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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY: CIVIL SERVICES

NOVEMBER 2019

MARKS: 200

TIME: 3 hours

This question paper consists of 15 pages and 5 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. 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, 3.6, 5.4, 6.8 and 6.9 on the attached ANSWER SHEETS using drawing instruments where necessary.
13. 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.
14. Drawings in the question paper are NOT to scale due to electronic transfer.
15. Google Images was used as the source of all photographs and pictures.

QUESTION 1: OHSA, 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	PVA paint	A	method of finishing metal exposed to heavy wear and tear conditions
1.1.2	Guard rail	B	can be applied to walls
1.1.3	Powder coating	C	keeps rungs free from oil and grease
1.1.4	Builder's hoist	D	light material used in the manufacturing of door and window frames
1.1.5	Ladder	E	used as a means to dispose of waste material and debris from elevated areas in the fastest possible way
1.1.6	Diagonal brace	F	keeps scaffolds stable when erected
1.1.7	Galvanising	G	transports workers, materials and equipment between ground and upper levels
1.1.8	Chute	H	gates should always be kept shut when the device is being used
		I	prevents people from falling off the scaffolds
		J	zinc coating applied to the base of metal
		K	used to delay the drying time of paint

(8 x 1) (8)

- 1.2 Explain TWO advantages of electroplating. (2)

- 1.3 Name the process when freshly cast concrete is kept moist for a specific period of time. (1)

- 1.4 Explain the purpose of keeping freshly cast concrete moist for a certain period of time after the concrete has been cast. (1)
- 1.5 You are transporting material on a construction site from one place to another. Describe TWO safety precautions that you will adhere to while transporting the material. (2)
- 1.6 Describe ONE safety factor that must be considered when using scaffold planks to erect a scaffold platform. (1)
- 1.7 FIGURE 1.7 below shows a surveying tool used on a building site.

**FIGURE 1.7**

- 1.7.1 Identify the tool above. (1)
- 1.7.2 Predict ONE consequence if the instrument is NOT set level. (1)
- 1.8 FIGURE 1.8 below shows a joining fixture that is used on building sites and in workshops.

**FIGURE 1.8**

- 1.8.1 Identify the joining fixture above. (1)
- 1.8.2 Name the fixing agent that should be used with this joining fixture. (1)
- 1.8.3 Explain ONE use of this joining fixture. (1)

[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.

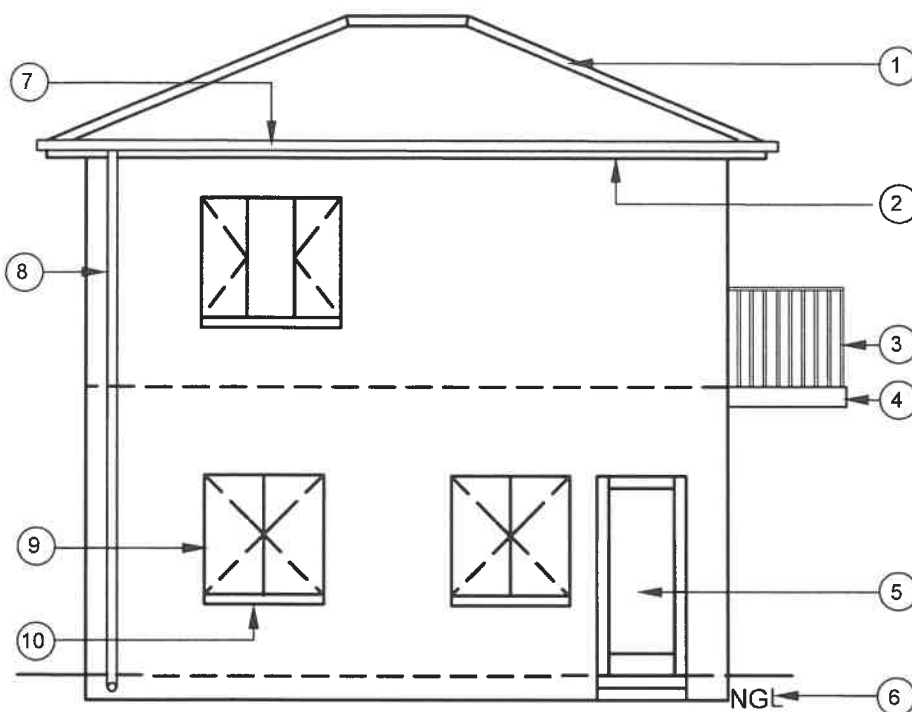


FIGURE A
SCALE 1 : 100

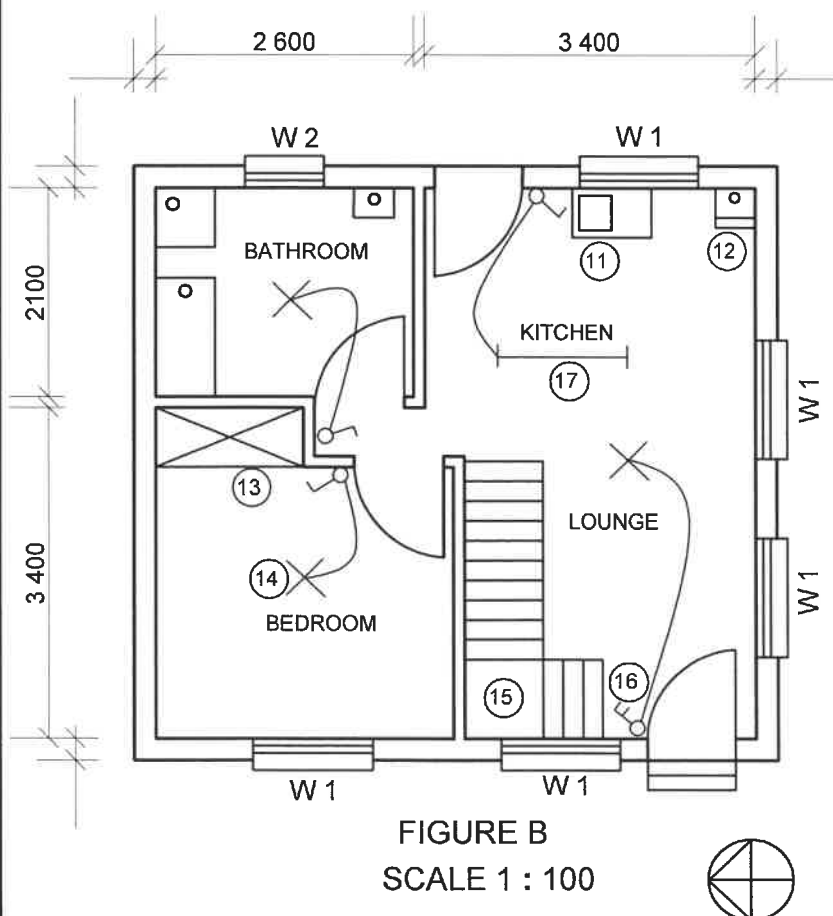


FIGURE B
SCALE 1 : 100

NOTE:

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

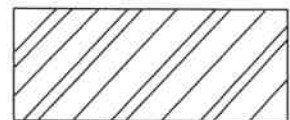
Wall thickness: External = 220 mm
Internal = 110 mm

ARCHITECT'S SIGNATURE
CLIENT'S SIGNATURE

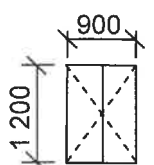
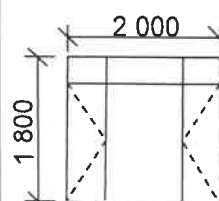
The following electrical installation should be installed in the kitchen:

W

The following symbol shows the type of brick finishing that will be used for the building:



REVISION	DATE	DESCRIPTION
PRINTED BY: DLAMINI PRINTERS		
DATE OF PRINT: 2019/04/01		
DRAWING TITLE: SITE PLAN STAND 502		
PROJECT: PROPOSED DWELLING ON STAND 502, DEO PARK		
PROJECT NO. GR 228-201		DRAWING NR. 339P9
DATE 16/4/2019	DRAWN JP MBALI	CHECKED P CARTER
		SCALE 1 : 100
REFERENCE CODE QP 2-2019		
WINDOW 1		WINDOW 2



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

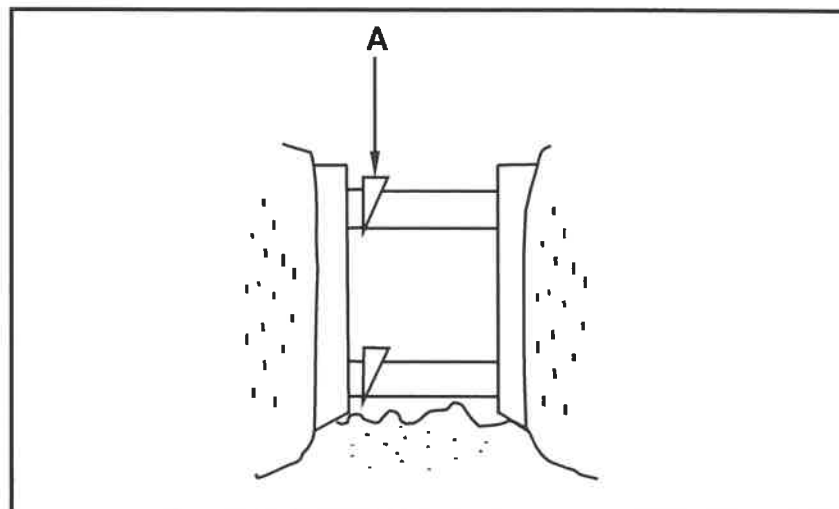
Start this question on a NEW page.

- 3.1 Complete the following sentence by filling in the TWO missing accessories for manholes. Write only the word(s) next to the question numbers (3.1.1 to 3.1.2) in the ANSWER BOOK.

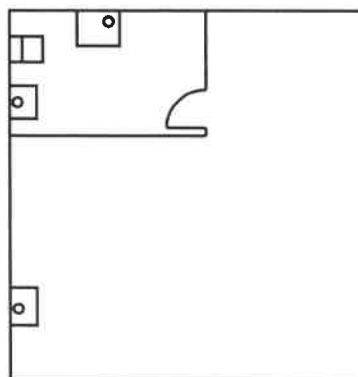
The accessories used for a manhole are (3.1.1) ..., cover slabs, reducing slabs and (3.1.2) ...

(2)

- 3.2 FIGURE 3.2 below shows shoring used in a wet area. Study the drawing and answer the questions that follow.

**FIGURE 3.2**

- 3.2.1 Identify **A**. (1)
- 3.2.2 State the depth at which the sides of an excavation in saturated ground will start to cave in. (1)
- 3.3 FIGURE 3.3 below shows an incomplete drawing of the layout of a drainage system for a house. Study the drawing and answer the questions that follow.

**FIGURE 3.3**

- 3.3.1 Use the drawing and deduce the number of sanitary fixtures needed for this house. (1)

3.3.2 Use the drawing and deduce the number of waste-water fixtures that will be needed for the drainage system. (1)

3.3.3 The internal measurement of the sides of a cubical water reservoir is 2 700 mm.

Calculate the following:

- Volume of the tank in m^3 (4)
- Volume of the tank in litres (2)

Show ALL calculations.

3.4 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 (3.4.1 to 3.4.5) in the ANSWER BOOK, e.g. 3.4.6 road kerb.

D-clip; breathing apparatus; manhole; steel ruler; tape measure; transparent pipe level; rope grab; slope; folding rule

3.4.1 Attached to the safety harness and lifeline (1)

3.4.2 Helps the worker to move down the lifeline at his/her own pace (1)

3.4.3 Must be worn when working in a deep manhole or confined spaces (1)

3.4.4 Can be used to transfer levels over long distances (1)

3.4.5 When the cover is removed, the area must be cordoned off and warning signs must be posted (1)

3.5 FIGURE 3.5 below shows the layout to determine the route and fall of a trench. Study the drawing and identify A, B and C.

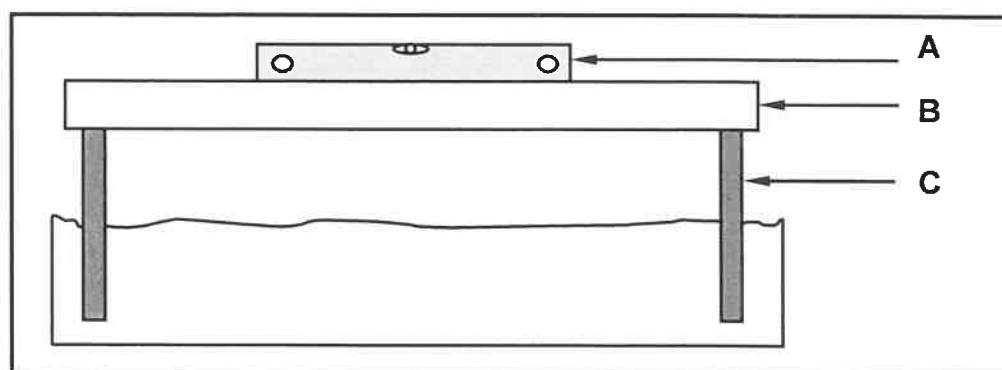


FIGURE 3.5

(3)

3.6 ANSWER SHEET 3.6 shows the top view of a corner (quoin) of a wall with a T-junction (1st course). Use ANSWER SHEET 3.6 to project and draw the consecutive layer of this brick wall (2nd course).

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

(10)

[30]

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

Start this question on a NEW page.

4.1 FIGURE 4.1 below shows a water-heating system.

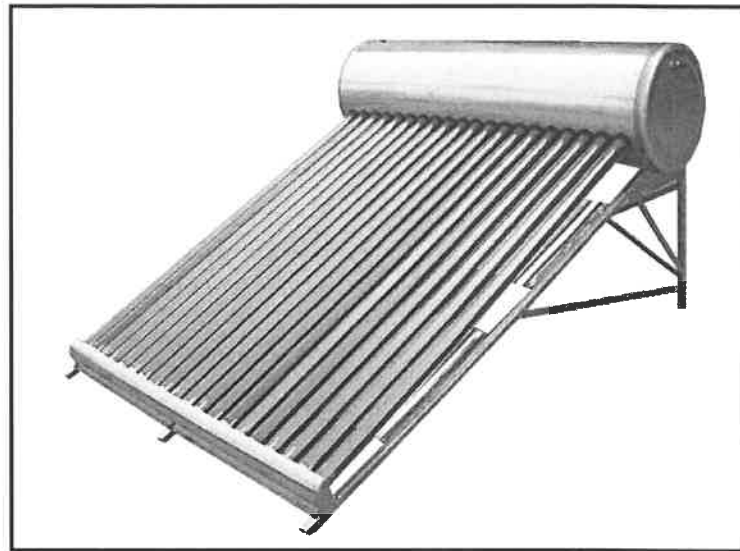


FIGURE 4.1

4.1.1 Identify the water-heating system above. (1)

4.1.2 What will be the result of continuous use of hot water from this system? (1)

4.1.3 Why must the glass panel of this system be cleaned regularly? (1)

4.2 Briefly explain what an *airlock* in a hot-water system is. (3)

4.3 State TWO causes of water hammer in pipes. (2)

4.4 Identify the following symbols:

4.4.1  (1)

4.4.2  (1)

4.5 Draw the following symbols:

4.5.1 Mixer (single manual control, single lever) (2)

4.5.2 Vacuum relief valve combined with an air release valve (2)

4.6 FIGURE 4.6 below shows a water trap that can be used under a washbasin.



FIGURE 4.6

4.6.1 Identify the type of water trap. (1)

4.6.2 Name the minimum diameter of the waste pipe that connects to the water trap. (1)

4.7 **A** and **B** below show two different types of pipe fittings.



A



B

4.7.1 Identify the pipe fittings in **A** and **B** above. (2)

4.7.2 State where you would install EACH of the pipe fittings in **A** and **B**. (2)

4.8 Recommend ONE tool that can be used:

4.8.1 To thread and cut pipes (1)

4.8.2 For pressure testing of water systems (1)

4.8.3 To clean and unblock drains using high water pressure (1)

4.9 Describe TWO functions of a centrifugal pump. (2)

4.10 Explain why it is NOT recommended to connect copper pipes to galvanised pipes. (2)

4.11 FIGURE 4.11 below shows a tap.



FIGURE 4.11

4.11.1 Identify the tap in FIGURE 4.11 above. (1)

4.11.2 Recommend TWO places where you could use this tap. (2)

4.12 FIGURE 4.12 below shows a typical cold-water installation in a house. Study the drawing and answer the questions that follow.

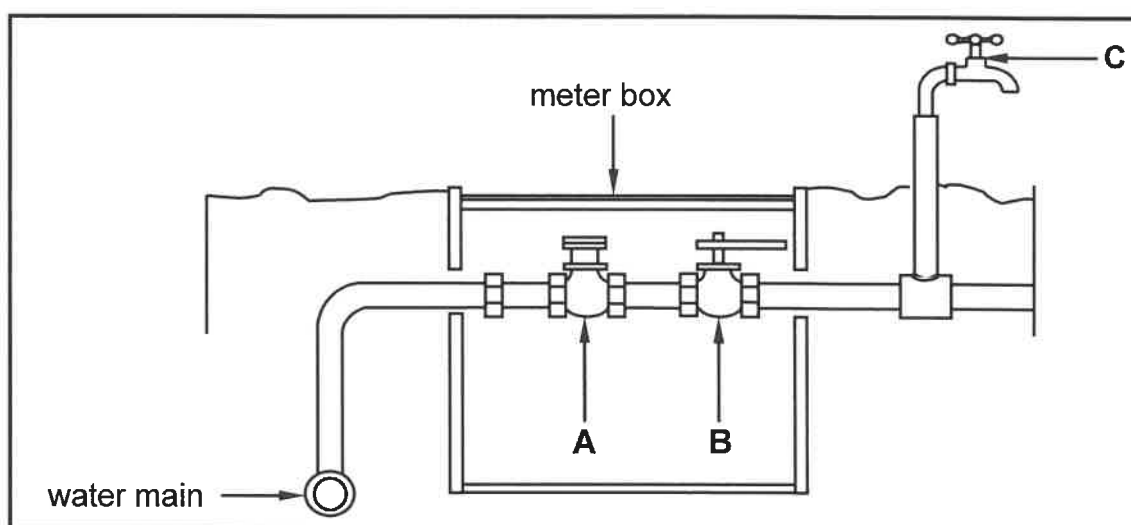


FIGURE 4.12

4.12.1 Local authorities use **A** to determine the water usage of a household. What is this fitting called? (1)

4.12.2 Identify **B** and explain what the function of this fitting is. (2)

4.12.3 Name the type of tap that is used at **C**. (1)

4.12.4 Predict if a chemical reaction will take place if a high-density polyethylene pipe is connected to **A**. (1)

4.12.5 What is the electrochemical reaction called when zinc is selectively leached from copper alloy? (1)

4.13 Name TWO water-saving devices that can reduce water waste due to taps that are left open when water supply is shut down and restored later. (2)

4.14 Differentiate between a *pressure-control valve* and *temperature and pressure safety valve* in terms of its use. (2)

[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 different parts for the installation of a PVC gutter. Study the drawing and answer the questions that follow.

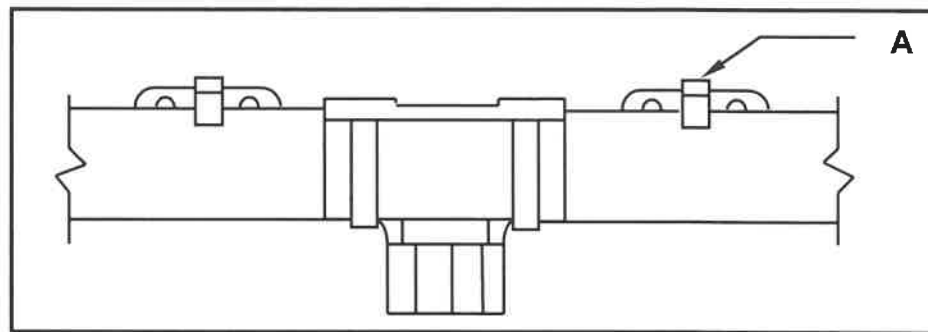


FIGURE 5.1

- 5.1.1 Sketch, in good proportion, a neat pictorial view of a square gutter outlet in the ANSWER BOOK. (4)
- 5.1.2 **A** indicates a bracket. To which part of the roof construction is this bracket attached? (1)
- 5.2 Give ONE word/term for each of the following descriptions of disposing of storm water. Write only the word/term next to the question numbers (5.2.1 to 5.2.4) in the ANSWER BOOK.
- 5.2.1 Channels constructed from precast concrete with the main function of routing storm water to rivers or dams (1)
- 5.2.2 An object that can be placed underneath a down pipe to channel water from the roof away from the house (1)
- 5.2.3 An object that is used on the edge of a road to channel storm water towards a manhole (1)
- 5.2.4 A method that can be used to waterproof roofs at junctions of walls (1)
- 5.3 Name the authority that is responsible for all public storm-water pipes and systems in a town. (1)
- 5.4 ANSWER SHEET 5.4 shows the front view and top view of a square-based truncated pyramid that is cut parallel to the horizontal plane.
- Use the drawing and information on ANSWER SHEET 5.4 and draw the development of the pyramid by using the radial-line method. Start the development at **A** showing the 3 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.

(20)
[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 One can use ... to secure galvanised pipes to different surfaces.

- A pipe flanges
- B steel hangers
- C perforated straps
- D All the above-mentioned (1)

6.1.2 When one needs to cut uPVC pipes to a specific length, one will use a ...saw.

- A hack-
- B crosscut
- C coping
- D All the above-mentioned (1)

6.1.3 A property of solder:

- A Bluish in colour
- B Non-elastic modulus
- C Low strain rate
- D Ductile (1)

6.1.4 Flux is used to ...

- A solder two pieces of pipes together.
- B assist with cleaning the material to be soldered.
- C enhance oxidation and stop the flow of solder.
- D form the oxide film to prevent corrosive action. (1)

6.1.5 Pop rivets are divided into two groups, namely ... rivets.

- A blind and open
- B hollow and solid
- C blind and solid
- D hollow and open (1)

6.2 When soldering two tin plates together, a cover strip can be used to assist with joining them. Draw, in good proportion, a simple lapped joint with a cover strip in the ANSWER BOOK. (3)

- 6.3 Copy the following table into the ANSWER BOOK and tabulate the symbols under the correct headings. Write only the question numbers (6.3.1 to 6.3.4) under the correct heading in the ANSWER BOOK.

DRAINAGE ABOVE GROUND	DRAINAGE BELOW GROUND

6.3.1



6.3.3



6.3.2



6.3.4



(4)

- 6.4 FIGURE 6.4 below shows a pipe fitting. Study the drawing and answer the following questions.

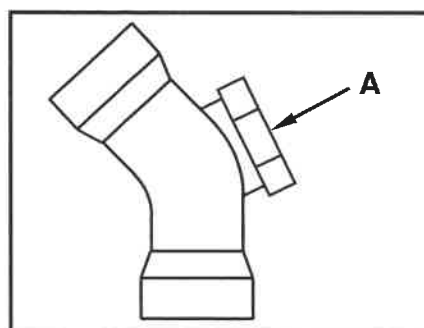


FIGURE 6.4

- 6.4.1 Give the angle for the bend of the fitting. (1)
- 6.4.2 Explain the purpose of A. (1)
- 6.5 Describe TWO aspects that fittings in a drainage system should comply with. (2)
- 6.6 Name TWO methods of ventilating a drainage system to prevent syphonage. (2)
- 6.7 Describe the difference between *septic tanks* and *vacuum tanks* in terms of the removal of the sewage. (4)
- 6.8 ANSWER SHEET 6.8 shows the front elevation of a shower rose without the pipes and taps. Use ANSWER SHEET 6.8 and draw a line diagram to show the cold- and hot-water pipe layout for the shower. (5)
- Use the assessment criteria on the ANSWER SHEET as a guide.

- 6.9 ANSWER SHEET 6.9 shows a line diagram of a part of a house with a granny flat and an incomplete sewerage layout. Use ANSWER SHEET 6.9 and design and draw the complete sewerage layout.

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

(13)

[40]

TOTAL: 200

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 2

NO.	QUESTION	ANSWER	MARKS
1	Identify the elevation in FIGURE A.		1
2	Identify the type of roof that is used on the building in FIGURE A.		1
3	Identify number 1.		1
4	Identify number 4.		1
5	Identify number 5.		1
6	Identify number 7.		1
7	Identify number 8.		1
8	Identify number 12.		1
9	Identify number 13.		1
10	Identify number 15.		1
11	Identify the company that printed the building plan.		1
12	Name a suitable material that can be used for the manufacturing of number 2.		1
13	Name the drawing symbol in the column for the notes in FIGURE 2 that must be installed in the kitchen.		1
14	Name the drawing symbol in the column for the notes in FIGURE 2 that indicates the type of bricks for the building.		1
15	Name a material that should NOT be used to manufacture the frame of number 9 for coastal areas.		1

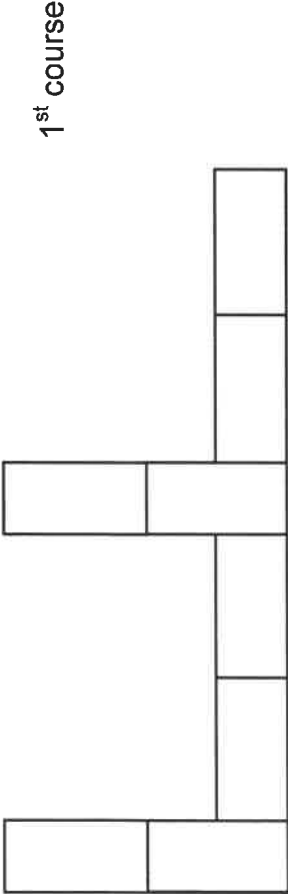
16	Name a material that can be used to manufacture the sanitary fitting indicated by number 11.		1
17	Who checked the building plan?		1
18	How many types of windows are used in FIGURE B?		1
19	What does the abbreviation <i>NGL</i> at number 6 stand for?		1
20	Give the reference code for this plan.		1
21	Which room will electrical symbol 16 serve?		1
22	Describe the purpose of number 3.		2
23	Explain what the curved lines between the electrical installations in FIGURE B indicate.		2
24	Explain why the light switch is mounted on the outside of the bathroom.		1
25	Identify in FIGURE 2 which elevation does NOT have windows.		1
26	Identify the thickness of the internal wall in FIGURE 2.		1
27	Differentiate between symbols 13 and 15 in terms of their purpose.		2
28	Justify why FIGURE B is a ground floor plan.		1

29	Predict what will happen if number 10 is NOT installed.		1
30	Redraw the staircase in FIGURE B in the adjacent column and indicate the direction of the flight with arrows.		2
31	Calculate the total length of the wall on the eastern side of the building. Show ALL calculations.		6
		TOTAL:	40

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 3.6



2nd course

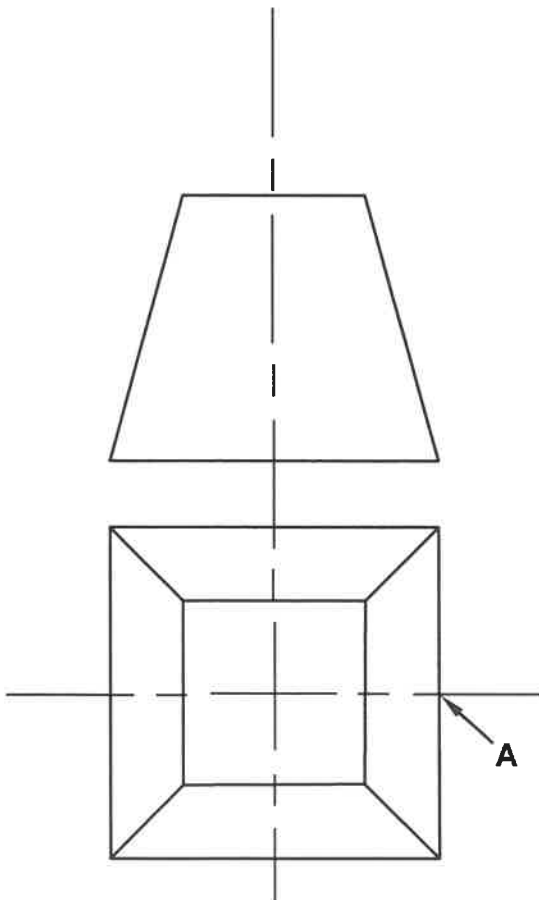
ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Bricks at corner drawn correctly	2	
2 x ¾ bricks	4	
Full bricks on each side of ¾ bricks	2	
Full brick at T-junction	1	
Correctness of drawing	1	
TOTAL:	10	

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 5.4

NO.	ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
1	Projection lines to determine the apex	2	
2	Determine true length	4	
3	Top and bottom arc of pyramid	2	
4	Development of base of pyramid	5	
5	Development of top of pyramid	5	
6	3 mm seams	2	
TOTAL:		20	

CENTRE NUMBER:

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ANSWER SHEET 6.8

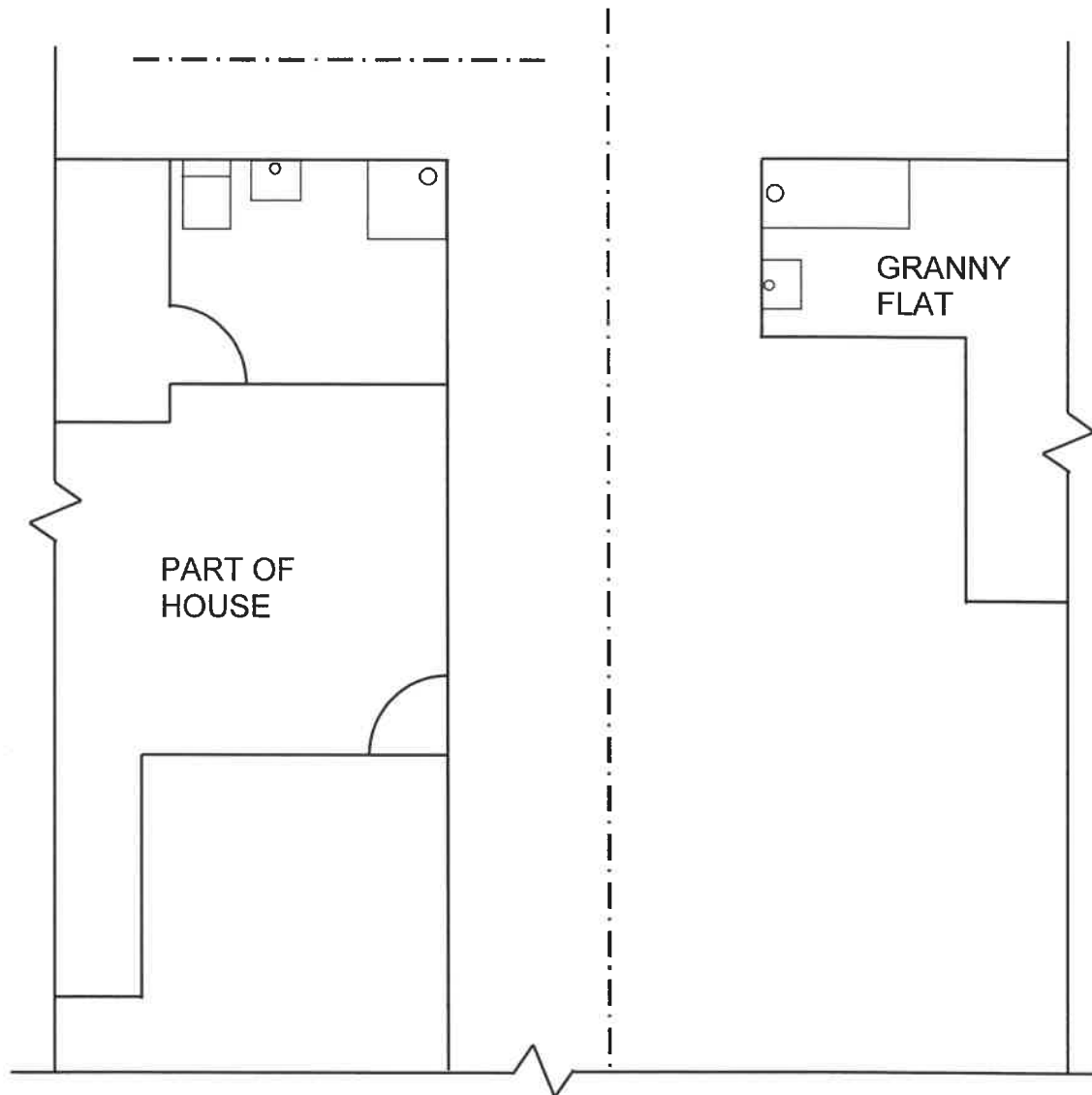
ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Cold water inlet	1	
Hot water inlet	1	
Cold water tap (NO mixer taps)	1	
Hot water tap (NO mixer taps)	1	
Flow direction on mixed pipe	1	
TOTAL:	5	

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 6.9**FIGURE 6.9**

ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Branch pipes	3	
Vent pipe	1	
Gulleys	2	
Junction of two main sewer pipes	1	
Rodding eyes	2	
Inspection eyes	3	
Gradient	1	
TOTAL:	13	