No. 9195

Plumbers, Gasfitters and Drainlayers Board

REGISTRATION EXAMINATION, JUNE 2021
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.

This exam booklet consists of 2 sections

Section A – Question 1 to 10

Section B – Question 1 to 16

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 26-29 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.

Blue or Black pens only.

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

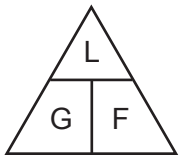Check that this booklet has all of 30 pages in the correct order.

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

USEFUL FORMULAE

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

Area of circle = π × R² or Area of circle = 0.7854 × D²

Volume of cylinder = π × R² × H   or   Volume of cylinder = 0.7854 × D² × H

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   /\
  /L \
 /----\
/ G | F \
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length = L

gradient = 1:G

fall = F

SECTION A

QUESTION 1

The drawing below shows an elevation of part of a sanitary plumbing installation. The wash hand basin in the basement is below the level of the drain and therefore discharges into a holding tank.

Complete the drawing to show a wet well installation to discharge the waste to the gravity drain system. On your drawing, label and show all necessary measurements. The complete installation is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

Label all components, and show the minimum allowable diameter for the pipework you have drawn.

Show on the drawing the maximum allowable water level before the pump must activate, and the measurement used to determine it.

Vent to above

WC

WHB

SHWR

Ground level

Basement

Not to scale

Holding tank

WHB
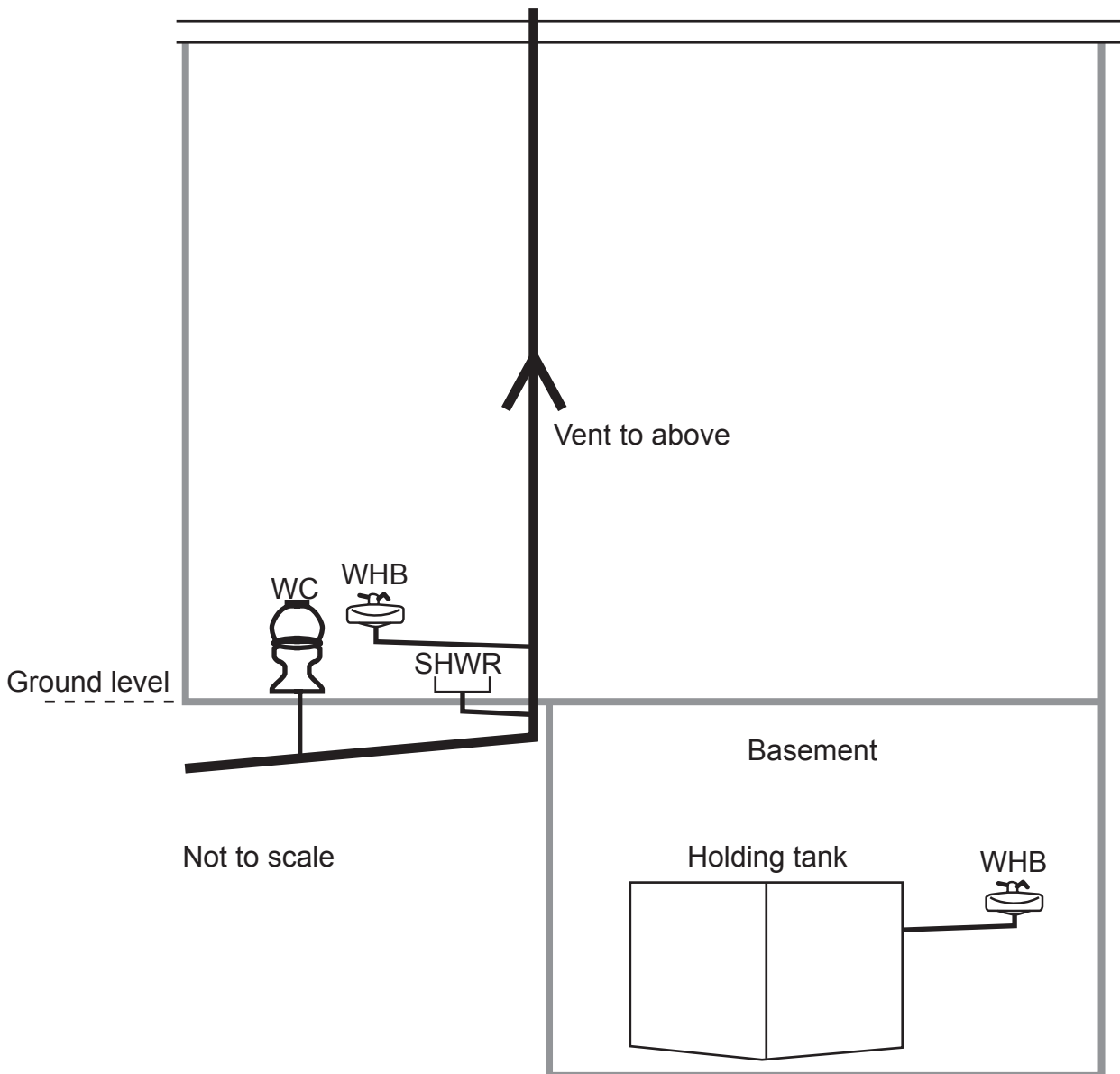
Total 8 marks

QUESTION 2

The plan on the opposite page below shows the layout of sanitary fixtures in a dwelling.

The plan is drawn to a scale of 1:100

The dwelling is to be built on a concrete pad foundation.

The drainage for the dwelling has been completed, and the connection point for the sanitary plumbing is as 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, complete the underslab pipework to show all discharge pipes and vent connections that will need to be installed before the concrete floor is poured.

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

Total 9 marks

Scale 1:100

LEGEND

WC		Sink		
Bath		Basin		
Vanity		FWG Floor waste gully		
Laundry tub		Shower		
ORG Overflow Relief Gully		Sanitary plumbing connection point		

QUESTION 3

The drawing on the opposite page 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 size for each vent pipe.

Total 9 marks
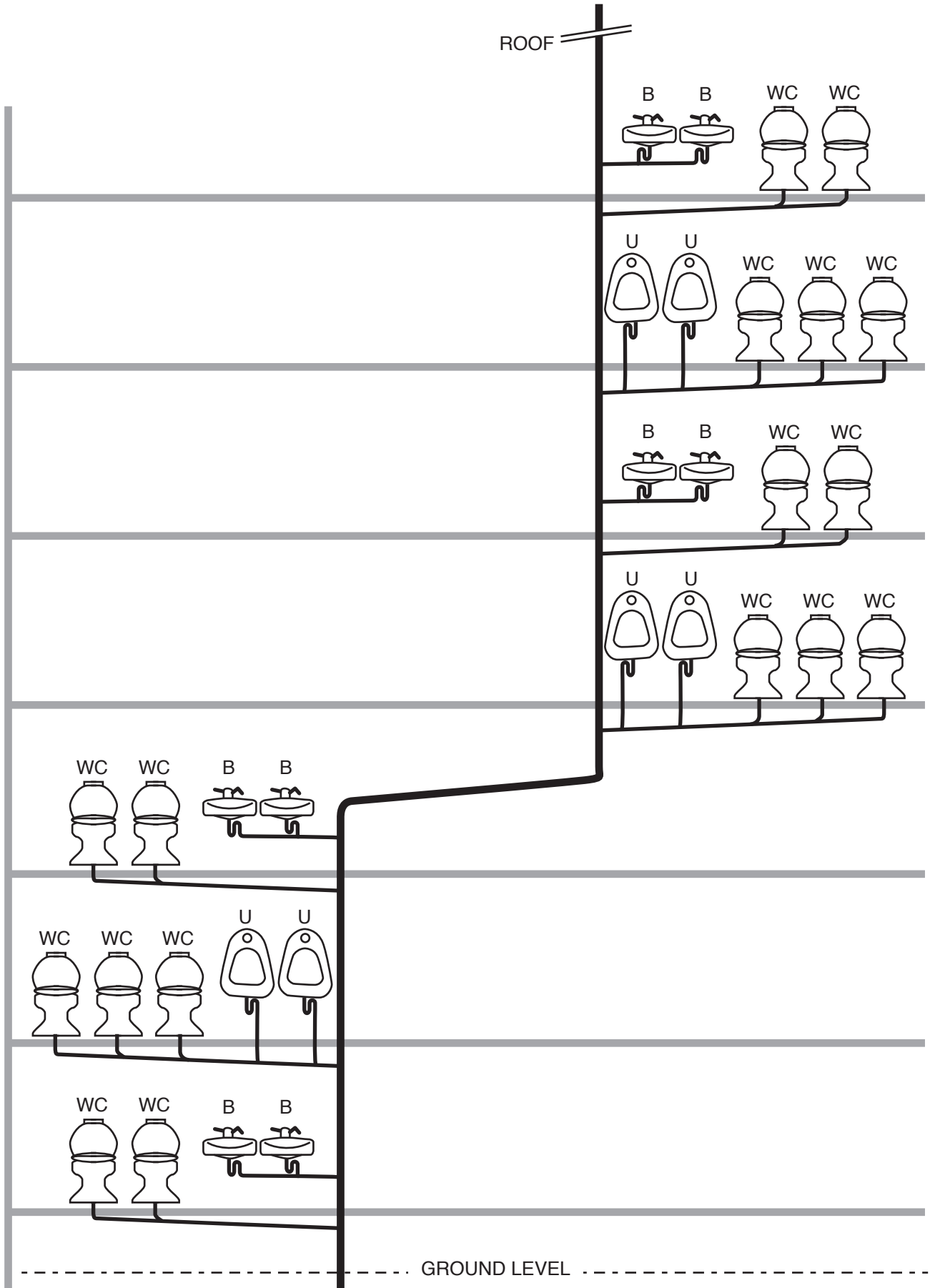
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QUESTION 4

Complete the following table by naming four different types of backflow prevention device and stating the highest hazard rating installation for which each device is suitable for back-pressure and back-siphonage situations.

| Type of device | Highest hazard rating | |
	Back-pressure	Back-siphonage

Total 8 marks

QUESTION 5

It is proposed that a 40 mm diameter hot water ring main be installed to supply the units of a motel.

(a) Each motel unit is to be connected to the ring main by a single 15 mm diameter pipe.

    (i)   Calculate how many motel units the ring main can supply.
        Formula:

$$N = \sqrt{\left(\frac{D}{d}\right)^5}$$

where
N = number of laterals (branches)
D = diameter of the ring main
d = diameter of the laterals

                                                                          (3 marks)

    (ii)   Give TWO solutions that would provide tempered water to the outlets and also protect the ring main system from legionella bacteria.

        1 _____

        2 _____

                                                (2 marks)

    (iii) The ring main is to be fitted with a circulating pump.

        State where in the ring main the pump should be fitted.

        _____

                                                  (1 mark)

QUESTION 5 (cont'd)

(b) The ring main will be supplied by two hot water storage cylinders connected in parallel.

(i) Complete the starter drawing below to show the pipework and valves required for the installation of the hot water cylinders.

Cold supply
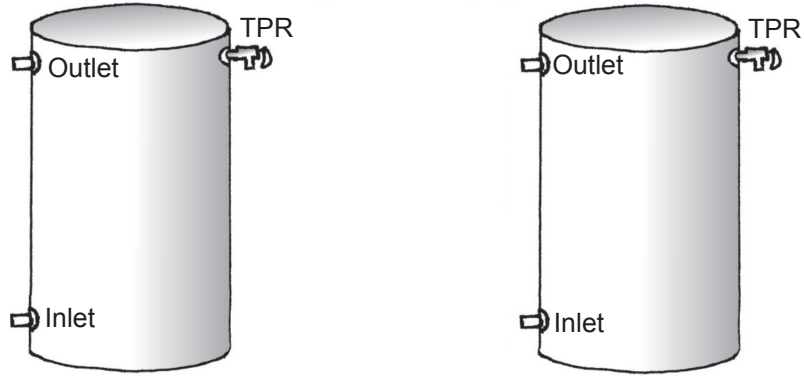
(2 marks) ☐

(ii) Give THREE advantages of installing the cylinders in parallel.

1 _____

2 _____

3 _____

(3 marks) ☐

(c) The layout requires that a section of the ring main be installed under the concrete floor of the motel.

Give the requirements that must be met for the installation and testing of this section of the pipework.

_____

_____

_____

_____

_____

(4 marks) ☐

Total 15 marks ☐

QUESTION 6

The diagram on the opposite page is a schematic of polyethylene supply pipework in a building.

The building specifications state the following:

- Support is to be provided 100 mm from the end of each pipe.
- Three clips are to be included for each tee, each located 100 mm from the tee.
- Two clips are to be included for each bend, each located 100 mm from the bend.
- The straight lengths of pipework are to be supported to comply with New Zealand Building Code Acceptable Solution G12/AS1 Water Supplies: Table 7.

Table 7 is provided below.

Table 7:	Water Supply Pipework Support Spacing Paragraph 7.1.3		
Pipe material	**Pipe diameter (mm)**	**Maximum distance between supports (m)**	
		Vertical pipe	**Graded and horizontal pipe**
Copper	10 – 15	1.5	1.2
	20 – 25	2.0	1.5
Galvanised steel	15 – 20	2.0	1.5
	25	3.0	2.5
uPVC	15 – 20	2.0	1.0
	25	2.4	1.2
Polyethylene and polybutylene (cold water supply)	15 – 20	1.5	0.75
	25	1.8	0.9
Polybutylene (hot water supply)	15 – 18	1.0	0.6
	20 – 22	1.4	0.7

Note:
The spacing for these pipe materials is based on the pipes being located within the *building* structure.
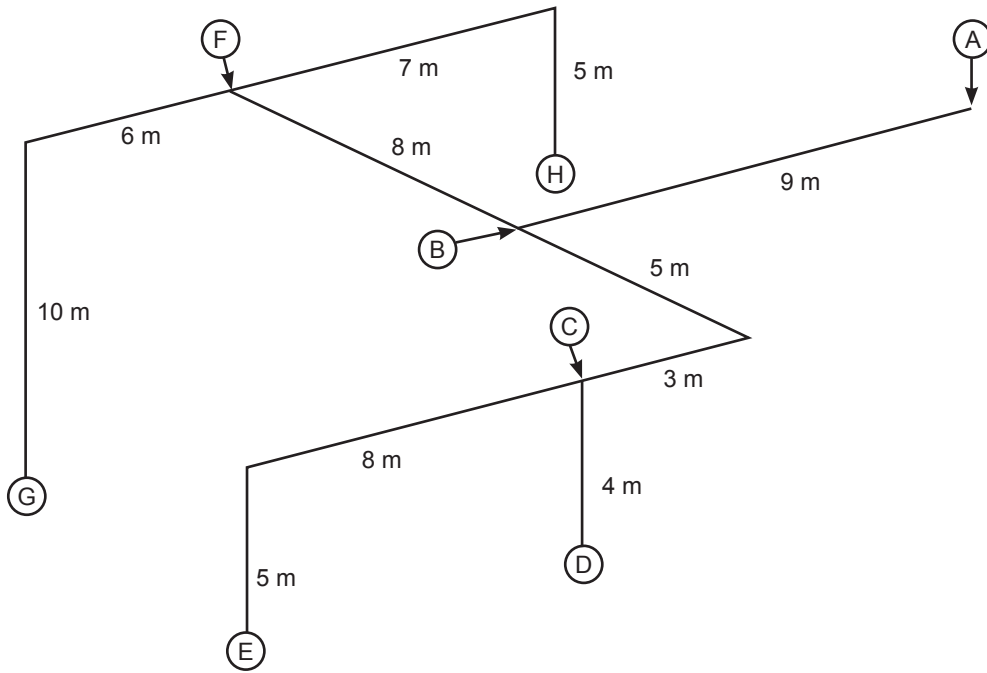
Complete the table below to show the number of clips required for each listed section of the pipework. The diameter of the pipe in each section is as shown.

Pipe section	Number of clips
A – B (25 mm)	
B – C (20 mm)	
C – D (15 mm)	
C – E (15 mm)	
B – F (20 mm)	
F – G (15 mm)	
F – H (15 mm)	

Total 7 marks

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QUESTION 7

Name THREE types or methods of fire-proofing a pipe penetration through a fire-cell wall.

1 _____

2 _____

3 _____

Total 3 marks ☐

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QUESTION 8

A 2500 litre water tank has been installed.

(a) AS/NZS 3500 Part 1: Water services recommends an initial chlorine dose of 50 mg/litre when disinfecting the tank.

Calculate how many grams of chlorine is required for the initial dose.

_____

_____

_____

_____

(2 marks)

(b) Give a circumstance in which a 50 mg/litre dose would not be adequate.

_____

(1 mark)

Total 3 marks

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QUESTION 9

(a) Minutes are taken for a safety meeting on a construction site.

Give FIVE items of information that should be recorded in the minutes.

1 _____

2 _____

3 _____

4 _____

5 _____

(5 marks)

(b) An accident report must be completed for all accidents that occur on a work site.

Give FIVE items of information that should be recorded in the accident report.

1 _____

2 _____

3 _____

4 _____

5 _____

(5 marks)

Total 10 marks

QUESTION 10

(a)   A plumber is to train a work colleague to use a piece of machinery that the colleague is not familiar with.

Give FOUR aspects regarding safety that should be covered in the training.

1   _____

2   _____

3   _____

4   _____

(4 marks)

(b)   A workplace hazard has been identified, and it is not practicable to eliminate the hazard.

State TWO actions an employer must take in this situation.

1   _____

2   _____

(2 marks)

(c)   (i)   Name FOUR hazardous substances that a plumber may use at work.

1   _____

2   _____

3   _____

4   _____

(2 marks)

(ii)   Manufacturers' instructions or product labels can contain information regarding the handling of the substances in (i).

Name the document that gives more detailed information than given in manufacturers' instructions or on product labels.

_____

(1 mark)

QUESTION 10 (cont'd)

(c)   (iii)   Give THREE items of safety information that should be obtained regarding hazardous substances before making contact with them.

1   _____

2   _____

3   _____

(3 marks) ☐

Total 12 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. To provide backflow protection, what is the minimum size for an air gap?

   A   Equal in size to the inlet pipe diameter.

   B   1.5 × the inlet diameter or 25 mm whichever is greater.

   C   2 × the inlet diameter or 25 mm whichever is greater.

   D   20 mm.

   E   40 mm.

2. Which of the following statements is correct for a bypass fitted to a backflow prevention installation?

   A   The bypass must be larger in diameter than the main.

   B   The bypass must be smaller in diameter than the main.

   C   The bypass must be the same size as the main.

   D   The bypass must be constructed of the same material as the main.

   E   The bypass must provide the same protection as the main.

3. How many seismic restraint straps must be installed on a 300 litre storage hot water cylinder?

   A   2

   B   3

   C   4

   D   5

   E   6

4. Which of the following determines the inclination at which a solar panel must be installed to give 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.

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

A   The water storage cylinder.

B   The drain tundish.

C   The circulating pump.

D   The solar panel.

E   The solar panel manifold system.

6. Which of the following best describes a solar preheater?

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

B   A pump that circulates warm water when panel temperatures drop to near freezing.

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

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

E   A selective surface coating that directs rays to the solar tubes.

7. Which of the following is an advantage of using an indirect heating system?

A   Higher temperatures can be achieved.

B   The temperature can be maintained at a more stable level.

C   One heat source can be used for both potable and non-potable hot water supplies.

D   The pressure rating of the circulating pump can be increased.

E   A tempering valve is not required on the installation.

8. A water service carrying non-potable water is to be installed.

    Which colour pipe or marking should be used to enable future identification of the pipe?

    A   Purple.

    B   Red.

    C   Yellow.

    D   Orange.

    E   Pink.

    ☐

9. What is the maximum temperature at which hot water is permitted to be delivered from a basin tap in an aged care facility?

    A   35ºC

    B   40ºC

    C   45ºC

    D   50ºC

    E   55ºC

    ☐

10. Within which distance from the top and bottom of a hot water storage cylinder must a seismic restraint be fitted?

    A   50 mm.

    B   75 mm.

    C   100 mm.

    D   150 mm.

    E   200 mm.

    ☐

11. 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

12. When multiple mains pressure storage cylinders are being installed, how many of the cylinders need to be fitted with temperature and pressure relief valves?

    A   Only the first cylinder in the installation.

    B   Only the last cylinder in the installation.

    C   The first cylinder in the installation and every second cylinder thereafter.

    D   Every cylinder in the installation.

    E   One relief valve for every three cylinders in the installation.

13. What is the maximum number of 90º bends that are permitted in a relief valve drain that is 8 metres long?

    A   4
    B   5
    C   6
    D   7
    E   8

14. Who is responsible for organising the periodic testing of a backflow prevention device?

   A   The local territorial authority.

   B   The building owner.

   C   The building architect.

   D   The installing plumber.

   E   An independently qualified person.

   ☐

15. What is the minimum period pipework concealed behind wall linings must last in order to be compliant with the New Zealand Building Code?

   A   1 year.

   B   2 years.

   C   5 years.

   D   15 years.

   E   50 years.

   ☐

16. 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.

   ☐

Total 16 marks ☐

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Question number	Marks	Marks
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