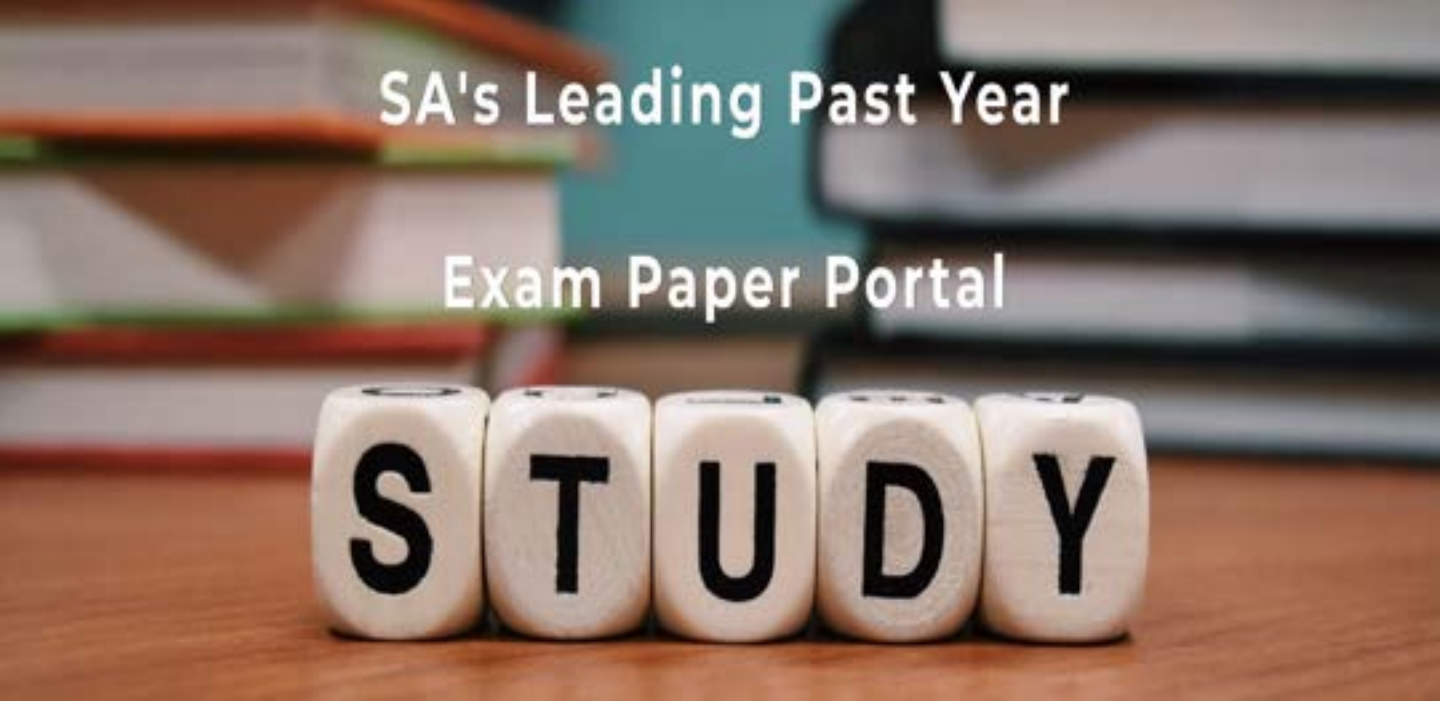

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GRADE 12

CIVIL TECHNOLOGY: CIVIL SERVICES

NOVEMBER 2022

MARKS: 200

TIME: 3 hours

This question paper consists of 15 pages and 5 answer sheets.

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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, 3.10, 4.9, 5.5 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.

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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 1.1.5) in the ANSWER BOOK, e.g. 1.1.6 casement.

1.1.1 (Oil or water-based paint/Silicone/Acid) is used to protect metal against corrosion. (1)

1.1.2 Curing (increases the strength of concrete/increases the density of concrete/allows concrete to set faster). (1)

1.1.3 Electroplating can be applied using (electrodes/electro jacks/ electrolysis). (1)

1.1.4 Powder coating is the process of applying a layer of (plastic/paint/zinc) to a metal. (1)

1.1.5 Galvanising is the process of applying a (zinc/copper/tin) coating to the base of metals. (1)

1.2 FIGURE 1.2 below shows an incomplete construction of a staircase.

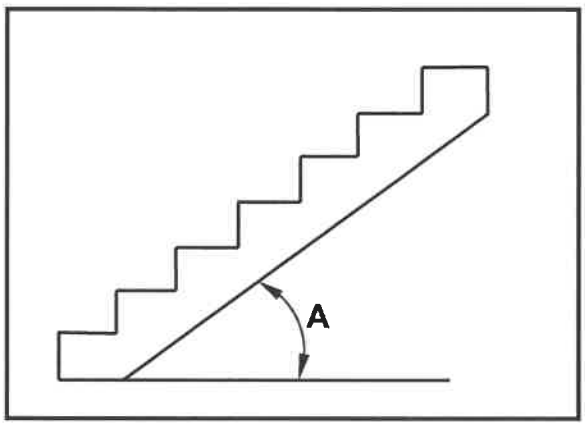

FIGURE 1.2

1.2.1 Name the maximum angle of **A**. (1)

1.2.2 How will you ensure the safety of workers when using the treads? (1)

1.2.3 Explain the purpose of metal pan treads as part of the construction of a staircase. (1)

1.3 Discuss TWO safety precautions that must be adhered to when transporting long ladders. (2)

1.4 Name ONE safety component that can be positioned above workers to protect them against falling objects. (1)

1.5 Name the component that will ensure stability to scaffolding in all directions. (1)

1.6 Predict what could happen if the ends of scaffold planks exceed 230 mm beyond the last support. (1)

1.7 Determine the maximum height of stacked material if the width of the stack is 1 m. (1)

1.8 By means of sketches, explain the difference between a Rawl bolt with a hook and a Rawl bolt with an eye. (4)

1.9 You have been asked to do renovations in a bathroom. Name the tool you will use to:

1.9.1 Detect existing copper pipes in a wall (1)

1.9.2 Align mirrors horizontally against a wall (1)
[20]

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)

Start this question on a NEW page.

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

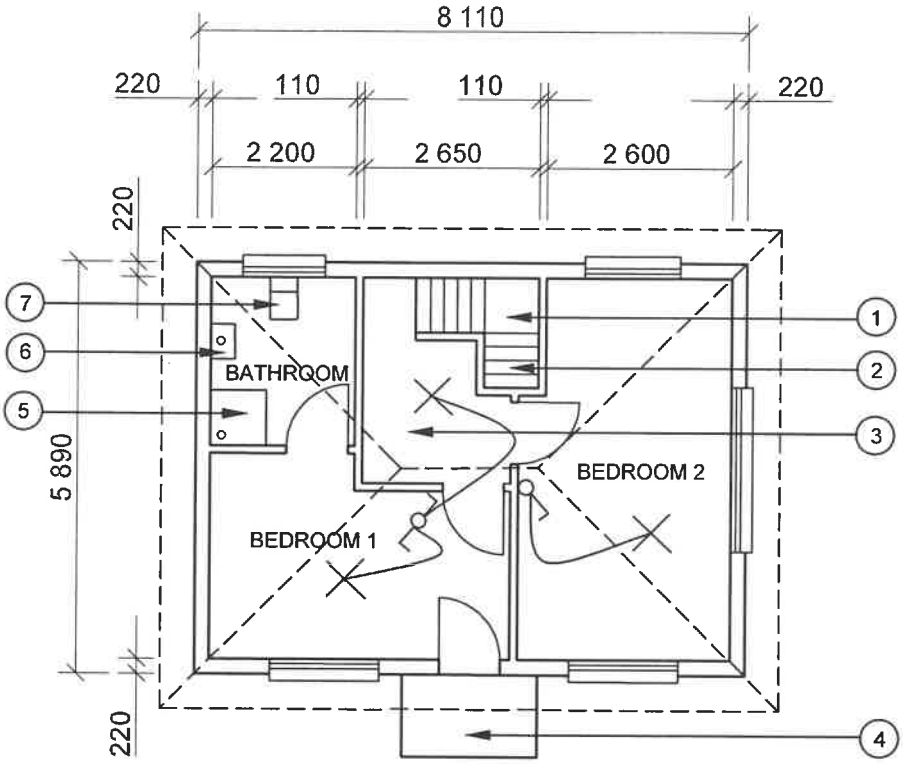

FIGURE A

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

Wall thickness: External = 220 mm
Internal = 110 mm

Architect's signature .....

Client's signature .....

Concrete stairs must be according to engineering specifications.

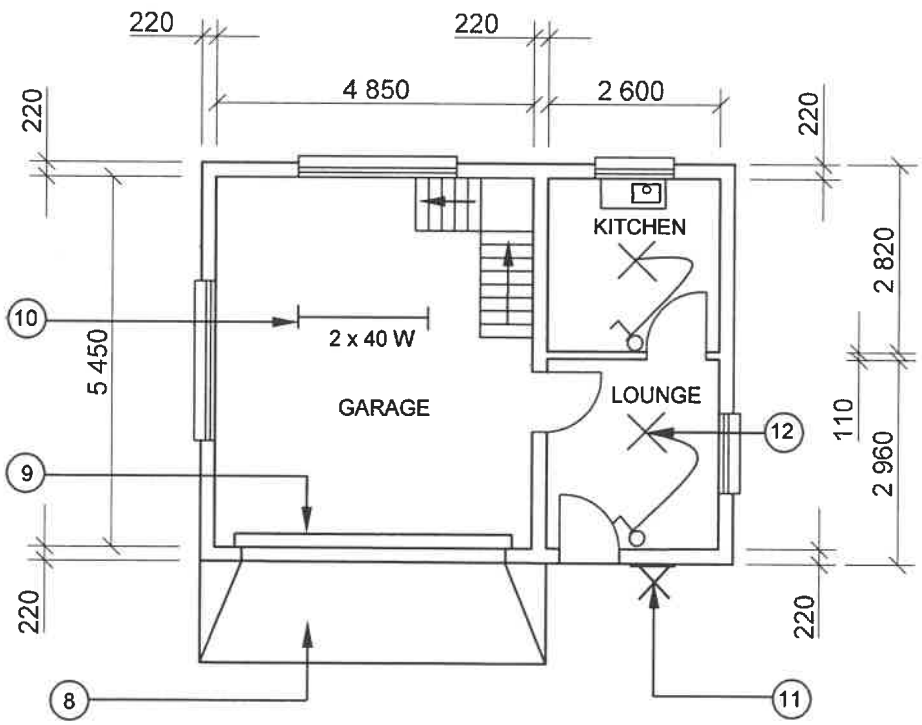

FIGURE B

REVISION 1	DATE: 24/06/2022	DRAWING OF SANITARY FITMENTS
REVISION 2	DATE: 26/06/2022	DRAWING OF STAIRCASE
PRINTED BY: XENO PRINTERS	DATE OF PRINT: 27/06/2022	
DRAWING TITLE: FLOOR PLAN PLOT 36		
PROJECT: PROPOSED DWELLING ON PLOT 36, BENONI		
PROJECT NO.: GR 288-620	DRAWING NO.: 446P5	
DATE: 20/06/2022	DRAWN: HB NEL	CHECKED: K KLEIN
FLOOR PLAN	SCALE 1 : 100	
REFERENCE CODE QP 6 – 2022		

[40]

FIGURE 2

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

Start this question on a NEW page.

3.1 Indicate TWO locations where manholes should be placed. (2)

3.2 Explain the purpose of installing benching in a manhole at a slope. (2)

3.3 State the compaction method that is suitable for sandy soil. (1)

3.4 Show, by means of a sketch, how the sides of firm ground can be supported during excavations when poling boards and struts/braces are used. (6)

3.5 What can be used to transfer levels accurately over long distances? (1)

3.6 Why must a competent person be appointed to prepare a fall protection plan? (2)

3.7 Describe TWO regulations that must be adhered to when working in a manhole, excluding personal protective equipment. (2)

3.8 Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question numbers (3.8.1 and 3.8.2) in the ANSWER BOOK.

3.8.1 The (D-clip/rope grab) helps a worker to move up and down a lifeline at his/her own pace. (1)

3.8.2 Personal protective equipment like (breathing apparatus/face masks) must be worn when working in deep manholes. (1)

3.9 The internal measurement of the sides of a cubic water storage tank is 2 900 mm.

3.9.1 Calculate the volume of the tank in m^3. (4)

3.9.2 Calculate the volume of the tank in litres. (2)

Show ALL calculations and round off your answer to TWO decimal places.

3.10 FIGURE 3.10 below shows the first course of the top view of a one-brick wall.

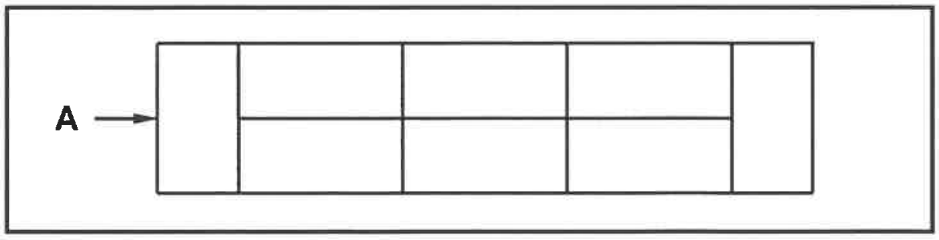

FIGURE 3.10

Use ANSWER SHEET 3.10 to project and draw the front view of the TWO consecutive brick courses. (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	Electrical isolator	A	used to remove burr
4.1.2	Pillar tap	B	self-sacrificing rod that protects the geyser
4.1.3	Red-water diverter	C	hot-water outlet of a solar geyser
4.1.4	Thermostat	D	enables local authorities to calculate the amount of water used by a household
4.1.5	Anode	E	switches electricity supply to the geyser on and off
4.1.6	Water meter	F	regulates the heating of the water inside a geyser
4.1.7	Water hammer	G	redirects cool water, before it reaches the tap, to a rain-water tank
4.1.8	Pressure-control valve	H	fitted to the cold-water intake of a geyser
		I	prevents the siphoning of water out of the high-pressure geyser when the cold-water supply is shut off
		J	device that allows water to flow in one direction to prevent backflow
		K	has a long-threaded tail and can be connected to a pipe below a basin
		L	noise caused by poorly installed pipes

(8 x 1) (8)

4.2 FIGURE 4.2 below is a picture of a pipe fitting.

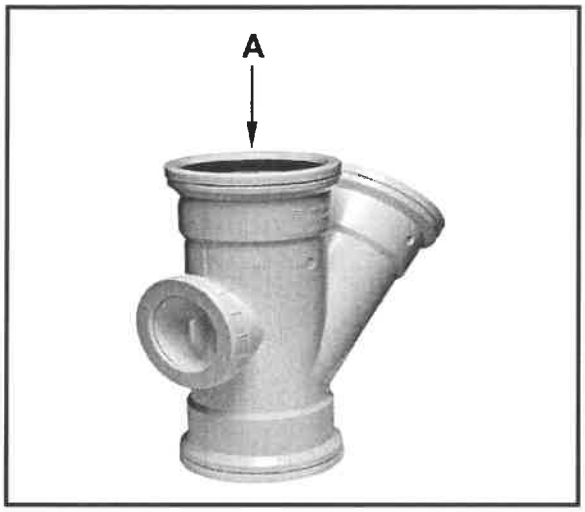

FIGURE 4.2

4.2.1 Identify the pipe fitting. (1)

4.2.2 Explain the function of the fitting. (1)

4.2.3 Explain the purpose of the seal at **A**. (1)

4.3 FIGURE 4.3 below shows a blocked sewer pipe.

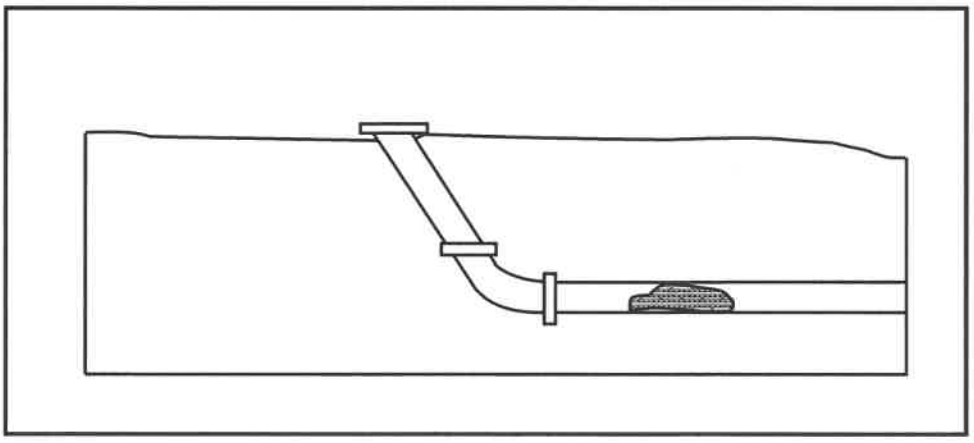

FIGURE 4.3

4.3.1 Name the fitting that allows access to the blocked sewer pipe in order to unclog it. (1)

4.3.2 Name a machine that uses water to unclog the sewer pipe. (1)

4.3.3 Explain how the machine, named in QUESTION 4.3.2, uses water to unclog sewer pipes. (1)

4.3.4 A drain stopper is part of a compressed-air test apparatus. Describe what happens to the diameter when the wing nut is turned clockwise. (1)

4.4 Differentiate between a *water-pressure testing pump* and a *compressed-air test apparatus* in terms of their use. (2)

4.5 Explain how an airlock is caused in a hot-water system. (2)

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

4.6.1 Automatic shut-off valve (2)

4.6.2 Stopcock (2)

4.7 Installation of low and high-pressure solar geysers:

4.7.1 State the direction that the solar panels must face when installed and give a reason why. (2)

4.7.2 Draw a neat freehand sketch of the cross-sectional view of an evacuated tube of a solar hot-water system in the ANSWER BOOK. Label the radiation absorption coating. (5)

4.8 FIGURE 4.8 below shows a valve which is commonly used in hot-water and pumping installations.

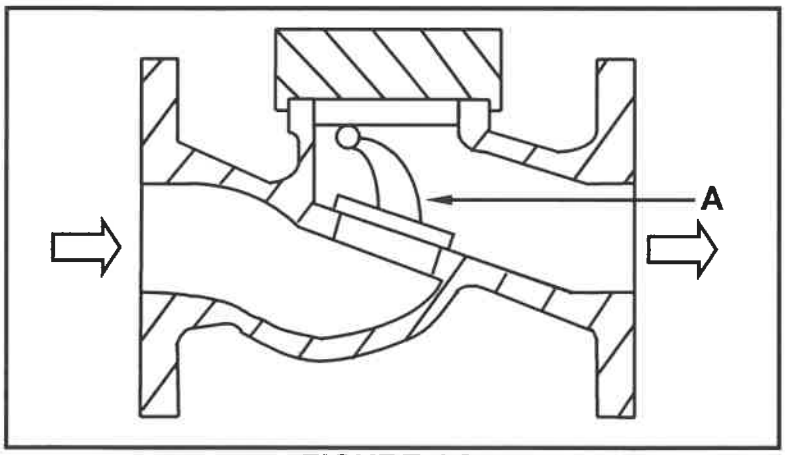

FIGURE 4.8

4.8.1 Identify the type of valve above. (1)

4.8.2 Identify **A**. (1)

4.8.3 Explain the working principles of this valve. (3)

4.9 ANSWER SHEET 4.9 shows an incomplete drawing of a high-pressure geyser without the pipes and components. Draw the correct installation of the cold- and hot-water pipes and indicate the direction of the flow of water. (5)
[40]

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

Start this question on a NEW page.

5.1 Flashing is used on roofs to prevent water from entering a dwelling. Name TWO places in a dwelling where flashing can be used. (2)

5.2 FIGURE 5.2 below shows TWO components of a gutter system.

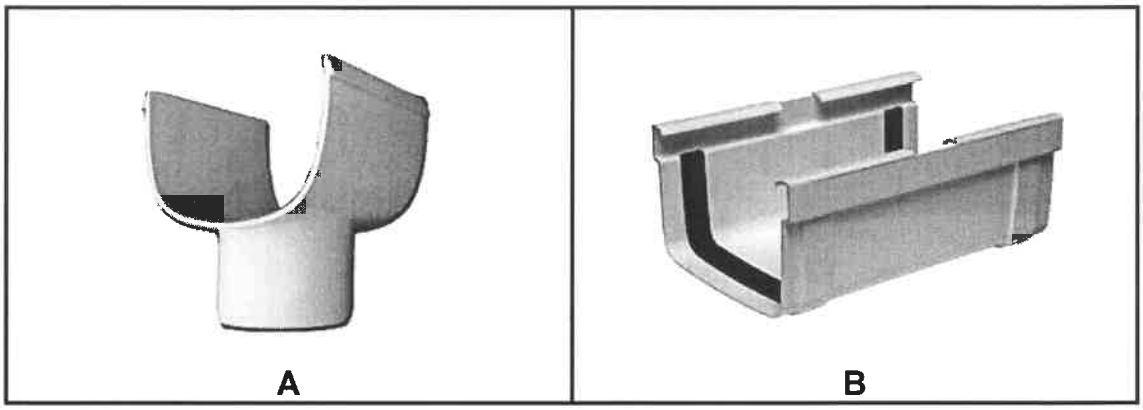

FIGURE 5.2

5.2.1 Identify component **A**. (1)

5.2.2 Explain the function of component **A**. (1)

5.2.3 Explain the purpose of clip **B**. (1)

5.2.4 Name the material that **A** and **B** are made of. (1)

5.3 Explain TWO reasons why dangerous chemicals and solid waste should not be dumped into a storm-water system. (2)

5.4 Discuss TWO responsibilities of the municipality with regard to storm-water systems. (2)

5.5 ANSWER SHEET 5.5 shows the front view and top view of a square-based truncated pyramid.

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

The pyramid has 3-mm seams on both sides.

Show ALL construction and projection lines. (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 D.

6.1.1 The spring toggle fixer is used to …

A fix lights to a gypsum board ceiling.
B hang frames on a masonry wall.
C mount air conditioners.
D hang entrance gates. (1)

6.1.2 For which type of material should a washer be inserted on one side before being riveted?

A Copper
B Galvanised sheet metal
C Brass
D Plastic (1)

6.1.3 Soft solder is an alloy of the following:

A Lead and aluminium
B Lead and brass
C Tin and copper
D None of the above-mentioned (1)

6.1.4 … is the flux used when soldering brass sheets.

A Hydrochloric acid
B Copper chloride
C Resin
D Sal ammoniac (1)

6.1.5 The …, which is the flared part of a PVC sewer pipe, allows other pipes to be fitted into it.

A chamfer
B collar
C O-ring
D ferrule (1)

6.2 Explain the difference between *sewerage* and *sewage*. (2)

6.3 FIGURE 6.3 below shows a fitting that is used in a drainage system.

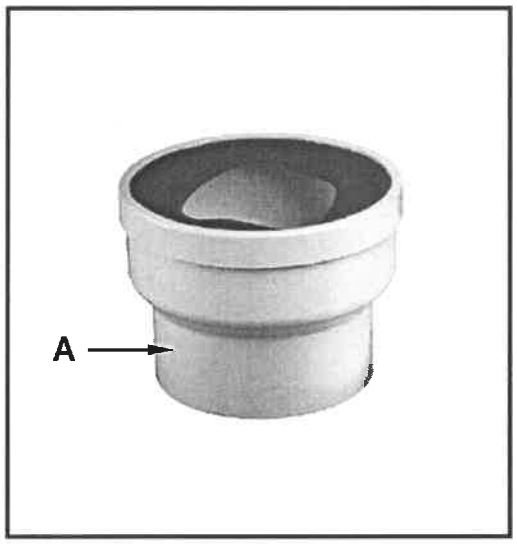

FIGURE 6.3

6.3.1 Identify the fitting above. (1)

6.3.2 Name the component of the sanitary fitment to which the fitting will be installed. (1)

6.3.3 Name the component that will be attached to **A**. (1)

6.4 Describe TWO functions of a vent valve. (2)

6.5 FIGURE 6.5 below shows a diagram of a sewage disposal system.

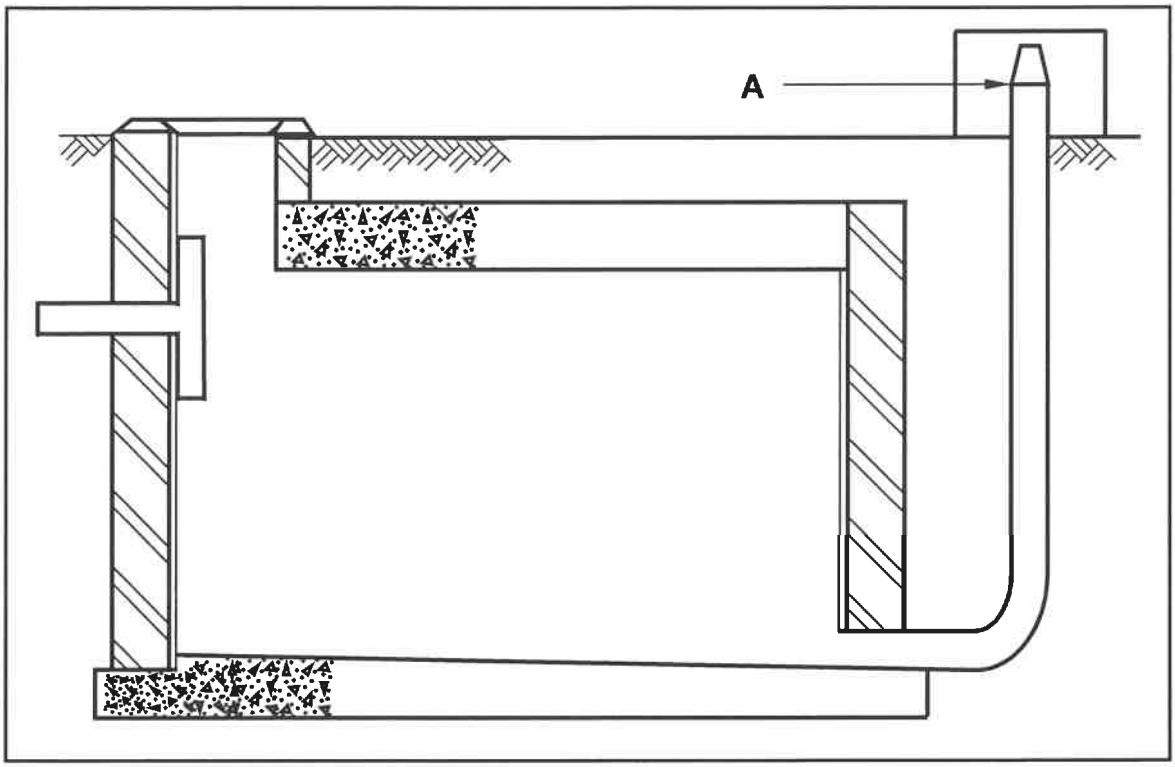

FIGURE 6.5

6.5.1 Identify the tank. (1)

6.5.2 Name TWO materials that can be used to manufacture or build the tank. (2)

6.5.3 Identify **A**. (1)

6.5.4 Describe the purpose of **A**. (2)

6.5.5 Give TWO reasons why the tank would be installed on a residential property. (2)

6.6 Describe the final treatment process to get sewage free from bacteria and safe for consumption. (2)

6.7 FIGURE 6.7 below shows the sectional view of a bath installation.

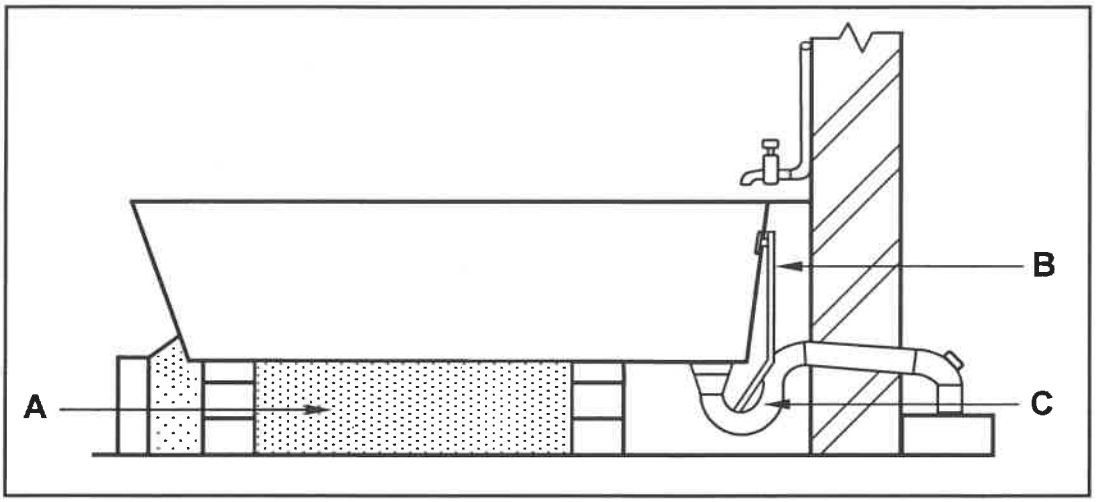

FIGURE 6.7

6.7.1 Explain the purpose of **A**. (1)

6.7.2 Identify **C**. (1)

6.7.3 Recommend a suitable diameter for the pipe connected to **C**. (1)

6.7.4 Describe why **B** is installed in a bath. (1)

6.8 FIGURE 6.8 shows an incorrectly drawn sewerage plan of a dwelling. Use ANSWER SHEET 6.8 to design and draw a sewerage plan using correct drainage principles.

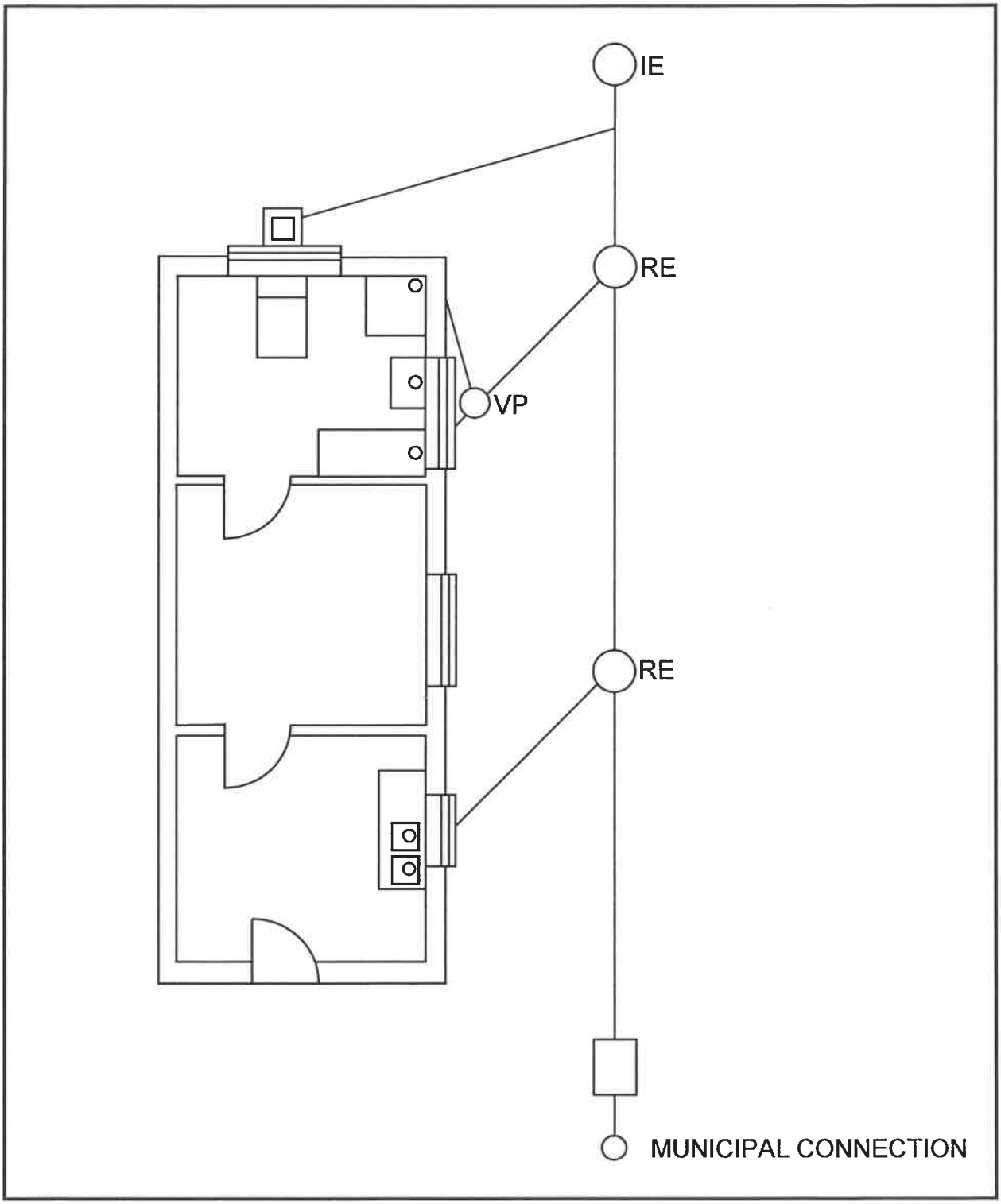

FIGURE 6.8 (14)
[40]

TOTAL: 200

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EXAMINATION NUMBER:													

ANSWER SHEET 2

NO.	QUESTIONS	ANSWERS	MARKS
1.	Name the FIGURE that represents the ground floor. Give ONE reason for your answer.		2
2.	Deduce the scale that was used to draw the floor plan of the house from the given building plan.		1
3.	Identify number **1**.		1
4.	Identify number **4**.		1
5.	Identify number **5**.		1
6.	Identify number **6**.		1
7.	Give the abbreviation for the symbol at number **7**.		1
8.	Identify number **8**.		1
9.	Identify number **9**.		1
10.	Identify number **10**.		1
11.	Identify the number that indicates the wall-mounted light.		1
12.	Give the abbreviations for the following: • Finished floor level • Natural ground level		2
13.	Name a suitable material that can be used for constructing number **2**.		1

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CENTRE NUMBER:							

EXAMINATION NUMBER:													

14.	Recommend ONE use for the area indicated by number **3**.		1
15.	Recommend ONE permanent fixture for bedroom 1 that can be used for storage		1
16.	Who is the architect that was responsible for the drawing?		1
17.	Describe what is indicated by the arrows on the staircase in FIGURE **B**.		1
18.	State what was done during revision 1 and revision 2 of the house plan.		2
19.	Deduce the reference code from the building plan.		1
20.	Who must be notified when a contractor sets out levels on a site and there are variances?		1
21.	Identify ONE important fixture that is omitted in the bathroom.		1
22.	Draw the symbol for face brick.		2
23.	Draw the electrical symbol for earth.		2

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CENTRE NUMBER:							

EXAMINATION NUMBER:													

24.	Draw the symbol for a grease trap.		2
25.	Prove, by means of a control test, that the total vertical dimensions on the left and right sides of the plan in FIGURE **B** are equal.		7
26.	Calculate the area of the first floor. Show ALL calculations. Give your answer in m^2.		3
		TOTAL:	**40**

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EXAMINATION NUMBER:													

ANSWER SHEET 3.10

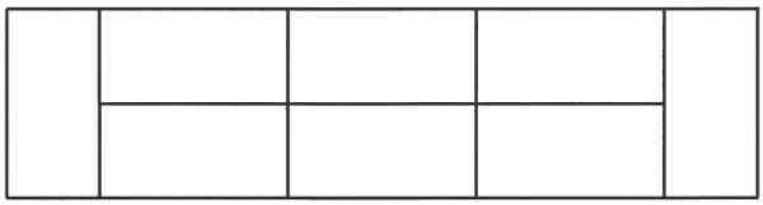

FIGURE 3.10

ASSESSMENT CRITERIA	MARK	CM
Correctness of consecutive brick courses	1	
Bricks	5	
TOTAL:	**6**	

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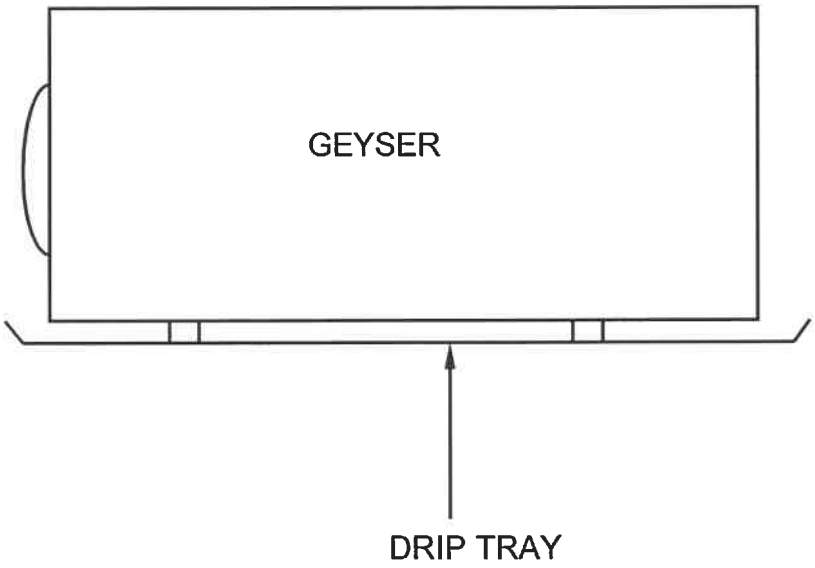
EXAMINATION NUMBER:													

ANSWER SHEET 4.9



ASSSESSMENT CRITERIA	MARK	CM
Correctness of cold and hot-water pipes	1	
Pipes and flow direction	4	
TOTAL:	**5**	

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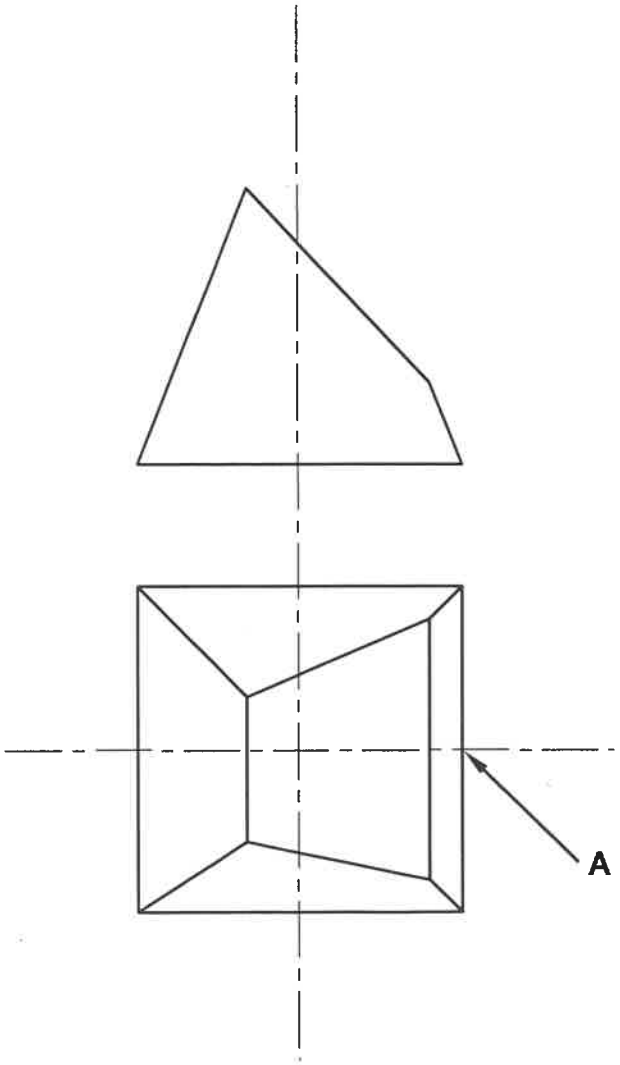
CENTRE NUMBER:							

EXAMINATION NUMBER:													

ANSWER SHEET 5.5



ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing	20	
TOTAL:	20	

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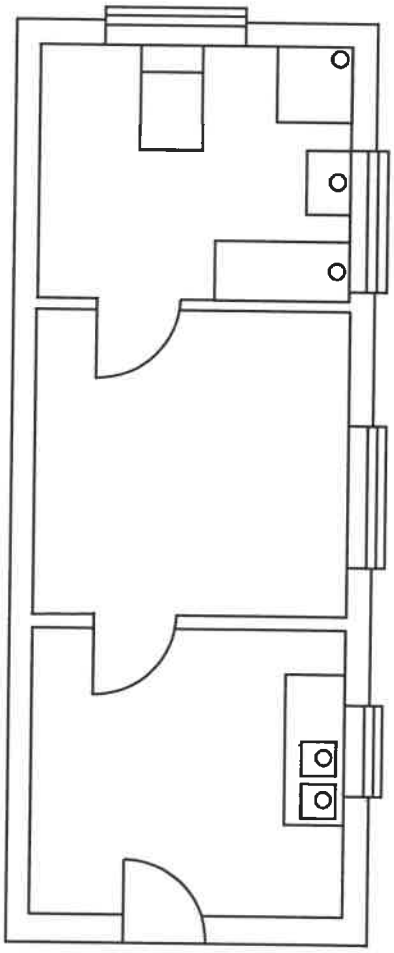
CENTRE NUMBER:								

EXAMINATION NUMBER:													

ANSWER SHEET 6.8



○ MUNICIPAL CONNECTION

ASSESSMENT CRITERIA	MARK	CM
Correctness of drawing	14	
TOTAL:	**14**	

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