No. 9192

**Plumbers,
Gasfitters and
Drainlayers Board**

# REGISTRATION EXAMINATION, JUNE 2016
# **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 20–21 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 21 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 June 2016 were provided with the following documents:

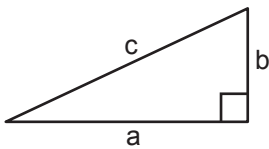- New Zealand Building Code Clause G13 – Foul Water

# USEFUL FORMULAE

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

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

$$\text{Area of circle} = \pi \times R^2 \quad \text{or} \quad \text{Area of circle} = 0.7854 \times D^2$$
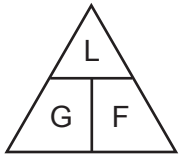
length = L

gradient = 1:G

fall = F

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

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

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**

The starter drawing below shows two kitchen sinks, one fitted with a waste disposal unit, and a dishwasher.

All fixtures and appliances are to discharge to the gully dish via a single trap.

The system is to be installed to comply with the minimum requirements of New Zealand Building Code clause G13/AS1 Foul Water.

(a)   Complete the drawing to show the discharge pipework required for the installation.



Waste disposal unit →

Dishwasher

Dishwasher outlet

Gully dish
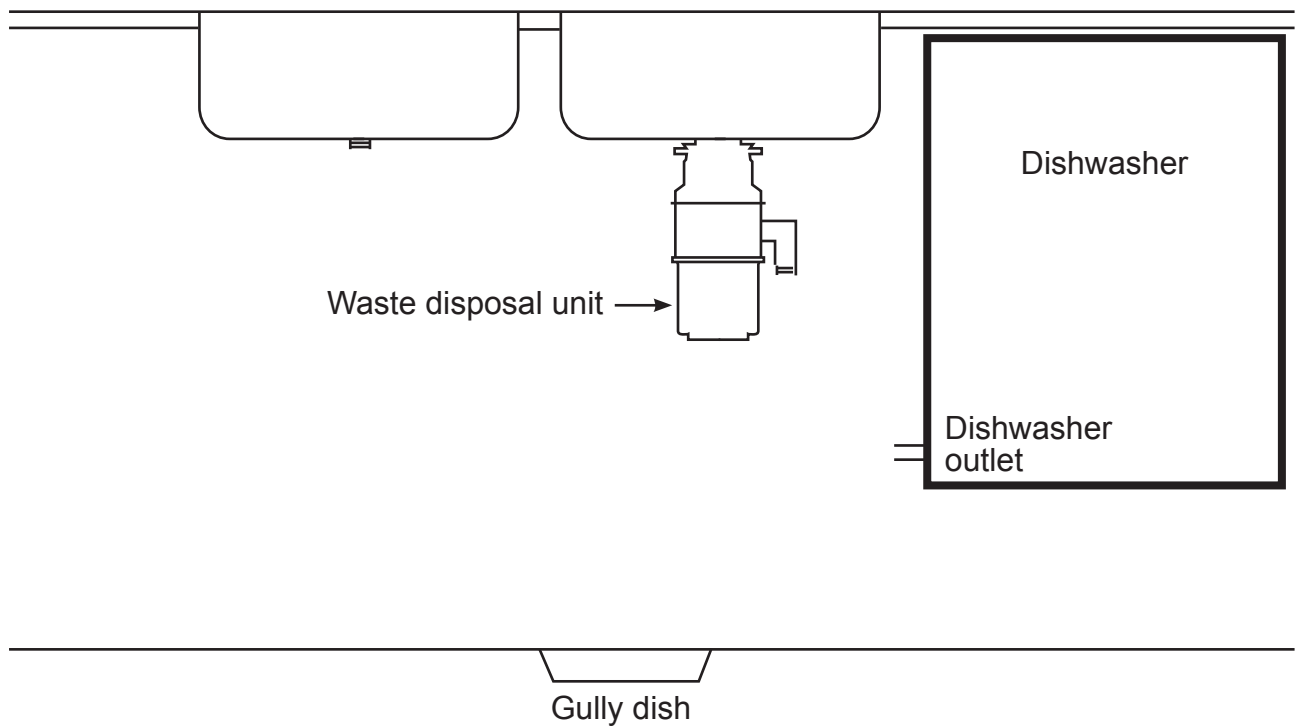
(3 mark) ☐
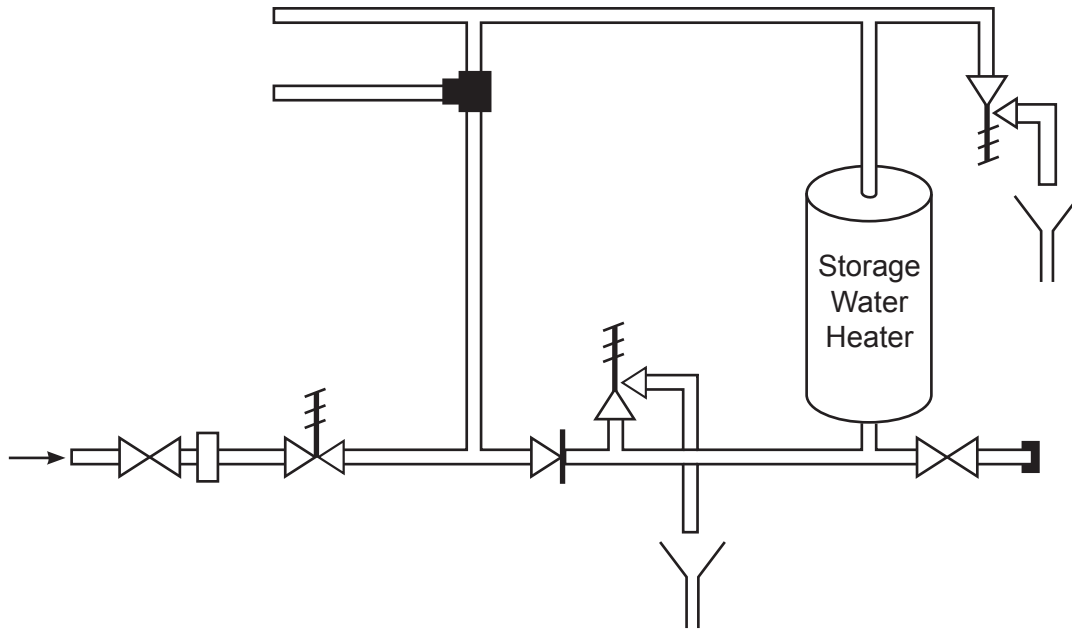
(b)   State the minimum allowable diameter for the trap and discharge pipe.

_____

(1 mark) ☐

**Total 4 marks** ☐

# QUESTION 2

The diagram below shows a hot water storage system.



A customer has complained that since this morning only cold water has been delivered through the hot taps.

Give FIVE possible reasons for this.

1 _____

2 _____

3 _____

4 _____

5 _____

**Total 5 marks** ☐

**QUESTION 3**

(a) Below are THREE possible ways a trap on a sanitary plumbing system can lose its seal.

Explain how each type of trap seal loss occurs.

    (i)    Self syphonage

_____

_____

_____

(2 marks) ☐

    (ii)    Capillary attraction

_____

_____

_____

(2 marks) ☐

    (iii)    Oscillation

_____

_____

_____

(2 marks) ☐

(b) Give THREE additional ways in which a trap on a sanitary plumbing system can lose its seal.
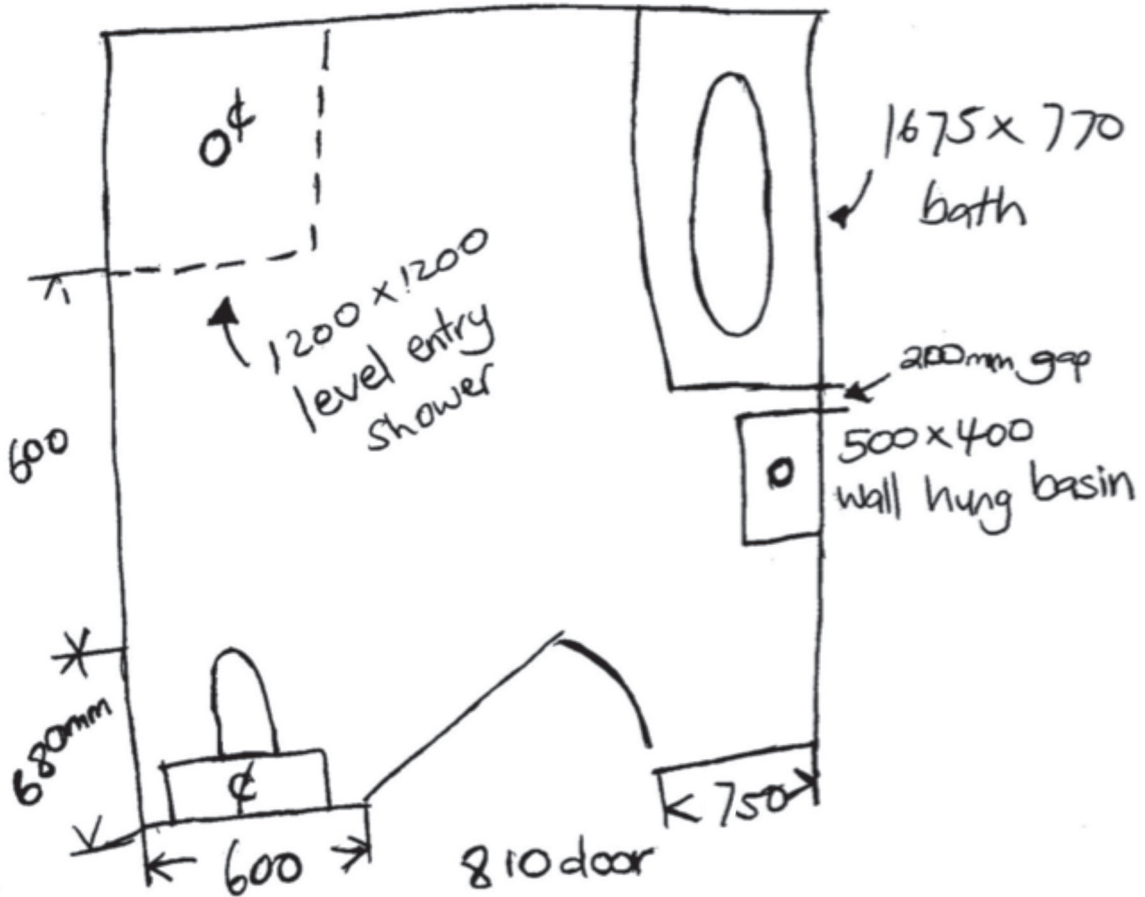
1 _____

2 _____

3 _____

(3 marks) ☐

**Total 9 marks** ☐

## QUESTION 4

A customer has supplied the sketch below for the proposed layout of sanitary fixtures in a bathroom.

On the opposite page, draw to a scale of 1:20 a plan of the bathroom and fixtures.



**Total 5 marks**

**QUESTION 5**

(a)  (i)   Describe what occurs when an air admittance valve is fitted to a discharge pipe and there is **negative** pressure situation within the pipe.

_____

_____

(2 marks)

(ii)  State the effect on the water seal of the trap.

_____

(1 mark)

(b)  (i)   Describe what occurs when an air admittance valve is fitted to a discharge pipe and there is a **positive** pressure situation within the pipe.

_____

_____

(2 marks)

(ii)  State the effect on the water seal of the trap.

_____

(1 mark)

**Total 6 marks**

**QUESTION 6**

(a)  (i)    Name FOUR risks to personal safety that are present when GMAW (MIG welding).

          1  _____

          2  _____

          3  _____

          4  _____

          (2 marks)

    (ii)    List SIX items of personal protection equipment that should be used to protect yourself when GMAW (MIG welding).

          1  _____

          2  _____

          3  _____

          4  _____

          5  _____

          6  _____

          (3 marks)

(b)  (i)    Give TWO conditions that could make the atmosphere in a confined space unsafe.

          1  _____

          2  _____

          (1 mark)

    (ii)    Give TWO methods that can be used to protect against an unsafe atmosphere in a confined space.

          1  _____

          2  _____

          (2 marks)

          **Total 8 marks**

**QUESTION 7**

(a)   Name FOUR different plastic materials used for water pipes.

1   _____

2   _____

3   _____

4   _____

(2 marks) ☐

(b)   Give FOUR different methods used when jointing plastic pipe products.

1   _____

2   _____

3   _____

4   _____

(2 marks) ☐

**Total 4 marks** ☐

**QUESTION 8**

(a)  (i)   Give the meaning of the term 'discharge unit' in relation to sanitary plumbing.

_____

(1 mark)  ☐

(ii)  State the factors that determine a discharge unit rating.

_____

_____

(1 mark)  ☐

(b)  Complete the table below to show the discharge unit rating for each of the items listed.

| Items | Discharge unit rating |
|---|---|
| WC pan with cistern | |
| Dishwasher (domestic) | |
| Wall-hung urinal | |
| Double laundry tub | |
| Commercial kitchen sink | |
| Bath | |

(3 marks)  ☐

**Total 5 marks**  ☐

**QUESTION 9**

(a)  (i)  Give the meaning of the term 'high hazard' in relation to cross connection.

_____

(1 mark) ☐

(ii)  Give THREE situations that are considered to be high hazard in relation to cross connection.

1  _____

2  _____

3  _____

(3 marks) ☐

(b)  (i)  Give the meaning of the term 'medium hazard' in relation to cross connection.

_____

(1 mark) ☐

(ii)  Give TWO situations that are considered to be medium hazard in relation to cross connection.

1  _____

2  _____

(2 marks) ☐

(c)  (i)  Give the meaning of the term 'low hazard' in relation to cross connection.

_____

(1 mark) ☐

(ii)  Give ONE situation that is considered to be low hazard in relation to cross connection.

_____

(1 mark) ☐

**QUESTION 9 (cont'd)**

(d)  Name THREE diseases that could be contracted from an untreated water supply.

1  _____

2  _____

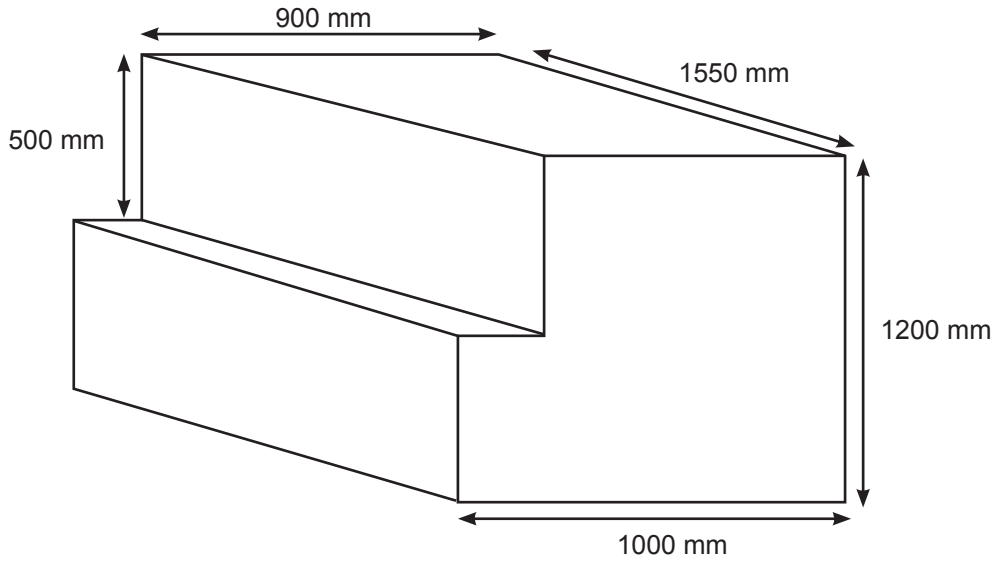3  _____

(3 marks) ☐

**Total 12 marks** ☐

## QUESTION 10

The diagram below shows a section of open ended sheet metal ducting.

The diagram is not to scale.



(a) Calculate in m² the area of sheet metal required to construct the ducting. Make no allowance for laps.

_____

_____

_____

(5 marks) ☐

(b) Calculate the volume of the ducting.

_____

_____

_____

(3 marks) ☐

**Total 8 marks** ☐

**QUESTION 11**

(a) Give THREE requirements that must be met by the connection between the outlet of a WC pan and the discharge pipe.

1 _____

2 _____

3 _____

(3 marks) [ ]

(b) State the minimum allowable diameter for a discharge pipe receiving waste from a WC pan.

_____

(1 mark) [ ]

(c) State the minimum allowable gradient for a discharge pipe receiving waste from a WC pan.

_____

(1 mark) [ ]

**Total 5 marks** [ ]

**QUESTION 12**

(a)  Below are symbols used for valves found in a water supply system.

Give the name of each of the symbols shown.

(i)  _____

(ii)  _____

(iii)  _____

(iv)  _____

(v)  _____

(vi)  _____

(6 marks)

(b)  Name THREE types of valve that will automatically turn a water supply off when required.

1  _____

2  _____

3  _____

(3 marks)

**Total 9 marks**

**QUESTION 13**

(a)  Calculate the amount of fall required when 6.8 m of pipe is to be laid at a gradient of 1:40

_____

_____

(1 mark)

(b)  Calculate the gradient of a 5.4 m length of pipe that has been laid with 67 mm of fall.

_____

_____

(1 mark)

(c)  Write a gradient of 1:120 as a percentage.

_____

_____

(1 mark)

(d)  Write a gradient of 1.65% as a ratio.

_____

_____

(1 mark)

**Total 4 marks**

**QUESTION 14**

Give the meaning of each of the following terms in relation to hot water systems.

(a) Stratification

_____

_____

(b) Peak load

_____

_____

(c) Uncontrolled heat source

_____

_____

(d) Quick recovery system

_____

_____

(e) Indirect

_____

_____

(f) Open vented

_____

_____

**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.

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

1.  Which statement best describes an oxidising flame?
    A    A flame with a feathered intermediate cone.
    B    A flame that has equal proportions of oxygen and acetylene.
    C    A luminous flame used when welding iron or steel.
    D    A noisy flame with a pointed, blue inner cone.
    E    An ideal flame to use when lead burning.

2.  Which of the following decreases as water is heated?
    A    The boiling point of the water.
    B    The density of the water.
    C    The pressure of the water.
    D    The velocity of the water.
    E    The volume of the water.

3.  How many litres of water can be contained in 1 cubic metre at 4°C?
    A    10
    B    100
    C    1000
    D    10 000
    E    100 000

4.   What are the minimum requirements that must be met when a new water pipework installation is being tested for soundness?

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.   What does the term positive displacement mean in relation to pumps?

A   The pump can be fitted above the supply water level.

B   The pump can be fitted below the supply water level.

C   The pump is capable of providing a flow rate above 50 litres/minute.

D   The pump will grind any solids and discharge them with the liquid.

E   The pump moves a measured portion of liquid by a plunger or gear.

6.   Which of the following pumps is a non-displacement type pump?

A   Centrifugal pump.

B   Gear pump.

C   Hydraulic ram.

D   Reciprocating pump.

E   Rotary pump.

7.   What is the maximum theoretical height that a pump is able to lift water when installed at sea level?

A   3.6 m.

B   7.85 m.

C   9.81 m.

D   10.3 m.

E   101.3 m.

8. How is the head pressure of a low pressure system determined?

    A    Calculating the friction losses for fittings and valves used in the system.

    B    Timing how long it takes to fill a container when the outlet is fully open.

    C    Measuring the developed length between the storage tank and the system outlet.

    D    Measuring the vertical distance between the highest water level and floor level.

    E    Measuring the vertical distance between the highest water level and the system outlet.

    ☐

9. How does a quick recovery hot water cylinder differ from a standard hot water cylinder?

    A    It has a second element located higher in the cylinder.

    B    It is fitted with higher grade insulation.

    C    It operates at higher pressures.

    D    The element has a higher kilowatt rating.

    E    The thermostat is set to a higher temperature.

    ☐

10. Under which circumstance is an isolating valve not required on the drain pipe from a storage hot water cylinder?

    A    When the cylinder is connected to a wet back.

    B    When the drain terminates outside the building with a cap or plug.

    C    When the storage hot water cylinder has a cold water expansion valve fitted.

    D    When the thermostat is set at or below 70°C.

    E    When the water heater is supplied from a ceiling tank.

    ☐

**Total 10 marks** ☐

This page is available for additional working or answers

Question number _____

This page is available for additional working or answers

Question number _____

For Examiner's use only

| Question number | Marks | Marks |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| Section B | | |
| Total | | |