No. 9192

Plumbers, Gasfitters and Drainlayers Board

REGISTRATION EXAMINATION, NOVEMBER 2015
LICENSED PLUMBER

QUESTION AND ANSWER BOOKLET

Time allowed THREE hours

INSTRUCTIONS

Check that the Candidate Code Number on your admission slip is the same as the number on the label at the top of this page.

Do not start writing until you are told to do so by the Supervisor.

Total marks for this examination: 100.

The pass mark for this examination is 60 marks.

Write your answers and draw your sketches in this booklet. If you need more paper, use pages 24–25 at the back of this booklet. Clearly write the question number(s) if any of these pages are used.

All working in calculations must be shown.

Candidates are permitted to use the following in this examination:

Drawing instruments, approved calculators, document(s) provided.

Publications, Acts, Regulations, Codes of Practice, or Standards other than the ones provided are NOT permitted in the examination room.

Check that this booklet has all of 25 pages in the correct order and that none of these pages is blank.

**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION**

Candidates that sat this examination in November 2015 were provided with the following documents:

- New Zealand Building Code Clause G12 – Water Supplies

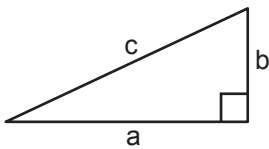- New Zealand Building Code Clause G13 – Foul Water

USEFUL FORMULAE

Circumference of circle = 2 × π × R   or   Circumference of circle = π × D

Area of circle = π × R^2 or   Area of circle = 0.7854 × D^2
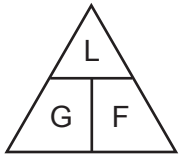
length = L

gradient = 1:G

fall = F

Volume of cylinder = π × R^2 × H   or   Volume of cylinder = 0.7854 × D^2 × H

$a^2 + b^2 = c^2$

Heat energy = mass × specific heat × temp diff

Litres of hot water × temp diff cold to hot = litres of mixed water × temp diff cold to mixed

Heating time = $\dfrac{\text{mass of water (kg)} \times 4.2 \times \text{temp diff (}^{\circ}\text{C)} \times 100}{\text{heat energy input per hour in kJ} \times \text{efficiency (\%)}}$

Box's formula: q = $\sqrt{\dfrac{H \times D^5}{25 \times L \times 10^5}}$

where   q = quantity discharged in litres per second
         H = head in metres
         D = diameter of pipe in mm
         L = length of pipe in metres

SECTION A

QUESTION 1

Give the meaning of each of the following terms in relation to the physical properties of materials, and name a material known to have a high rating for each property.

Name a different material for each property.

(a)   Conductivity

Meaning:

_____

Material:

_____

(b)   Malleability

Meaning:

_____

Material:

_____

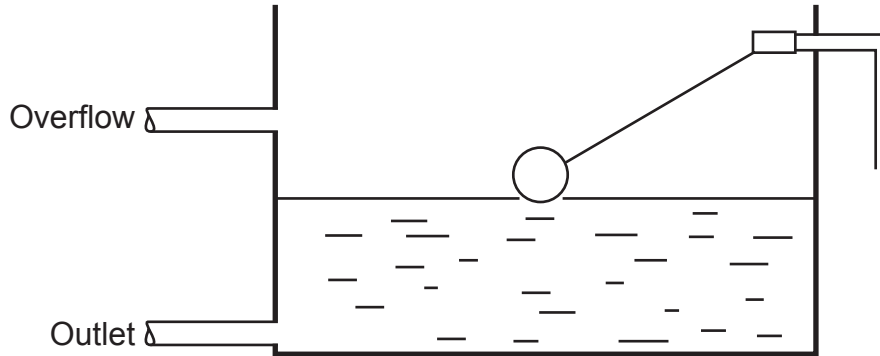(c)   Tenacity (Tensile Strength)

Meaning:

_____

Material:

_____

Total 6 marks

QUESTION 2

The drawing below shows a water tank being filled via a float valve on the inlet.

(a) (i) On the drawing, show the two points between which the air gap is measured.

(1 mark)

(ii) To keep up with demand, the tank is to be fitted with two water supply inlets.

Each inlet has a diameter of 20 mm.

State the minimum permitted height for the air gap to comply with New Zealand Building Code clause G12/AS1 Water Supplies.

_____

(1 mark)

(b) An air gap can protect the potable water supply from both back siphonage and back pressure for all hazard ratings.

State the situation where an air gap must not be used to provide backflow protection.

_____

(1 mark)

QUESTION 2 (cont'd)

(c) Water supplies must be installed so that there is no likelihood of cross connection.

Give the FOUR potential sources of cross-connection identified in New Zealand Building Code clause G12/AS1 Water Supplies.

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

(2 marks) ☐

Total 5 marks ☐

QUESTION 3

(a)   Give the function of an energy cut-off device for a hot water cylinder.

_____

_____

(1 mark)

(b)   Give the TWO purposes of a cold water expansion valve being fitted to a hot water cylinder.

1   _____

2   _____

(2 marks)

(c)   Give TWO pieces of information that are required when selecting a temperature/pressure relief valve for a mains pressure valve-vented hot water system.

1   _____

2   _____

(2 marks)

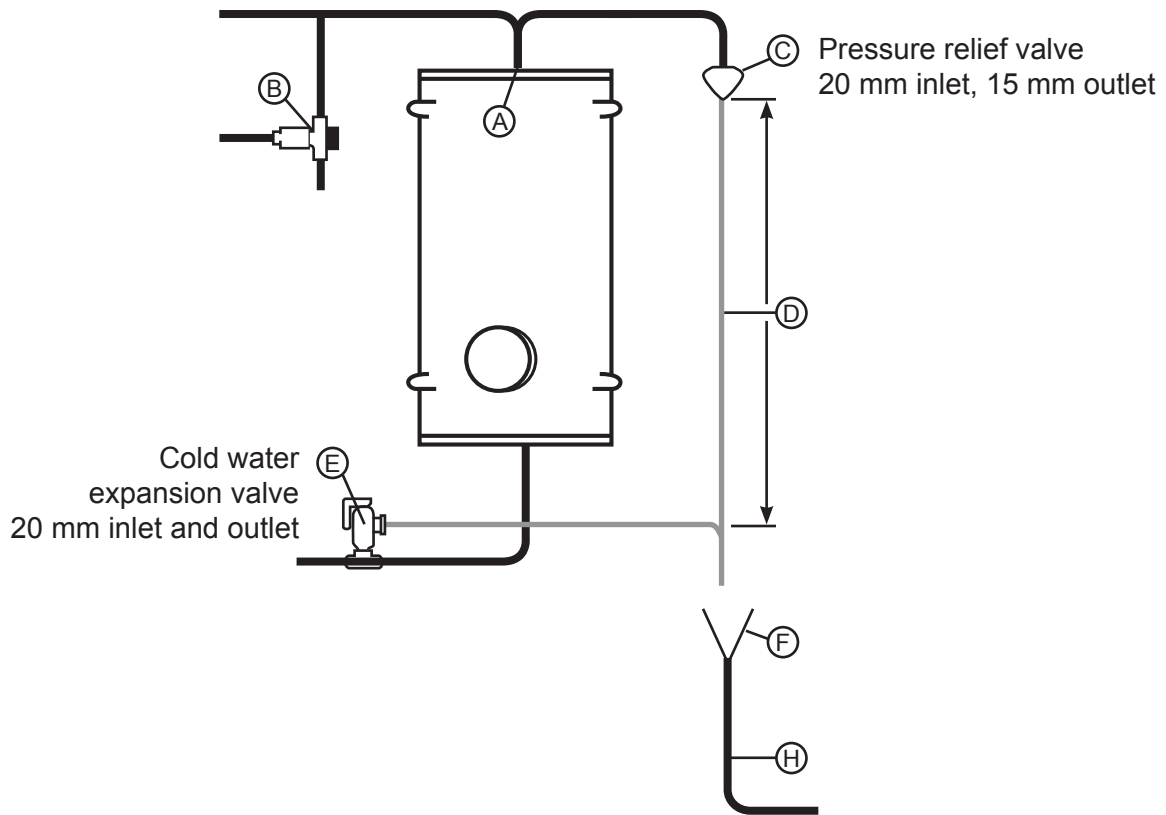(d)   State the meaning of the term 'quick recovery' in regard to hot water cylinders.

_____

_____

(1 mark)

QUESTION 3 (cont'd)

(e) The diagram below shows part of a low pressure hot water system.

Complete the table below by giving the required information for the system to comply with New Zealand Building Code clause G12/AS1 Water Supplies.

|	
The minimum allowable distance between the hot outlet (A) and the tempering valve (B)	
The maximum allowable distance between the hot outlet (A) and the pressure relief valve (C)	
The maximum allowable length of pipe labelled (D)	
The minimum allowable height of air gap to tundish (F)	
The minimum allowable diameter of pipe labelled (H)	

(5 marks)

Total 11 marks

QUESTION 4
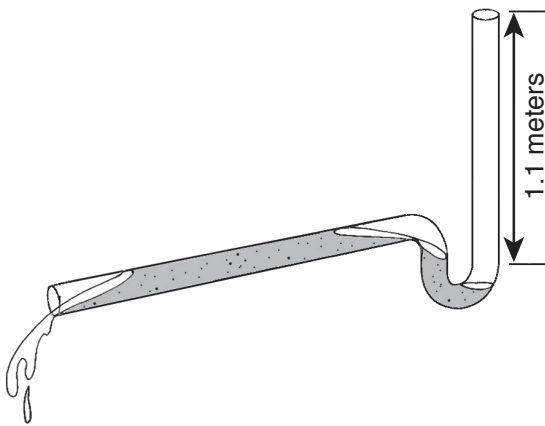
Each drawing below shows a trap losing its water seal.
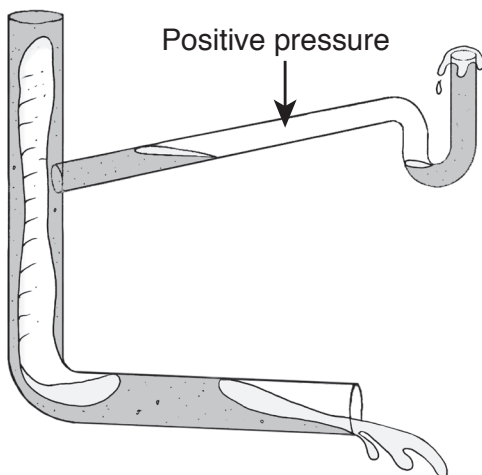
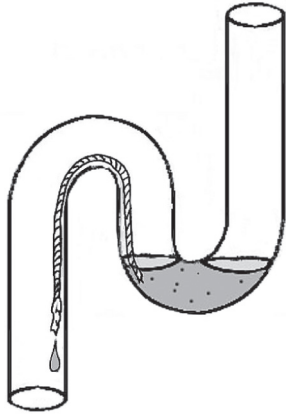Name the way each of the traps is losing its seal.

(a)

_____

(b)

1.1 meters

_____

(c)

Positive pressure

_____

(d)

_____

(e)

Vent

Water rising
and falling

_____
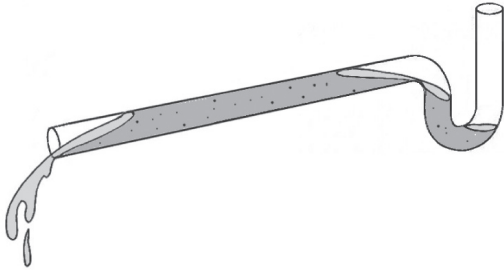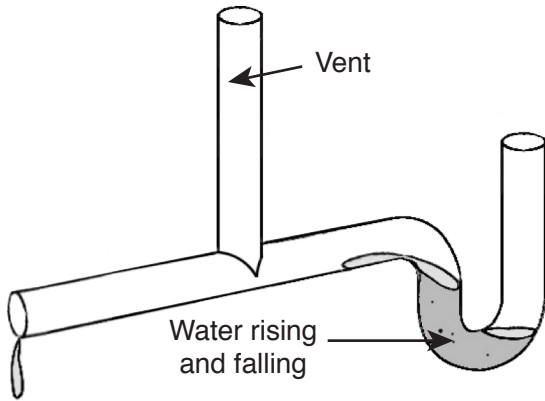
(f)

_____
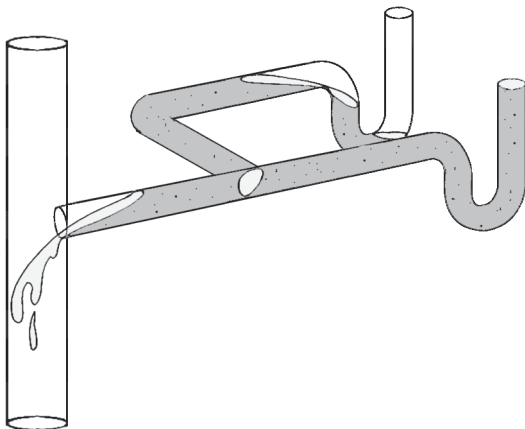
Total 6 marks

QUESTION 5

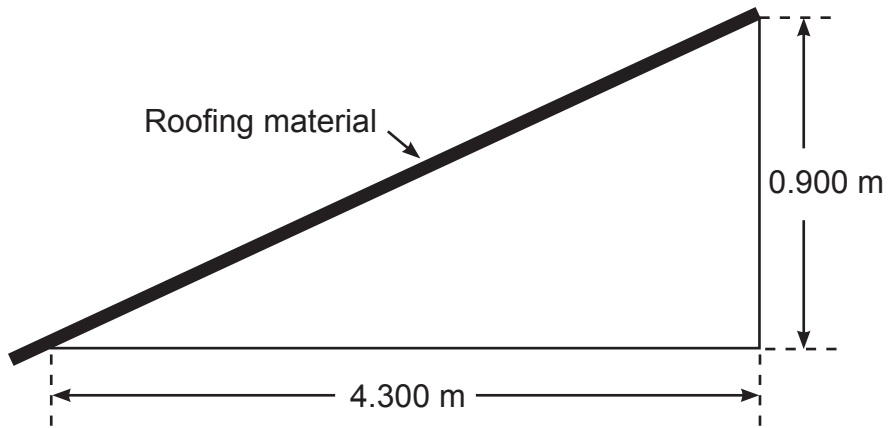(a) The drawing below shows the end elevation of a corrugated profile roof.

(i) The roofing material extends 50 mm over the gutter.

Calculate the length of each corrugated roofing sheet.

_____

_____

_____

_____

(3 marks)

(ii) The fascia length (gutter length) is 16 m.

A rainfall event gives 50 mm of water.

Calculate the volume of water that will be collected.

_____

_____

(1 mark)

QUESTION 5 (cont'd)

(b)   An existing roof is being used to harvest rain water for drinking.

    (i)   Name TWO materials used for the roofing from which rain water should not be harvested.

        1   _____

        2   _____

        (2 marks)

    (ii)   Name THREE potential sources of contamination of the rain water, other than roofing material.

        1   _____

        2   _____

        3   _____

        (3 marks)

Total 9 marks

QUESTION 6

(a) (i) Name FOUR factors in relation to pipework that affect the flow rate achievable in a water supply system.

1 _____

2 _____

3 _____

4 _____

(2 marks)

(ii) Give the reason these factors affect the flow rate of the system.

_____

(1 mark)

(b) Some water piping installations make a loud banging noise when water is flowing to an outlet or immediately after the outlet is turned off.

(i) Give the term that this situation is known by.

_____

(1 mark)

(ii) Give TWO probable reasons for this situation to occur.

1 _____

2 _____

(2 marks)

(iii) Give TWO actions that can be taken during the pipeout of a new dwelling to reduce the likelihood of this situation occurring.

1 _____

2 _____

(1 mark)

QUESTION 6 (cont'd)

    (iv)   Give FOUR actions that can be taken to stop the noise from occurring in an existing installation (e.g. a house that has been lived in for five years).

1 _____

2 _____

3 _____

4 _____

(2 marks)

Total 9 marks

QUESTION 7

(a) An existing WC pan is to be replaced.
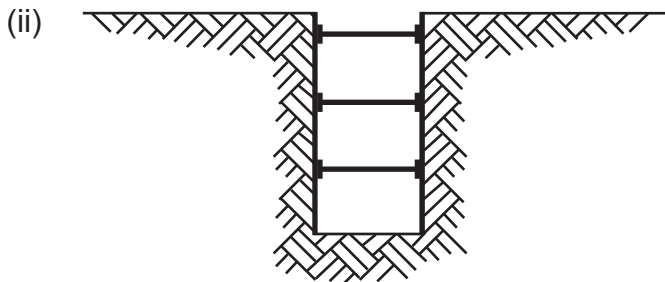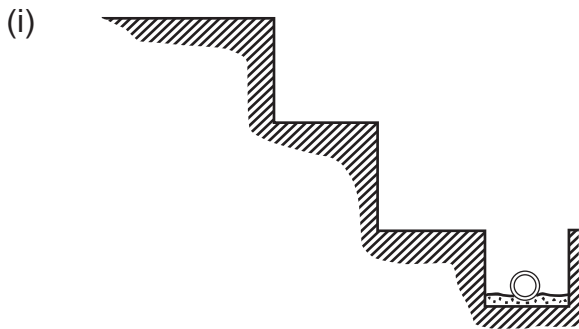
Give FOUR possible health and safety hazards that a plumber could be exposed to while completing the task.

1 _____

2 _____

3 _____

4 _____

(4 marks)

(b) Each of the following diagrams shows a different method of protecting an excavated trench from collapse.

Name the method shown in each diagram.

(i)

_____

(ii)

_____

(iii)
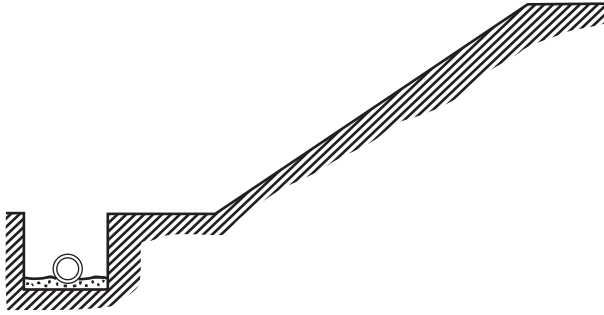
(iv)
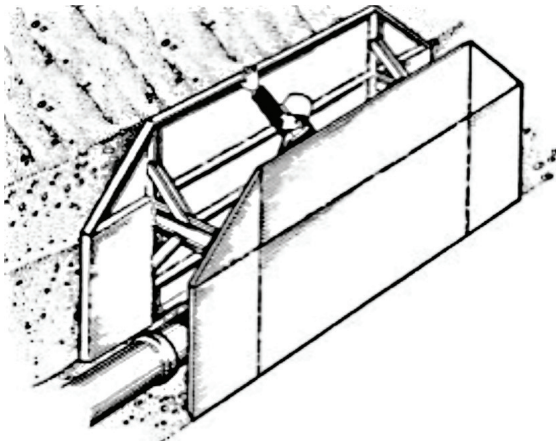
(4 marks) ☐

Total 8 marks ☐

QUESTION 8

Foul water discharge pipework for a concrete pad dwelling has been installed as shown in the sketch below.

On the opposite page, draw to a scale of 1:20 and label an as-laid plan to supply to a plumbing inspector during a pre-slab inspection.
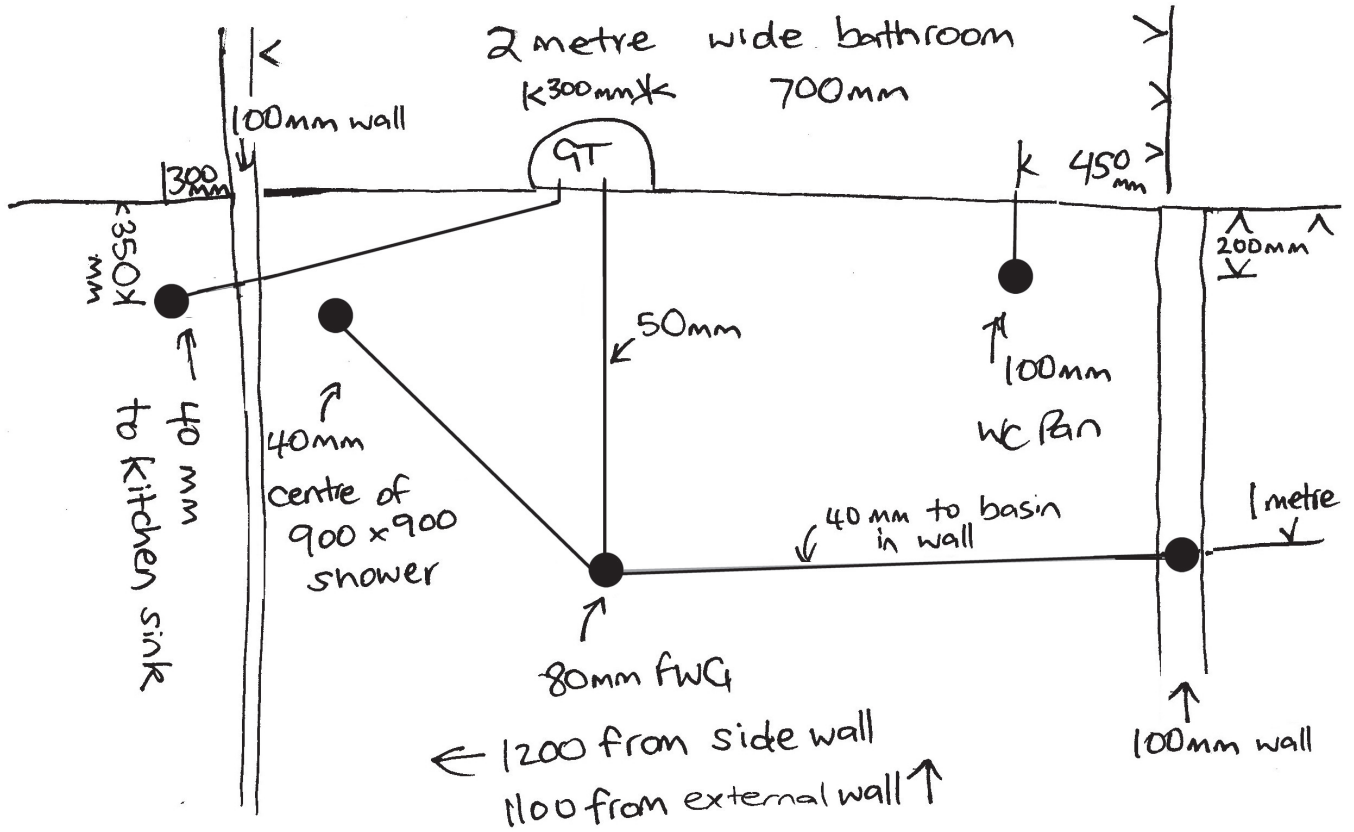
Total 6 marks

QUESTION 8 (cont'd)

QUESTION 9

(a) Give the meaning of the term 'positive displacement' in relation to pumps.

_____

(1 mark)

(b) Name THREE types of positive displacement pumps.

1 _____

2 _____

3 _____

(3 marks)

(c) Give THREE reasons why a potable water pump may continue to stop and start when no water is being used, and give a remedy for each.

1 Reason

_____

Remedy

_____

2 Reason

_____

Remedy

_____

3 Reason

_____

Remedy

_____

(6 marks)

Total 10 marks

QUESTION 10

(a) Describe what equipotential bonding is, and state its purpose.

Description

_____

_____

Purpose

_____

_____

(2 marks) ☐

(b) A customer has requested that a stainless steel shower tray be installed.

Give the FOUR conditions under which the shower tray will require equipotential bonding.

1 _____

2 _____

3 _____

4 _____

(2 marks) ☐

Total 4 marks ☐

QUESTION 11

(a) A sanitary discharge system is being installed to comply with the minimum requirements of the New Zealand Building Code clause G13/AS1 Foul Water.

Five basins are to discharge into a 40 mm diameter branch discharge pipe.

(i) The discharge pipe will be 4.5 metres long and will be laid at the minimum allowable gradient. State the minimum allowable gradient at which the discharge pipe can be laid.

_____

(1 mark)

(ii) Calculate in mm the fall of the pipe when it is laid with the minimum allowable gradient.

_____

_____

(1 mark)

(b) A shower and a bath are to discharge into a 50 mm diameter branch discharge pipe.

The discharge pipe will be 5.7 metres long and laid at the minimum allowable gradient.

(i) State the minimum allowable gradient at which the discharge pipe can be laid.

_____

(1 mark)

(ii) Calculate in mm the fall of the pipe when it is laid with the minimum allowable gradient.

_____

_____

(1 mark)

(c) A floor waste is to be installed. The floor waste will discharge into a gully dish.

Give FOUR requirements that must be met for the installation to comply with the New Zealand Building Code clause G13/AS1 Foul Water.

1 _____

2 _____

3 _____

4 _____

(2 marks)

QUESTION 11 (cont'd)

(d) The diagram below shows the part of the discharge stack system installed to comply with New Zealand Building code clause G13/AS1 Foul Water.

On the diagram, show where access points must be installed.
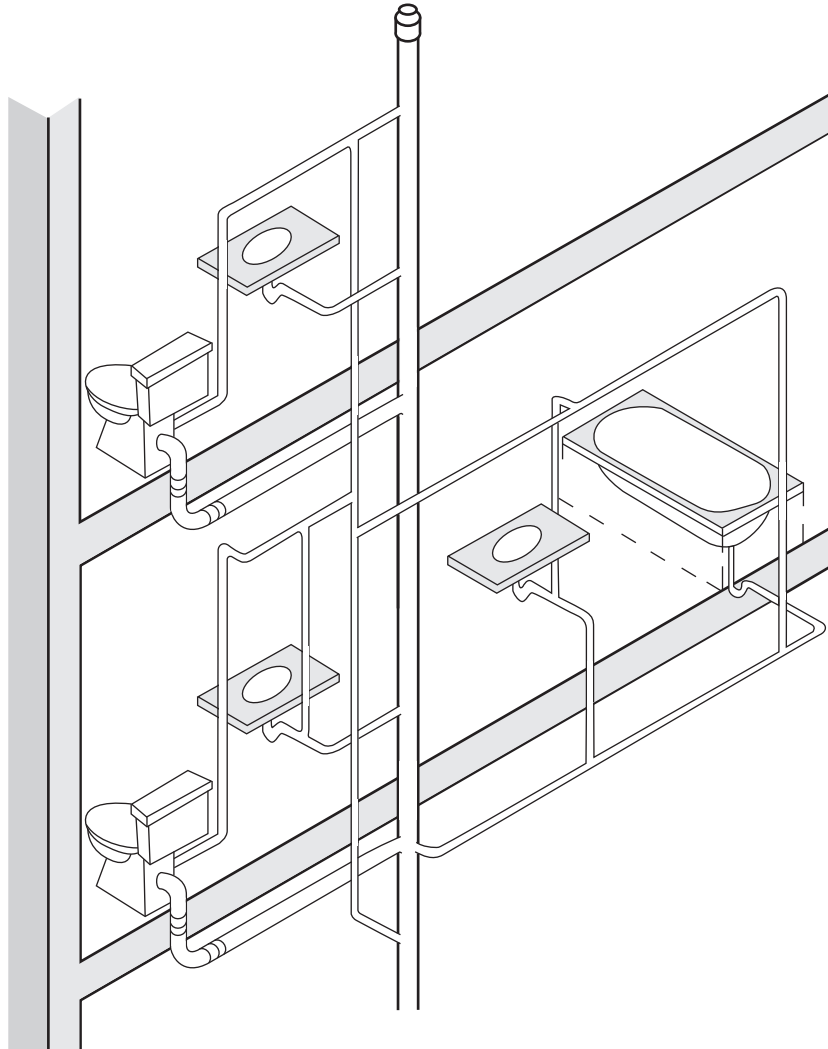
(3 marks)

(e) Give TWO reasons why restrictions are placed on the possible locations for vent terminals on a foul water discharge system.

1 _____

2 _____

(2 marks)

Total 11 marks

QUESTION 12

A customer is building a new house and wishes to minimise the amount of water being used within the dwelling.

Give FOUR suggestions a plumber can give to achieve this.

1   _____

2   _____

3   _____

4   _____

Total 4 marks

SECTION B

Answer the following multiple-choice questions by writing your answer (A, B, C, D or E) in the box provided after each one of the questions.

Each correct answer in this section of the examination is worth 1 mark.

Should your choice of answer be unclear no mark will be awarded.

1. Which of the following can occur if a water pipe rises above the hydraulic gradient in a low pressure hot water system?

    A   The water pressure can increase.

    B   The pressure and flow losses due to friction can increase.

    C   Back pressure can occur.

    D   Back siphonage can occur.

    E   An air lock can occur.

2. Which of the following is not permitted to discharge into a floor waste gully?

    A   A washing machine.

    B   A basin installed in an adjacent room.

    C   A tundish from a hot water cylinder in an adjacent room.

    D   A bidet.

    E   A refrigerated cabinet drain.

3. What is the minimum height above the flood level rim of a fixture that its vent pipe is permitted to join a branch or relief vent?

    A   50 mm.

    B   100 mm.

    C   150 mm.

    D   200 mm.

    E   250 mm.

4. According to the New Zealand Building Code clause G12/AS1 Water Supplies, what are the minimum water tightness testing requirements for newly installed water pipework?

A   15 minutes at 1500 kPa.

B   15 minutes at 2000 kPa.

C   20 minutes at 2000 kPa.

D   30 minutes at 1500 kPa.

E   30 minutes at 2000 kPa.

5. A new kitchen will have two sink bowls, a dishwasher and a waste disposal unit installed.

All of these fixtures and appliances are to connect to a single trap and discharge pipe.

What is the minimum size trap and discharge pipe that must be used?

A   32 mm.

B   40 mm.

C   50 mm.

D   65 mm.

E   80 mm.

6. A 50 mm waste pipe requires venting.

What is the minimum diameter required for the vent pipe?

A   20 mm.

B   25 mm.

C   32 mm.

D   40 mm.

E   50 mm.

7. According to New Zealand Building Code clause G13/AS1 Foul Water, what is the maximum allowable separation between supports fitted to a vertical section of 50 mm uPVC discharge pipe?

A   1.000 m.

B   1.200 m.

C   1.800 m.

D   3.000 m.

E   3.500 m.

8.	What is a wet vent?

    A	A vent that is designed to allow rain water to enter and flush a waste system.

    B	A vent that is connected to a floor waste gully in a wet floor bathroom.

    C	A vent that allows water to be relieved during excess pressure or temperature

    D	A vent that allows water to be relieved during an excess pressure situation.

    E	A vent that is connected to a discharge pipe downstream from the last fixture.

9.	What is the minimum trap size permitted to be installed for a commercial kitchen sink?

    A	32 mm.

    B	40 mm.

    C	50 mm.

    D	65 mm.

    E	80 mm.

10.	According to New Zealand Building Code clause G13/AS1 Foul Water, what is the minimum size permitted for a charge pipe used to maintain the water seal on a trapped floor waste?

    A	15 mm.

    B	20 mm.

    C	25 mm.

    D	32 mm.

    E	40 mm.

11.	A WC pan requires venting.

    According to New Zealand Building Code Clause G13/AS1 Foul Water, what is the minimum height above ground level at which the vent must terminate?

    A	2.0 m.

    B	2.5 m.

    C	3.0 m.

    D	3.5 m.

    E	4.0 m.

Total 11 marks

For Examiner's use only

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
Section B		
Total		