No. 9195

Plumbers, Gasfitters and Drainlayers Board

REGISTRATION EXAMINATION, NOVEMBER 2014
CERTIFYING 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 22–25 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 2014 were provided with the following documents:

· AS/NZS 3500 Part 1: Water services

· AS/NZS 3500 Part 2: Sanitary plumbing and drainage

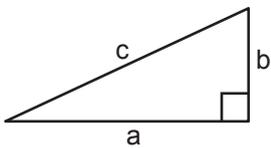· New Zealand Building Code Clause G12 – Water Supplies

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
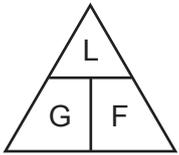
length = L
gradient = 1:G
fall = F

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

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

Plasterboard may be penetrated when plumbing systems are being installed.

(a)   Give TWO types of plasterboard that have restrictions on the location and size of penetrations through the plasterboard.

1   _____

2   _____

(2 marks) ☐

(b)   Give TWO ways in which the plasterboard in (a) can be identified.

1   _____

2   _____

(2 marks) ☐

Total 4 marks ☐

QUESTION 2

Many standards have sections that are normative and sections that are informative.

(a) Give the meaning of normative as it relates to standards.

_____

(1 mark)

(b) Give the meaning of informative as it relates to standards.

_____

(1 mark)

Total 2 marks

QUESTION 3

A bathroom in a house is to be renovated and an additional toilet is to be installed. The house has a wooden floor, and directly under the bathroom area is a basement having a 2.7 m stud height.

Six hazards have been identified for the task as shown on the hazard register below.

Complete the register by giving a management solution for each hazard and stating if the solution eliminates, isolates or minimises the hazard.

Hazard Register		
Hazard	Management solution	Eliminate, isolate, minimise
Dust falling from above		
Working from a ladder – falling from height		
Connecting discharge pipes to existing foul water pipework		
Tripping hazard from tools and pipe		
Brazing copper pipe		
Solvent cement for installing uPVC pipe		

Total 6 marks

QUESTION 4

The owners of a rural dwelling are considering changing from a bore water supply to a harvested rain water supply.

(a) Give SIX factors regarding the existing site that should be checked to ensure the rain water collected will be potable.

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

(3 marks)

(b) After a site assessment, it is decided the rain water will not be potable.

Give THREE outlets the rain water could be used to supply.

1 _____

2 _____

3 _____

(3 marks)

(c)   Due to site restrictions, the water collection tank for non-potable water is sited lower than the floor level of the dwelling as shown in the diagram below.

Complete the diagram to show all the necessary requirements for the installation of a pump to supply water from the tank to the dwelling so the completed system complies with AS/NZS 3500 Part 1: Water services. Label all components.
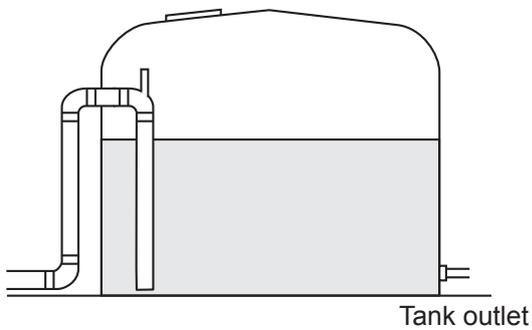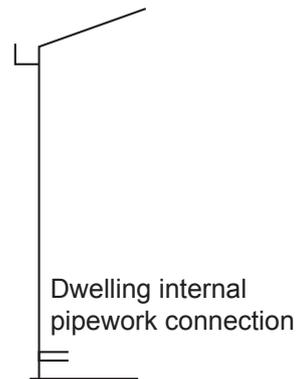
Dwelling internal
pipework connection

Tank outlet

Diagram is not to scale

(4 marks)

Total 10 marks

QUESTION 5

The plan opposite shows a large warehouse which is being converted into commercial premises with a variety of tenants. The layout of the water supply to each tenant is also shown.

A backflow prevention plan is to be prepared to comply with the minimum requirements of New Zealand Building Code clause G12/AS1 Water Supplies.

(a)   On the plan, show the required locations for backflow prevention devices to be installed.

(3 marks)

(b)   Complete the table below to show a fixture or appliance at each location that is a potential source of contamination and an appropriate method of backflow prevention to be used at that location.
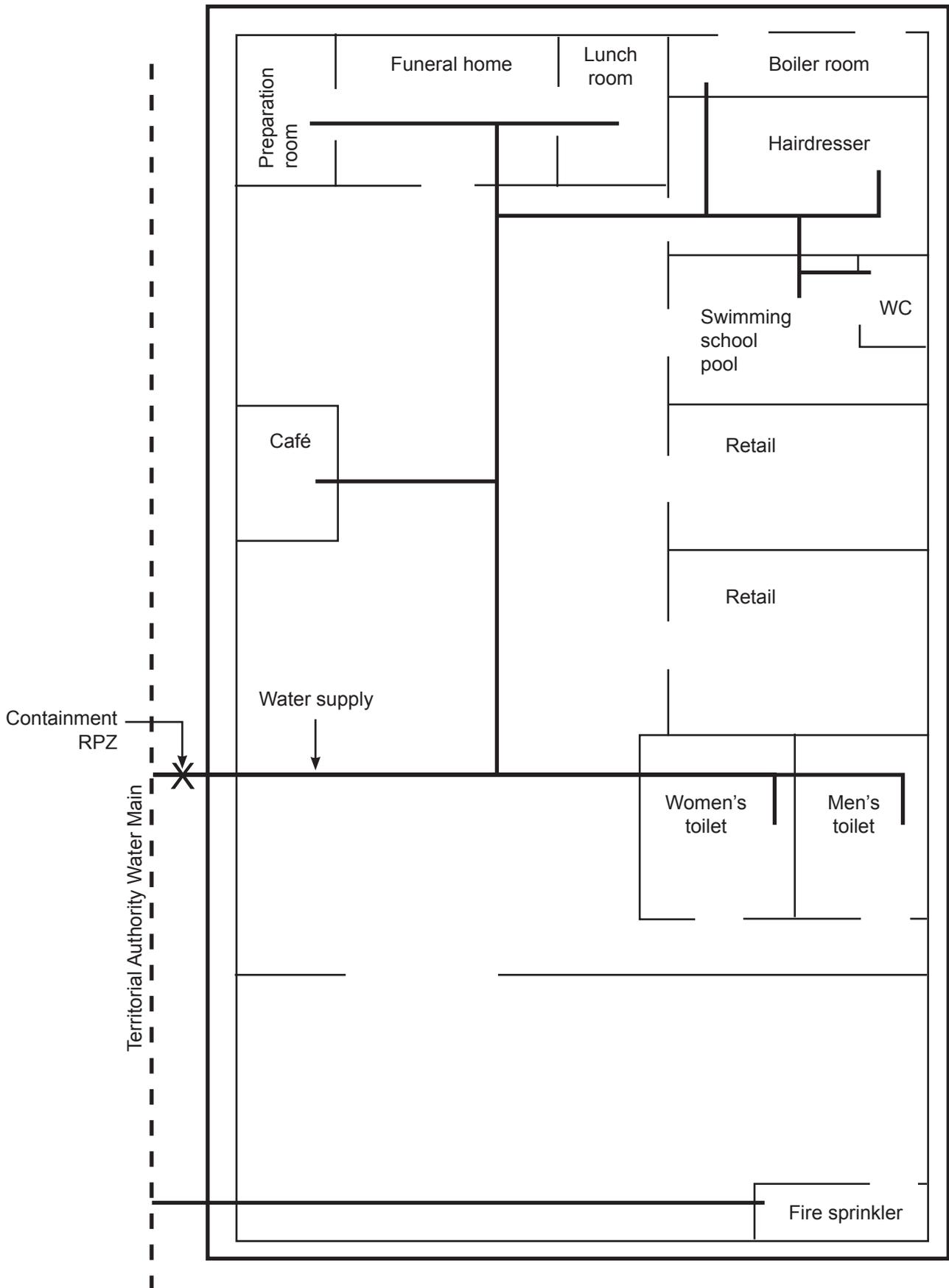
At least 3 different methods of backflow prevention are to be used throughout the plan.

Location	Potential source of contamination	Method of protection
Fire sprinkler connection		
Women's toilet and men's toilet		
Café		
Funeral home preparation room		
Funeral home lunch room		
Boiler room		
Hairdresser		
Swimming school pool		
Swimming school WC		

(9 marks)

Total 12 marks

QUESTION 6

The plan on the page opposite shows the layout of sanitary fixtures for a proposed two-storey domestic dwelling having a stud height of 2.4 m.

The diagram is drawn to a scale of 1:100

The dwelling is to be built on a concrete pad foundation.
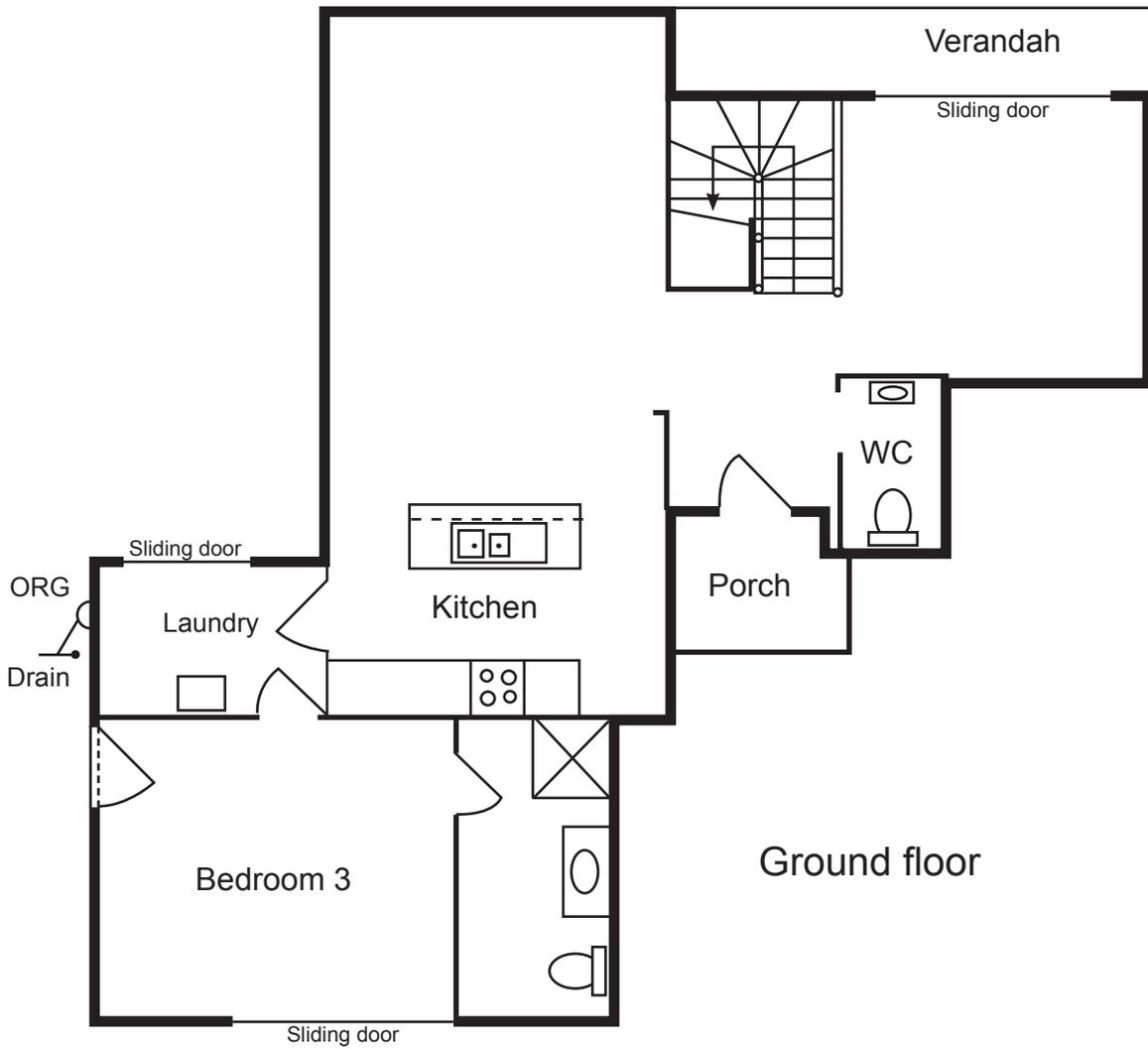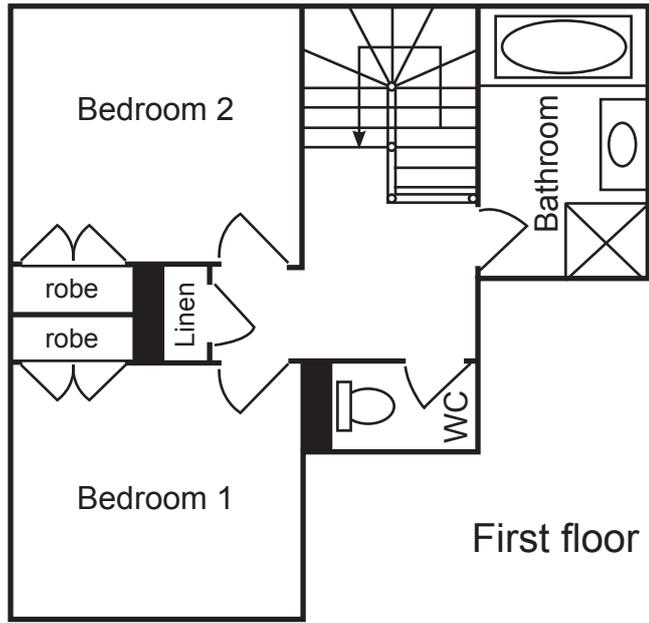
The drainage design for the dwelling has been completed, and the connection point for the sanitary plumbing is shown on the plan.

The sanitary plumbing system is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

(a)   On the plan, draw all discharge pipes and show vent connections that will be required to be installed before the concrete floor is poured.

(b)   On the plan, show the minimum allowable diameter for each section of discharge and vent pipework.

Total 9 marks

Bedroom 2

Bathroom

robe

robe

Linen

WC

Bedroom 1

First floor

Verandah

Sliding door

WC

Sliding door

ORG

Laundry

Kitchen

Porch

Drain

Bedroom 3

Ground floor

Sliding door

QUESTION 7

Five houses are to be built down a right-of-way, as shown in the plan on the opposite page.

The pressure available from the public water supply is 450 kPa.

The height of the highest fixture outlet is 3 m above the public water supply.

The minimum head required for the fixture outlets is 5 m.

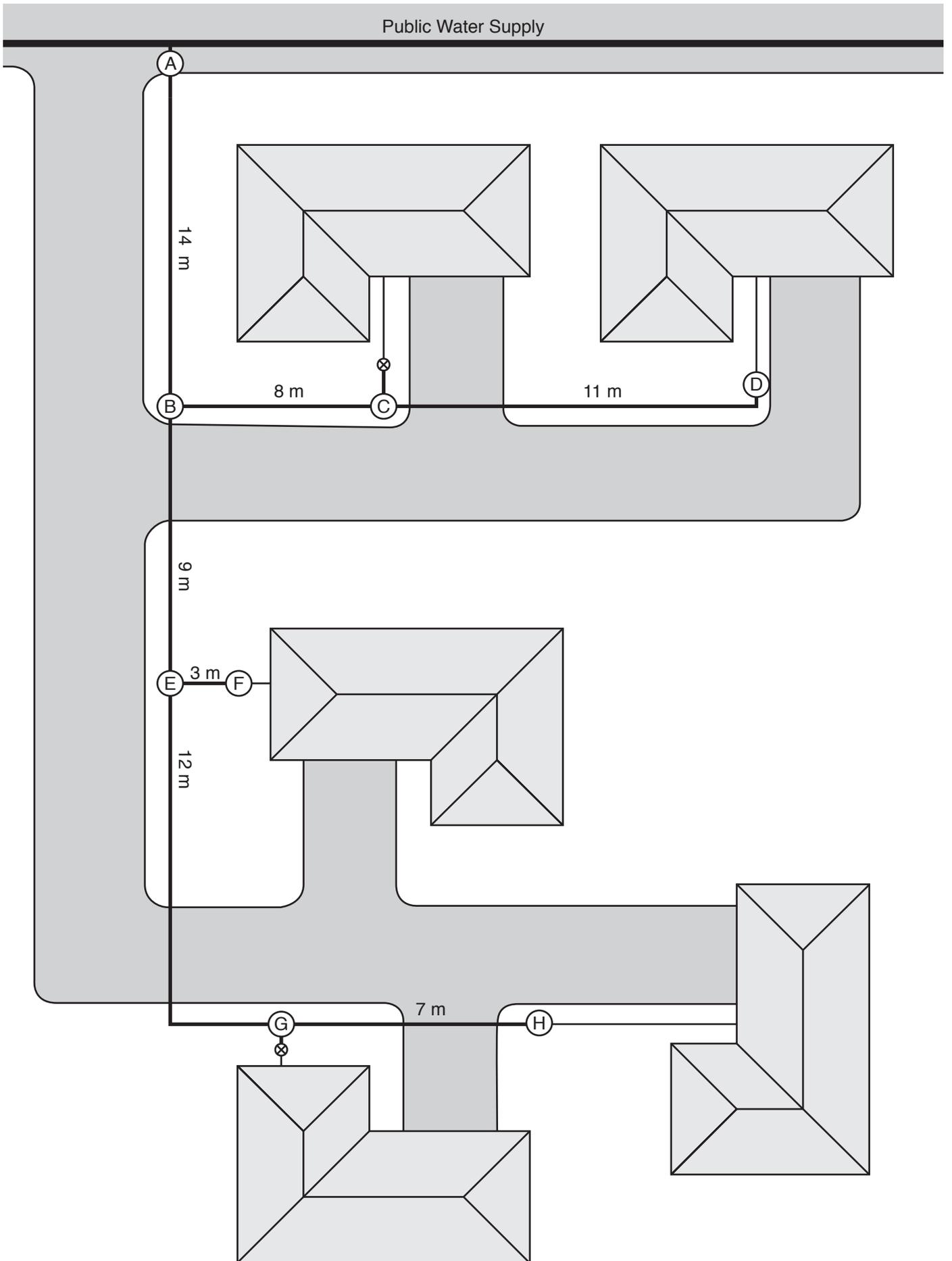The length of consumer pipework from the toby labelled H to the furthest outlet is 13 m.

Using the procedure in AS/NZS 3500 Part 1: Water supplies Appendix C, complete the tables below to size the pipework.

Index length of installation	Pressure drop

Pipe Section	Probable simultaneous demand (L/s)	Nominal pipe size (DN)
A – B		
B – C		
C – D		
B – E		
E – F		
E – G		
G – H		

Total 17 marks

QUESTION 8

The schematic diagram on the page opposite shows the hot water pipe layout for a dwelling. A hot water cylinder that is fitted with a 12 m head pressure reducing valve is also shown.

Complete the diagram by giving the minimum required pipe size at each of the 15 locations indicated by an arrow. The installation is to comply with the minimum requirements of the New Zealand Building Code clause G12/AS1 Water Supplies.

Total 8 marks
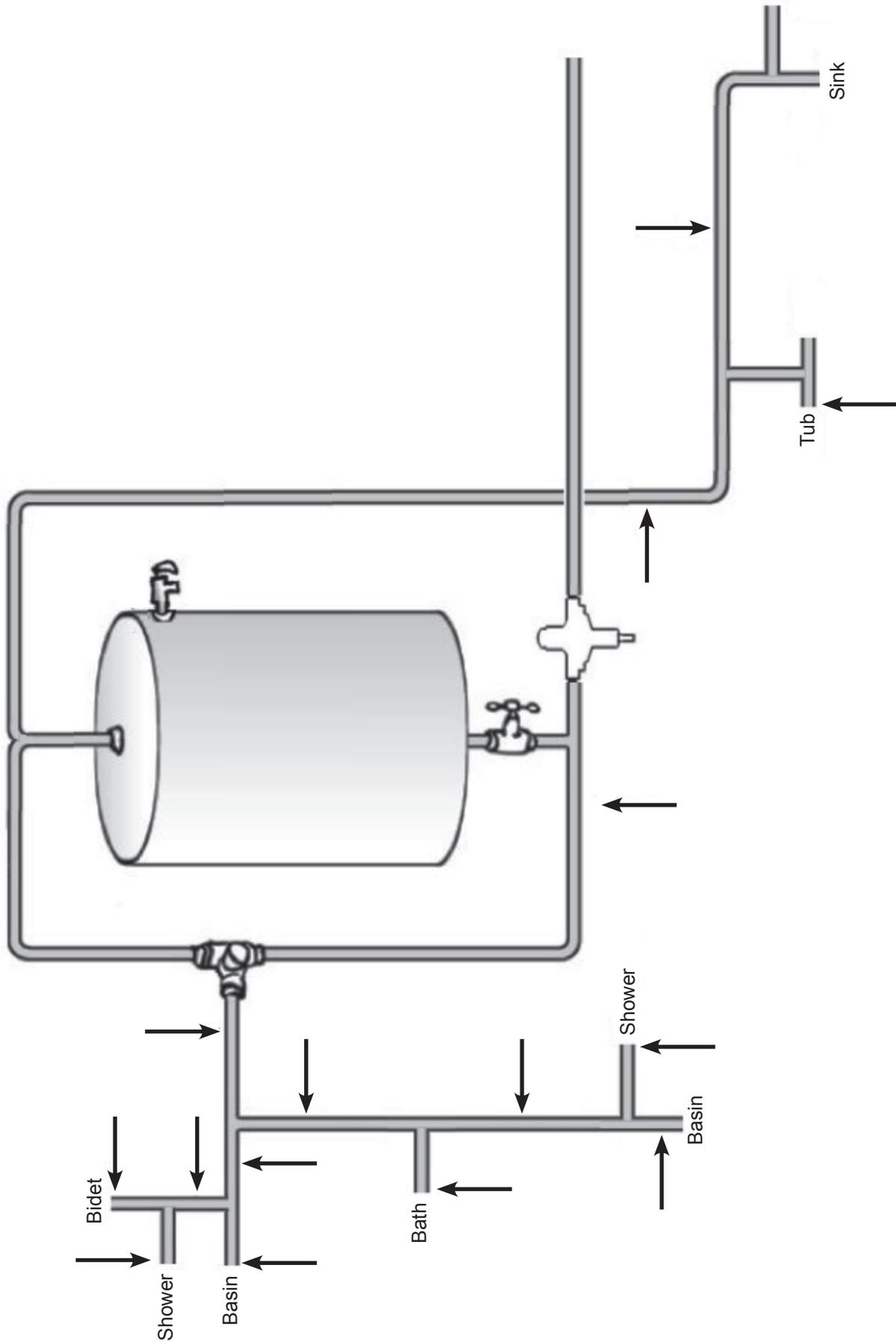
QUESTION 9

The drawing opposite shows a range of sanitary fixtures connected to an offset discharge stack.
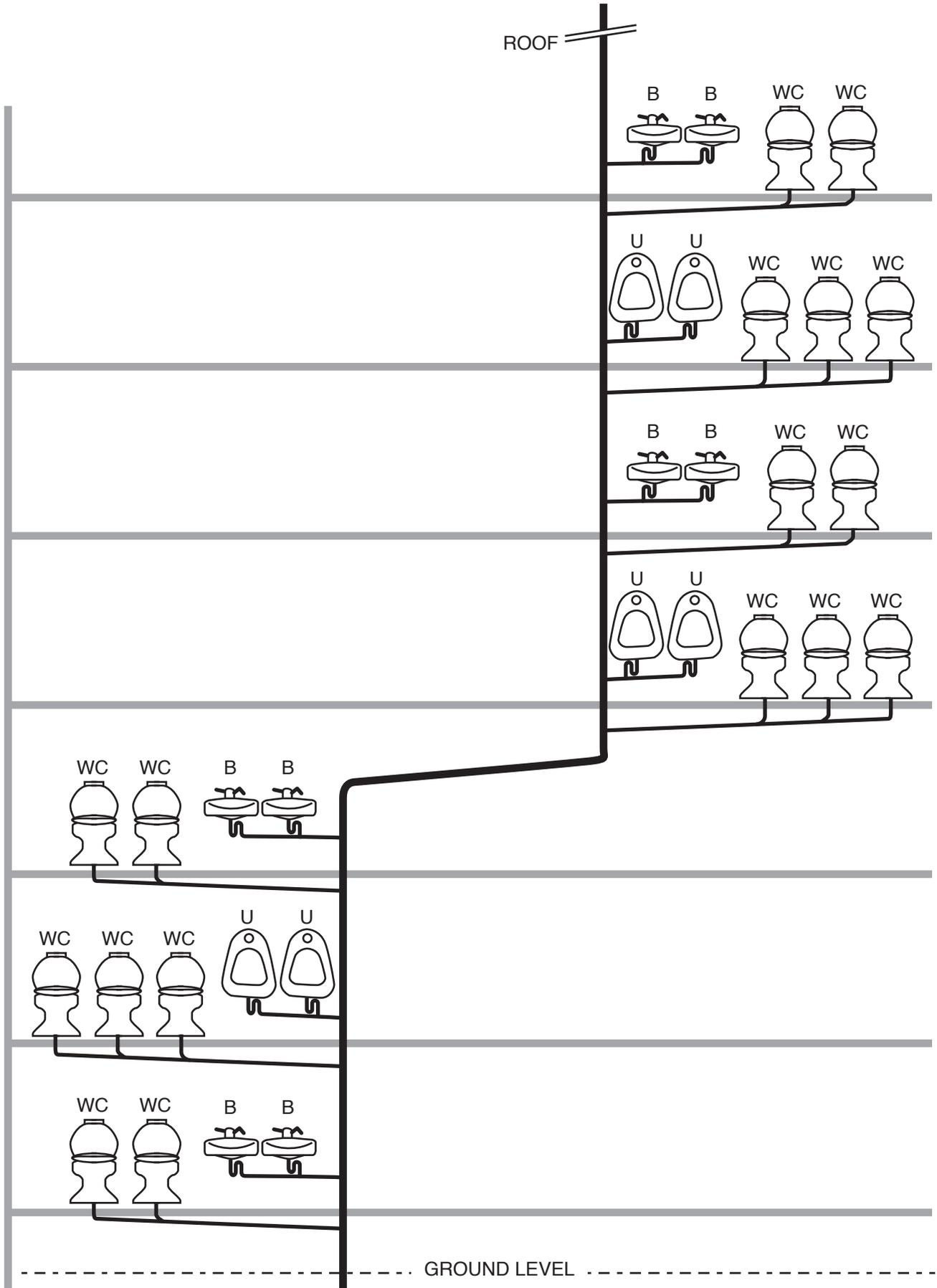
The WCs are flushed from cisterns. Each floor is 3 m in height.

The sanitary plumbing system is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage

(a)   Complete the drawing to show the vents required for a fully vented modified system.

(b)   On the drawing, show the minimum sizes for each vent pipe.

Total 10 marks

ROOF

GROUND LEVEL

QUESTION 10

Name TWO methods of ensuring fluid will circulate around a solar water heating system, and for each method give TWO aspects of their design that will ensure that the system will perform correctly.

Method:

_____

Design aspects:

1   _____

2   _____

Method:

_____

Design aspects:

1   _____

2   _____

Total 6 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.

Note that should your choice of answer be unclear no mark will be awarded for that question.

1.   Which of the following determines the inclination that a solar panel must be installed at to gain maximum efficiency?

A   The pitch of the roof.

B   The latitude of the installation.

C   The longitude of the installation.

D   The type of solar collector installed.

E   The pressure rating of the pump installed.

☐

2.   In a solar water heating system, which part is known as the collector?

A   The water storage cylinder

B   The drain tundish.

C   The evacuated tube.

D   The solar panel.

E   The solar panel manifold system.

☐

3.   Which of the following is a solar preheater?

A   A solar water heating system that feeds an electric storage water cylinder.

B   An element that prevents the panel temperature dropping below freezing point.

C   A water heating system that relies solely on solar energy to reach the desired temperature.

D   The selective surface coating that directs rays to the solar tubes.

E   An electric element that raises the water temperature slightly to start a thermo-syphon current.

☐

4. Which of the following will NOT protect a solar panel when the temperature drops below freezing?

   A   A frost valve.

   B   A circulating pump activated by a thermostat.

   C   An indirect system with glycol added.

   D   A drain-back system.

   E   A temperature/pressure relief valve.

   ☐

5. What is the minimum allowable pressure for a soundness test on cold water pipework?

   A   100 kPa.

   B   500 kPa.

   C   1000 kPa.

   D   1500 kPa.

   E   2000 kPa.

   ☐

6. According to the New Zealand Building Code clause G13/AS1 Foul Water, what is the maximum permitted developed length for an unvented 40 mm waste pipe discharging over a gully trap?

   A   2.500 metres.

   B   3.000 metres.

   C   3.500 metres.

   D   4.000 metres.

   E   4.500 metres.

   ☐

7. Which of the following requires the restricted zone at the base of a stack to be increased?

   A   When the discharge from connected fixtures is expected to be foamy.

   B   When the stack is 150 mm diameter or larger.

   C   When the stack receives 200 discharge units per floor.

   D   When the discharge stack is less than 80 mm in diameter.

   E   When an overflow relief gully is installed.

   ☐

8. What is the minimum time a hot water cylinder relief drain installed under a concrete slab must last to meet the durability requirements of the New Zealand Building Code?

A   1 year.

B   2 years.

C   5 years.

D   15 years.

E   50 years.

9. A grease trap is to be installed in the basement of a 125-seat restaurant.

What is the minimum required capacity for the grease trap to comply with New Zealand Building Code clause G13/AS2 Foul Water?

A.   250 litres.

B   375 litres.

C   500 litres.

D   625 litres.

E   750 litres .

10. According to AS/NZS 3500 Part 2: Sanitary plumbing and drainage, which of the following fixtures is not permitted to be installed in a room with an untrapped floor waste?

A   A WC pan.

B   A kitchen sink.

C   A slop sink.

D   A grease converter.

E   A urinal.

11. A sanitary plumbing system is to be hydrostatically tested in accordance with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

What is the maximum head pressure allowable for the test?

A   2 metres.

B   3 metres.

C   4 metres.

D   5 metres.

E   6 metres.

12. A sanitary plumbing system is to be hydrostatically tested in accordance with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

What is the minimum acceptable test duration?

A   5 minutes.

B   10 minutes.

C   15 minutes.

D   20 minutes.

E   30 minutes.

13. Within what length of time must the Plumbers, Gasfitters and Drainlayers Board be notified of a registered plumber's change of address?

A   7 days.

B   28 days.

C   6 weeks.

D   3 months.

E   6 months.

14. By which of the following dates must registered plumbers renew their annual licence?

    A   1 March.

    B   1 April.

    C   20 May.

    D   30 June.

    E   31 December.

15. A 6 metre length of pipe is to be laid at a gradient of 1:50 (2%).

    What is the pipe fall over its length?

    A   9 mm

    B   12 mm

    C   39 mm

    D   90 mm

    E   120 mm

16. A 5 metre length of pipe falls 125 mm over its length.

    What is the gradient of the pipe?

    A   1:20

    B   1:40

    C   1:60

    D   1:80

    E   1:100

Total 16 marks

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