.8.1. (2)
- 4.8.3 Name the unit of the geyser that regulates the temperature of the water. (1)
- 4.8.4 Explain the function of the anode in the geyser. (1)
- 4.8.5 Recommend ONE machine that you could use to cut galvanised steel pipes to length when installing a geyser. (1)
- 4.9 FIGURE 4.9 below is a sectional view of a tube in a solar water heating system.

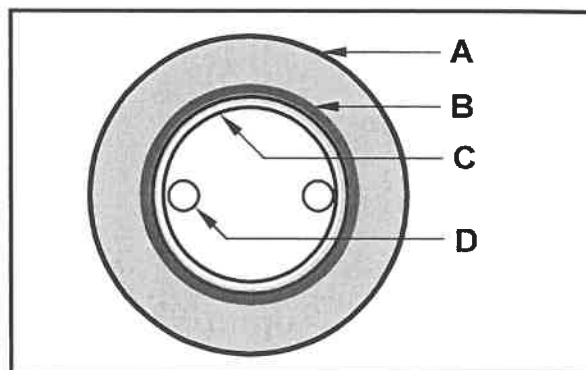


FIGURE 4.9

- 4.9.1 Identify the tube used in the solar water heating system. (1)
- 4.9.2 Identify A to D. (4)
- 4.9.3 Recommend ONE tool that can be used to test the pressure of the water inside this system. (1)

- 4.10 What does dezincification and electrolytic reaction have in common? (1)
- 4.11 FIGURE 4.11 below is an image of corrosion caused by connecting two pipes, which are not made of the same metal.

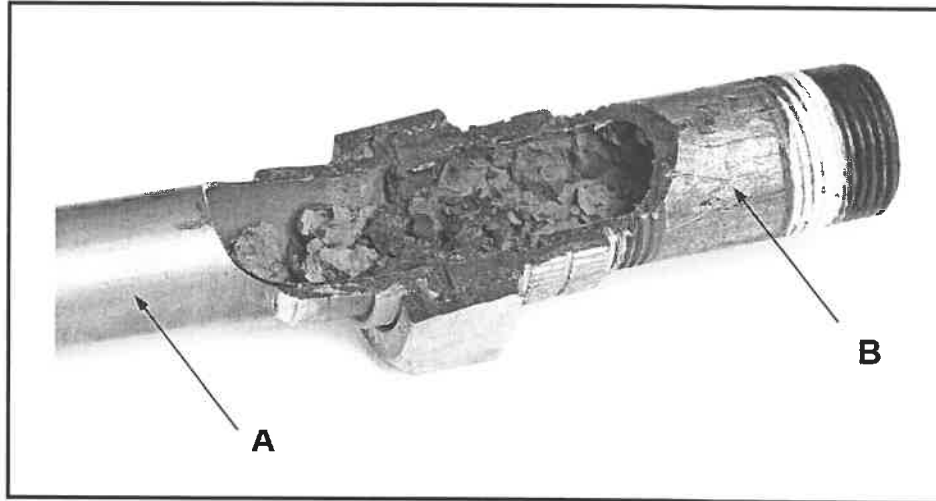


FIGURE 4.11

- 4.11.1 Name the type of corrosion illustrated. (1)
- 4.11.2 Deduce from the image above the TWO types of metals indicated by **A** and **B** respectively. (2)
- 4.12 Justify the use of a drain cleaning machine (jetting machine) rather than drain cleaning rods with regard to the effort by the worker. (2)
- 4.13 Explain TWO measures that must be considered when taking care of the bearings of a centrifugal pump. (2)

[40]

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

Start this question on a NEW page.

- 5.1 Name TWO methods that are used to channel storm water away from buildings. (2)
- 5.2 Who is responsible for the disposal (removal) of storm water from a property? (1)
- 5.3 Explain the purpose of a road kerb. (1)
- 5.4 Draw a neat freehand sketch, in good proportion, in your ANSWER BOOK of the development of the stop end that will fit on a 125 mm x 80 mm box gutter. The sides of the stop end is 40 mm wide. (5)
- 5.5 Explain why a stop end is used when installing gutters. (1)
- 5.6 Name ONE material that can be used for flashing. (1)
- 5.7 ANSWER SHEET 5.7 shows the front view and top view of a square-based truncated pyramid.

Use the drawing and information on ANSWER SHEET 5.7 and draw the development of the pyramid. Start the development at **A** showing a 5 mm seam on both sides.

Show ALL construction lines. DO NOT redraw the given views. Project the development from the given views.

Use the assessment criteria on the ANSWER SHEET as a guide. (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 C.
- 6.1.1 ... is the preferred choice for copper foil projects or tin plating.
- A 50/50 solder
 - B Wiping solder
 - C 60/40 solder
 - D Lead-free solder
- (1)
- 6.1.2 Copper pipes can be joined by using ... compression joints.
- A PVC
 - B brass
 - C aluminium
 - D cast-iron
- (1)
- 6.1.3 Soldered joints are used to join two ... pipes.
- A copper
 - B PVC
 - C galvanised steel
 - D iron
- (1)
- 6.1.4 The easiest way to cut PVC pipes is by using a ...
- A pipe cutter.
 - B tenon saw.
 - C hacksaw.
 - D All the above-mentioned
- (1)
- 6.1.5 Polyvinyl chloride is a popular ... that contains a high level of chlorine.
- A thermoplastic
 - B thermosetting plastic
 - C metal
 - D None of the above-mentioned
- (1)

6.2 FIGURE 6.2 below shows TWO different types of joining methods for joining PVC pipes.

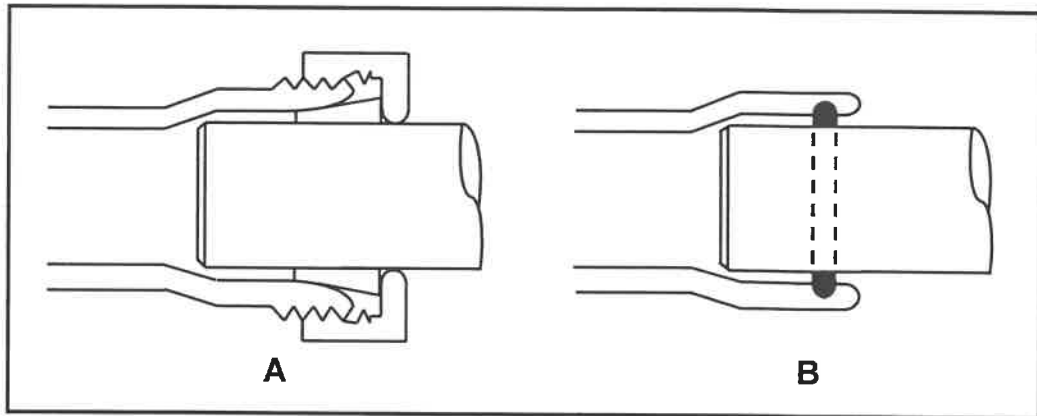


FIGURE 6.2

6.2.1 Identify joining methods **A** and **B** respectively. (2)

6.2.2 Differentiate between the joining methods **A** and **B** in terms of where they are used. (2)

6.3 FIGURE 6.3 below is a drawing of a side elevation of an installed bath.

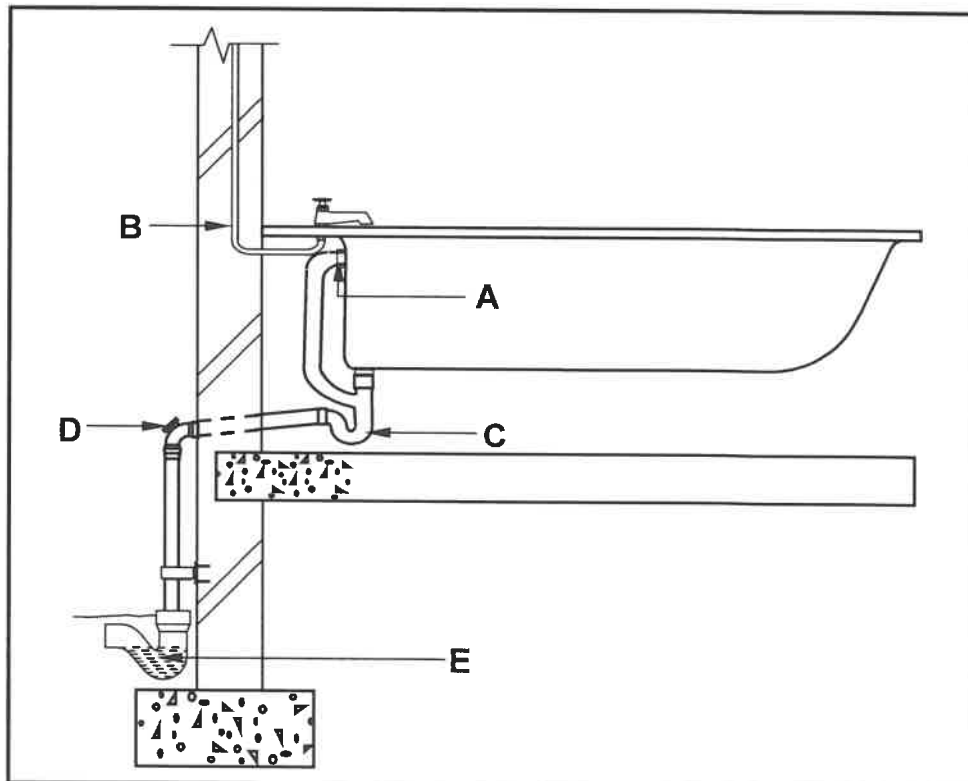


FIGURE 6.3

6.3.1 Identify **A** and explain the function of this part. (2)

6.3.2 Give the diameter of the pipe used for **B**. (1)

6.3.3 Name the type of trap that is installed at **C**. (1)

- 6.3.4 Predict what the consequence will be if the inspection eye at **D** is NOT installed. (2)
- 6.3.5 Identify **E**. (1)
- 6.4 Describe THREE requirements that should be met with regard to the sewerage pipes to ensure an efficient sewerage system. (3)
- 6.5 FIGURE 6.5 on ANSWER SHEET 6.5 is a line diagram of two bachelor flats and an incomplete sewerage layout that leads to a conservancy tank. Use ANSWER SHEET 6.5 to design and draw the complete sewerage layout.
Use the assessment criteria on the ANSWER SHEET as a guide. (14)
- 6.6 Draw the symbols for the following:
- 6.6.1 Manhole (2)
- 6.6.2 Bidet (2)
- 6.7 Name the colour that is used on a house plan for the following sewerage pipes:
- 6.7.1 Existing drains (1)
- 6.7.2 Waste-water pipes (1)
- 6.8 Explain the purpose of a septic tank. (1)
- [40]**
- TOTAL: 200**

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

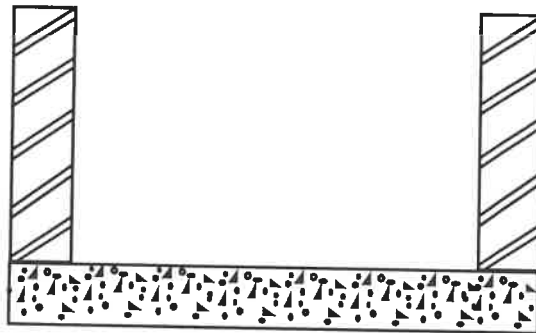
NO.	QUESTION	ANSWER	MARKS
1	Identify the elevation in FIGURE A.		1
2	Describe the type of house that is indicated in FIGURE A.		1
3	Identify number 1.		1
4	Identify number 3.		1
5	Identify number 4.		1
6	Identify the fastener indicated by number 5.		1
7	Identify number 6.		1
8	Identify number 7.		1
9	Identify number 8.		1
10	What does <i>DPM</i> stand for, as indicated in the notes?		1
11	Identify number 10.		1
12	Recommend a suitable material that can be used for the manufacturing of number 2 in FIGURE A.		1
13	Name the TWO elevations on which number 2 is installed.		2
14	Describe the purpose of number 3.		1
15	Deduce ONE feature that has been omitted from the elevation in FIGURE A.		1
16	Recommend any TWO sanitary fittings carrying waste-water, other than a bath, that can be installed in the room indicated by number 11.		2

17	What sanitary fixture carrying soil water can be installed in the room indicated by number 12?		1
18	Describe the error that appears at number 6 in the elevation in FIGURE A.		1
19	State the reference code for this plan.		1
20	Which room will number 13 serve?		1
21	What does the line between numbers 13 and 14 represent?		1
22	Differentiate between number 15 in FIGURE B and number 17 in the notes.		2
23	Explain the installation of brick force from the top of the window to the wall plate, as indicated by the architect.		1
24	Recommend a possible finish for the outside walls of the house.		1
25	Deduce from FIGURE 2 which elevation does NOT have windows.		1
26	Deduce the thickness of the external wall from FIGURE 2.		1
27	Name a material that can be used to close the open sides of number 16.		1
28	Name the town in which the proposed dwelling will be build.		1
29	Calculate the area of the bathroom. Show ALL calculations. Give your answer in m ² .		3
30	Calculate the total length of the wall on the eastern side of the building. Show ALL calculations. The length must be indicated in metres.		6
		TOTAL:	40

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 3.6



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Manhole cover and frame	3	
Pipe channel	2	
Sloping concrete/mortar/benching	2	
Correctness of drawing	1	
TOTAL:	8	

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

EXAMINATION NUMBER:																	
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ANSWER SHEET 3.7

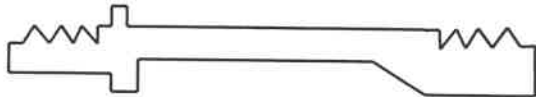
A	B	C	D

(8)

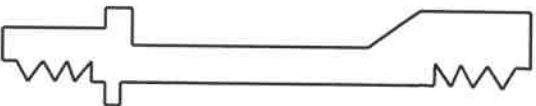
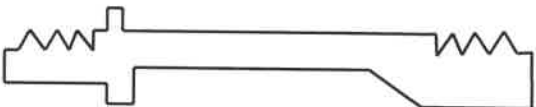
CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 4.1



OPEN NON-RETURN VALVE



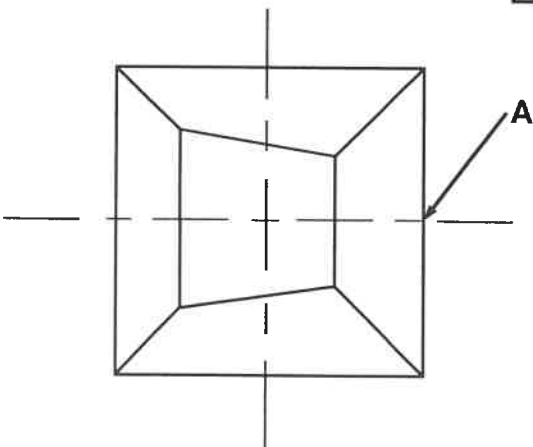
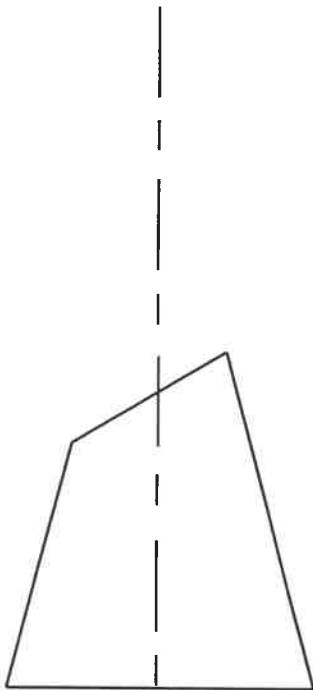
CLOSED NON-RETURN VALVE

ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Open non-return valve		
Correct position of ball	2	
Correct position of spring	1	
Closed non-return valve		
Correct position of ball	2	
Correct position of spring	1	
TOTAL:	6	

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 5.7

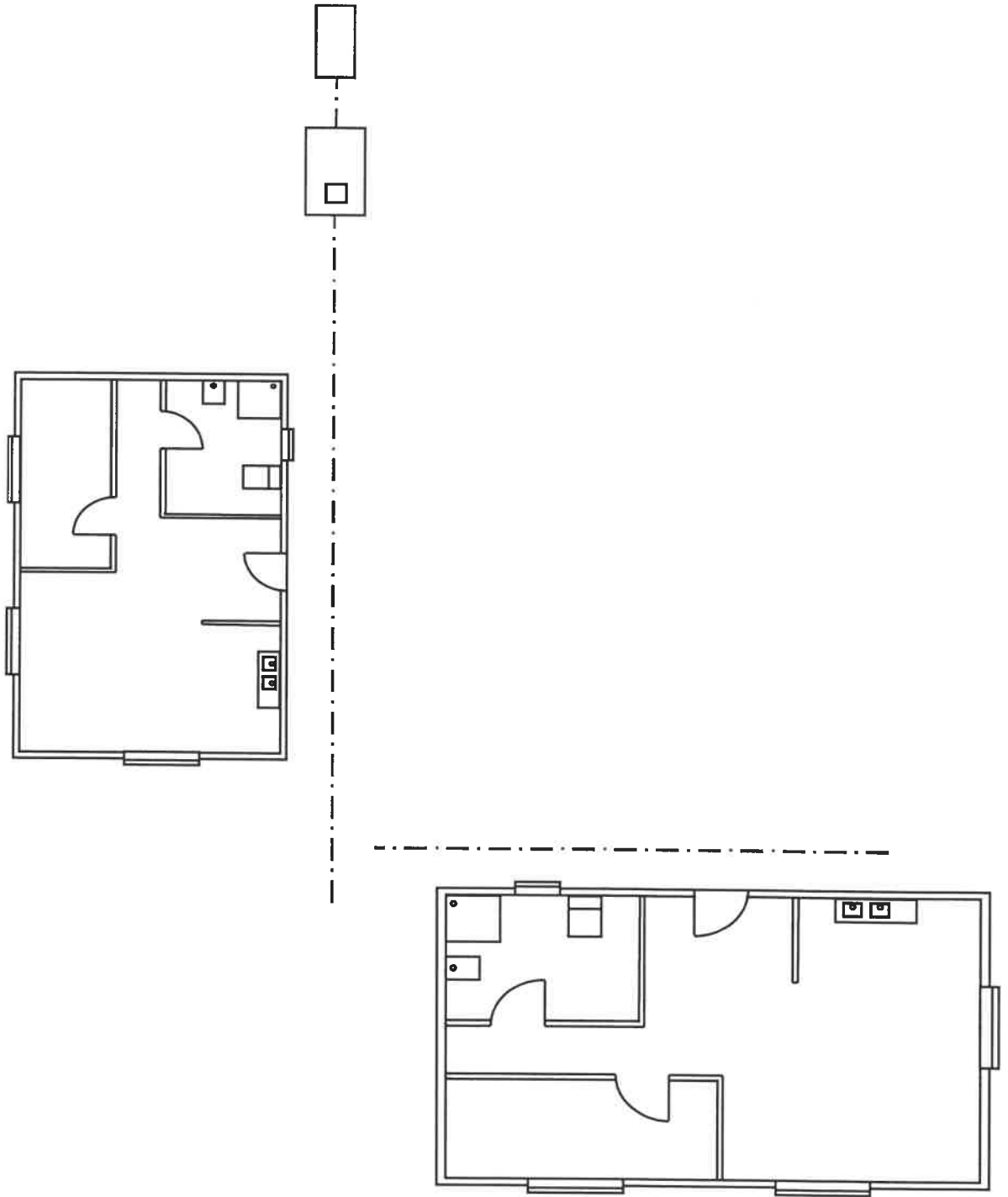


NO.	ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
1	Projection lines to determine the apex	2	
2	Determine true length	3	
3	Top and bottom arc of pyramid	2	
4	Development of base of pyramid	5	
5	Development of top of pyramid	5	
6	5 mm seams	2	
	TOTAL:	19	

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 6.5



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Branch pipes drawn correctly	5	
Vent pipes indicated correctly	2	
Gulleys indicated correctly	2	
Junction of two main sewer pipes at 45°	1	
Rodding eyes	2	
Inspection eyes	2	
TOTAL:	14	