No. 9192

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◆ Plumbers,
◆ Gasfitters and
○ Drainlayers Board

REGISTRATION EXAMINATION, NOVEMBER 2013
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.

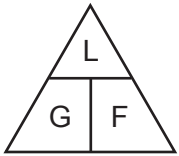**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION**

Candidates that sat this examination in November 2013 were provided with the following document:

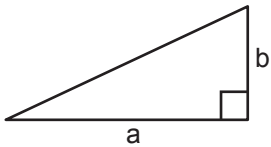· New Zealand Building Code Clause G13 Foul Water

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

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

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

(a)   Sketch and label a cross-sectional diagram of a ball-cock as used to fill a water storage tank.
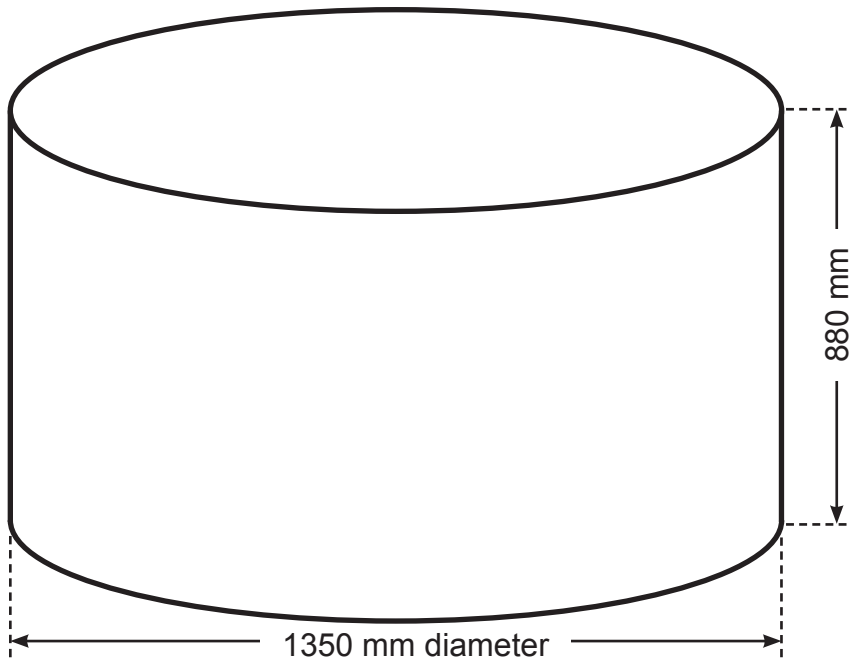
(6 marks)

(b)   Explain how a ball-cock operates.

_____

_____

_____

(2 marks)

(c)   List, in sequence, the steps required to replace a washer in a brass ball-cock.

_____

_____

_____

_____

(3 marks)

Total 11 marks

QUESTION 2

The diagram below shows a cylindrical water tank.

(a)   Calculate the capacity of the tank in litres.

_____

_____

_____

_____

_____

_____

(3 marks)

QUESTION 2 (cont'd)

(b)   The water tank is to be constructed from sheet metal.

       Draw a 1:20 scale pattern to show the sheet metal required to make the tank. Make no allowance for laps, and do not include a lid.

(5 marks)

Total 8 marks

QUESTION 3

A plumber has been called regarding each of the following complaints.

(a)   There is green staining on a sanitary fixture directly under a leaking tap outlet.

Give the likely reason why the staining is green.

_____

_____

(1 mark) ☐

(b)   The flow rate from a shower rose has reduced.

Give THREE different possible causes for this.

1   _____

2   _____

3   _____

(3 marks) ☐

(c)   A kitchen sink waste has begun to make gulping noises as the water discharges.

Give a likely reason for this.

_____

_____

(1 mark) ☐

(d)   The water temperature of a shower fluctuates during use.

Give TWO likely causes of this.

1   _____

2   _____

(2 marks) ☐

QUESTION 3 (cont'd)

(e) A banging noise is heard when a newly installed single lever mixer is turned off.

Give THREE ways in which the situation could be remedied.

1 _____

_____

2 _____

_____

3 _____

_____

(3 marks) ☐

Total 10 marks ☐

QUESTION 4

(a) Name the TWO main metals used to manufacture brass.

1 _____

2 _____

(2 marks) [　]

(b) The letters DR are often seen on brass fittings.

Give the meaning of this symbol.

_____

_____

(1 mark) [　]

(c) Give TWO different methods for protecting metal pipe from corrosion when installing it in the ground.

1 _____

2 _____

(2 marks) [　]

Total 5 marks [　]

QUESTION 5

(a) Name FOUR different pieces of equipment that could be used to safely access work at a high level.

1 _____

2 _____

3 _____

4 _____

(4 marks)

(b) Name THREE pieces of equipment that can be used to prevent injury in the case of a fall from a height.

1 _____

2 _____

3 _____

(3 marks)

Total 7 marks

QUESTION 6

(a)   The diagrams below show two ways of connecting solar panels in an installation.

  (i)   Name the type of manifold system which has been used to connect the panels together in Figure 1.
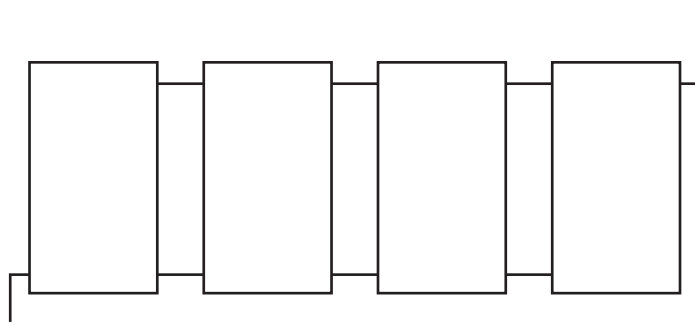
_____

Figure 1

(1 mark) ☐

  (ii)   Name the type of manifold system which has been used to connect the panels together in Figure 2.
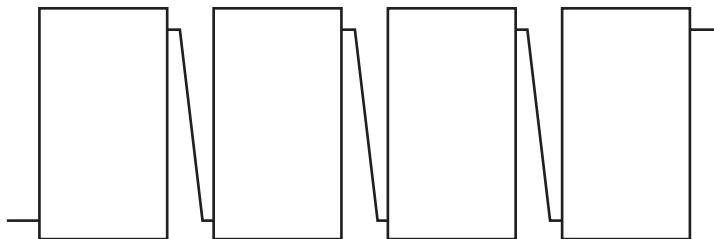
_____

Figure 2

(1 mark) ☐

(b)   Name TWO methods that can be used to circulate water through the solar hot water system.

  1   _____

  2   _____

(2 marks) ☐

Total 4 marks ☐

QUESTION 7

(a) A pump is being selected to supply water to a building.
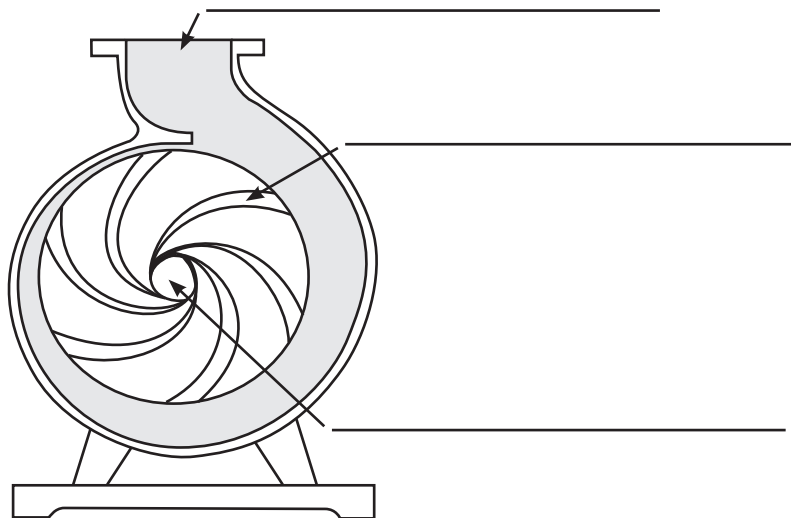
State THREE on-site linear measurements that are required to select a suitable pump for the installation.

1 _____

2 _____

3 _____

(3 marks)

(b) The diagram shows a cross-section of a centrifugal pump.

Name the THREE parts indicated by arrows.

(3 marks)

(c) Give an advantage a centrifugal pump has compared with a reciprocating pump.

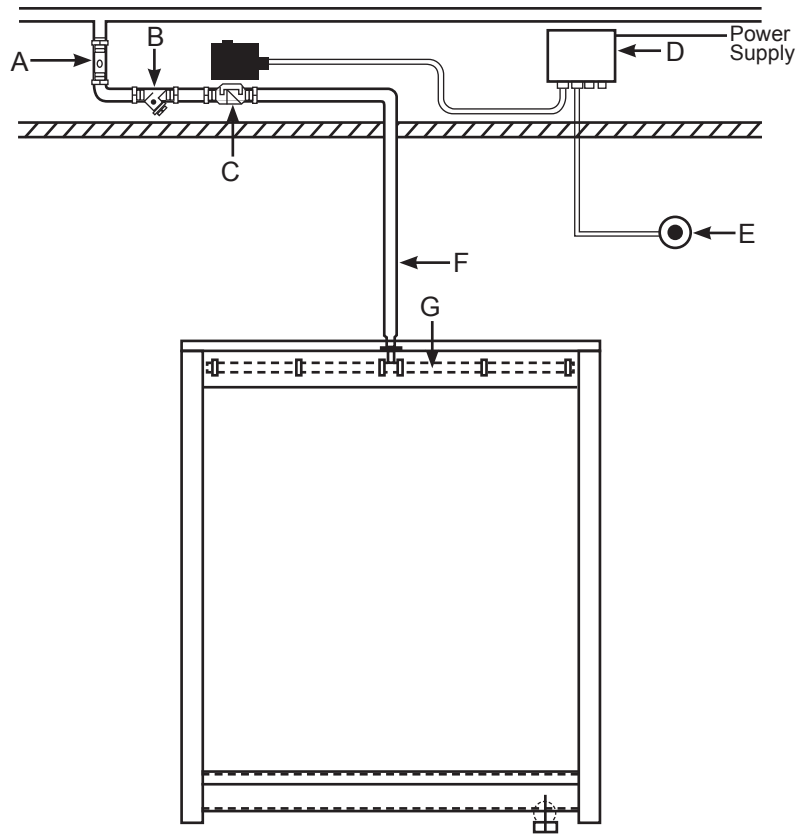_____

(1 mark)

(d) Give an advantage a reciprocating pump has compared with a centrifugal pump.

_____

(1 mark)

Total 8 marks

QUESTION 8

(a)   The diagram below shows the layout of an automatic urinal flushing system.

Complete the table below to show the names of each component labelled A – G.

Label	Name
A	
B	
C	
D	
E	
F	
G	

(7 marks)

QUESTION 8 (cont'd)

(b)   Describe how the system in (a) operates.

_____

_____

_____

_____

_____

(3 marks)

Total 10 marks

QUESTION 9

The diagrams A – D below show various backflow prevention devices.

A

B

C

D
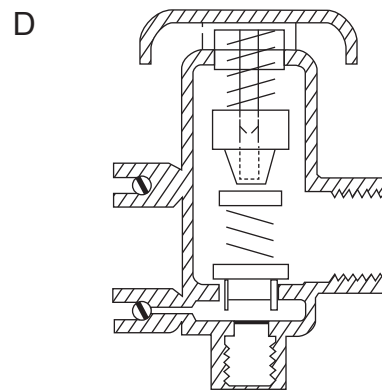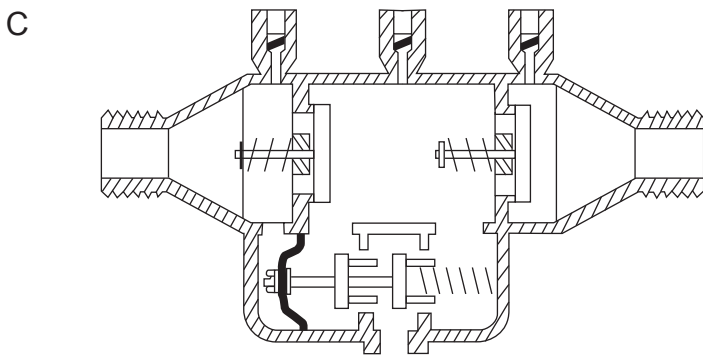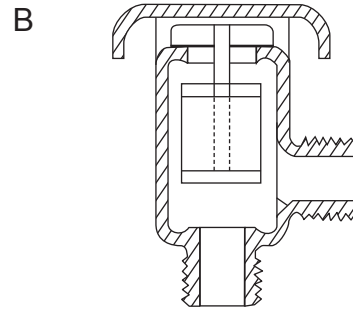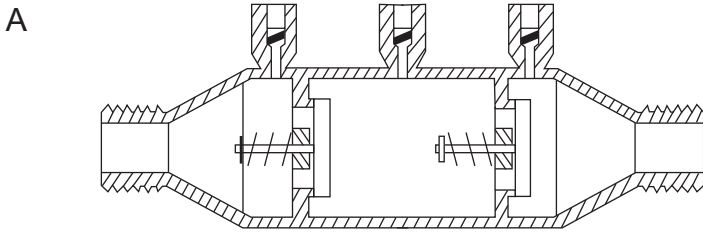
In the table below, write in full the name of each device, and tick the appropriate box(es) to show the required location(s) of any isolation valve(s) required when installing each device.

	Name of device in full	Tick if isolation valve is required upstream	Tick if isolation valve is required downstream
A			
B			
C			
D			

Total 8 marks

QUESTION 10

(a) Boyle's Law and Charle's Law involve three quantities.

Name these quantities.

1 _____

2 _____

3 _____

(3 marks)

(b) (i) Sketch a Venturi.

(1 mark)

(ii) Describe how a Venturi works.

_____

_____

_____

_____

(2 marks)

(iii) Give an example of where a Venturi is used in a plumbing system.

_____

(1 mark)

Total 7 marks

QUESTION 11

(a) State the purpose of a water seal in a sanitary plumbing system.

_____

_____

_____

(1 mark) ☐

(b) Give TWO situations in which a water seal is NOT required on a discharge pipe.

1 _____

2 _____

(2 marks) ☐

Total 3 marks ☐

QUESTION 12

(a) (i) Describe the term discharge unit in relation to sanitary plumbing.

_____

_____

(ii) Explain how a discharge unit rating is determined.

_____

_____

(2 marks)

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

Items	Discharge unit rating
Bath	
Wall-hung urinal	
Dishwasher	
WC pan	
Commercial kitchen sink	
Double laundry tub	

(3 marks)

Total 5 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 marks will be awarded for that question.

1. What is the purpose of a heat trap in a plumbing system?
   A   To absorb energy from the sun in a solar water heating system.
   B   To prevent a thermosiphon current from forming.
   C   To improve the efficiency of a central heating system.
   D   To recover heat from waste hot water in a commercial premises.
   E   To control the temperature of water within a hot water ring main.

2. What is the minimum distance above an opening window at which a vent pipe is permitted to terminate?
   A   150 mm.
   B   300 mm.
   C   450 mm.
   D   600 mm.
   E   1000 mm.

3. Which of the following is an acceptable location for a double 'Y' junction?
   A   Where two branches enter a discharge stack at the same level.
   B   Where a floor waste gully is receiving the discharge from two or more fixtures.
   C   Where a discharge stack requires a vent on an offset.
   D   Where two kitchen sinks are connected to a single trap.
   E   Where two relief valves are connecting to the waste system via a combined drain.

4. Which of the following does not require an access point to be included in order to comply with New Zealand Building Code Clause G13/AS1 Foul Water?

A   At the junction of a soil discharge pipe with a discharge stack.

B   Where a discharge pipe includes a number of changes of direction.

C   In a discharge pipe where access to junctions or changes of direction are restricted.

D   At the base of any soil stack at the point of connection to the drain.

E   At the junction of a relief vent with a discharge stack.

5. Which of the following sanitary fixtures is permitted to discharge to a floor waste gully?

A   WC pan.

B   Bidet.

C   Urinal.

D   Slop hopper.

E   Kitchen sink.

6. Which of the following pumps is NOT a positive displacement type pump?

A   Diaphragm pump.

B   Gear pump.

C   Centrifugal pump.

D   Reciprocating pump.

E   Rotary pump.

7. Which of the following MUST be included in an indirect hot water system?

A   A heat exchanger.

B   A temperature pressure relief valve.

C   A diffuser.

D   A solar panel.

E   A boiler.

8. Which of the following can reduce the effects of temporarily hard water?

   A   Carbon filter.

   B   Aerator.

   C   Line strainer.

   D   Chlorine.

   E   Boiling.

   ☐

9. What is the minimum allowable diameter for a vent pipe connected to a 50 mm discharge pipe?

   A   25 mm.

   B   32 mm.

   C   40 mm.

   D   50 mm.

   E   65 mm.

   ☐

10. In accordance with NZ Building Code Clause G13/AS1 Foul Water, what is the maximum allowable length for an unvented fixture discharge pipe discharging over a gully?

   A   2.0 m.

   B   2.5 m.

   C   3.0 m.

   D   3.5 m.

   E   4.0 m.

   ☐

11. What is the minimum permissible gradient of a 65 mm diameter fixture discharge pipe?

   A   1:20

   B   1:25

   C   1:30

   D   1:40

   E   1:60

   ☐

12. What is the minimum separation distance between supports on the vertical section of a 100 mm diameter uPVC soil stack?

A   1.0 m.

B   1.2 m.

C   1.8 m.

D   2.5 m.

E   3.0 m.

☐

13. How many millimetres fall will a 3 metre length of pipe that has been laid at a gradient of 1:20 have?

A   0.05

B   0.15

C   1.5

D   15

E   150

☐

14. A 5 metre length of pipe has 83 mm fall.

What gradient has the pipe been laid at?

A   1:10

B   1:20

C   1:40

D   1:60

E   1:80

☐

Total 14 marks ☐