Affix label with Candidate Code Number here.
If no label, enter candidate Number if known

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No. 9192

Plumbers, Gasfitters and Drainlayers Board

REGISTRATION EXAMINATION, NOVEMBER 2009

PLUMBING

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 21–23 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

The following are NOT permitted in the examination room:

Any publications, Acts, Regulations, Codes of Practice, or Standards

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

QUESTION 1

(a) Asbestos products on a bulding site may be a danger to health.

In regard to safety, answer the following questions.

(i) To be authorised to remove asbestos products, a person must be appropriately trained and qualified.

State what he or she must be trained in.

_____

_____

(1 mark) ☐

(ii) Name the body which is authorised to issue the certificate to carry out the work in (i).

_____

(1 mark) ☐

(iii) List FOUR trade-related areas where plumbers may encounter asbestos during the course of their work.

1 _____

2 _____

3 _____

4 _____

(2 marks) ☐

(b) Under the Health and Safety in Employment Act, some work is notifiable.

Give FOUR examples of notifiable work.

1 _____

2 _____

3 _____

4 _____

(4 marks) ☐

Total 8 marks ☐

QUESTION 2

(a) Define the following terms as they relate to plumbing.

(i) Capillary attraction: _____

_____

(ii) Friction: _____

_____

(iii) Non-ferrous metal: _____

_____

(iv) Potable water: _____

_____

(v) Solvent welding: _____

_____

(vi) Hydrostatics: _____

_____

(vii) Hydraulics: _____

_____

(7 marks) ☐

(b) There are three main factors determining the amount of flow from an open ended pipe.

One of these is frictional loss. Name the other TWO.

1 _____

2 _____

(1 mark) ☐

QUESTION 2 (cont'd)

(c) At sea level, the atmosphere can support a column of water in a vacuum tube to a height of approximately 10.3m.

(i) If the water was replaced with mercury, would the height of 10.3m change?

_____

(ii) Give a reason for your answer to (i).

_____

_____

(1 mark) ☐

(d) Answer the following questions in relation to the behaviour of water.

(i) State the temperature at which water is most dense.

_____

(1 mark) ☐

(ii) When water converts to steam, it expands. State the number of times it expands from its original volume.

_____

(1 mark) ☐

(iii) State how the temperature at which water boils can be changed.

_____

(1 mark) ☐

(iv) Describe how water expands as it is heated.

_____

(1 mark) ☐

Total 13 marks ☐

QUESTION 3

(a) A low pressure storage hot water cylinder is open vented.

The cylinder is fed from a cold water supply tank.

The supply tank and open vent are removed and are not replaced.

Describe how hot water can now be supplied from the existing cylinder.

_____

_____

(2 marks)

(b) State what action must be taken to inhibit the growth of legionella bacteria in a storage hot water cylinder.

_____

(1 mark)

(c) Individual sanitary appliances in a hospital are to be fed by a supply tank with an air gap to give back-flow protection.

(i) Give TWO sanitary fixtures that use this method of protection.

1 _____

2 _____

(2 marks)

(ii) Give the requirements regarding the minimum air gap to be maintained in the supply tank.

_____

_____

_____

(2 marks)

QUESTION 3 (cont'd)

(d) A reduced pressure zone device (RPZD) is to be installed for back-flow prevention.

State FOUR requirements, as specified in the New Zealand Building Code, that must be met regarding the location of the RPZD.

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

(4 marks)

Total 11 marks

QUESTION 4

(a) Rain water falling on a flat metal roof is to be collected.

The roof is 12.600m wide and 15.500m long.

A rainstorm has an intensity of 25mm/hour for a period of 15 minutes.

Calculate, in litres, the amount of rainwater collected during the rainstorm. Show all working to 3 decimal places.

(2 marks)

(b) A steel cylinder is to be constructed.

The cylinder is to contain 0.800m³ of water.

The length of the cylinder is to be 0.450m.

Calculate the diameter of the cylinder in metres. Show all working to 3 decimal places.

Formula:
$V = 0.7854 \times D^2 \times L$
where
V = Volume
D = Diameter
L = Length

(3 marks)

QUESTION 4 (cont'd)

(c) Hot water from a storage hot water cylinder is to be mixed with cold water to deliver tempered water.

The stored hot water temperature is 70°C.

Cold water is delivered at 20°C.

The temperature of the tempered water is to be 45°C.

Calculate, in litres, the amount of hot water required to produce 620 litres of tempered water. Show all working to 3 decimal places.

Formula:
Litres hot water × temp. rise cold to hot = litres mixed water × temp. rise cold to mixed

(3 marks)

(d) A rectangular tank is 2.400m high, 3.800m long and 1.200m wide.

The tank contains water to 60% of its capacity.

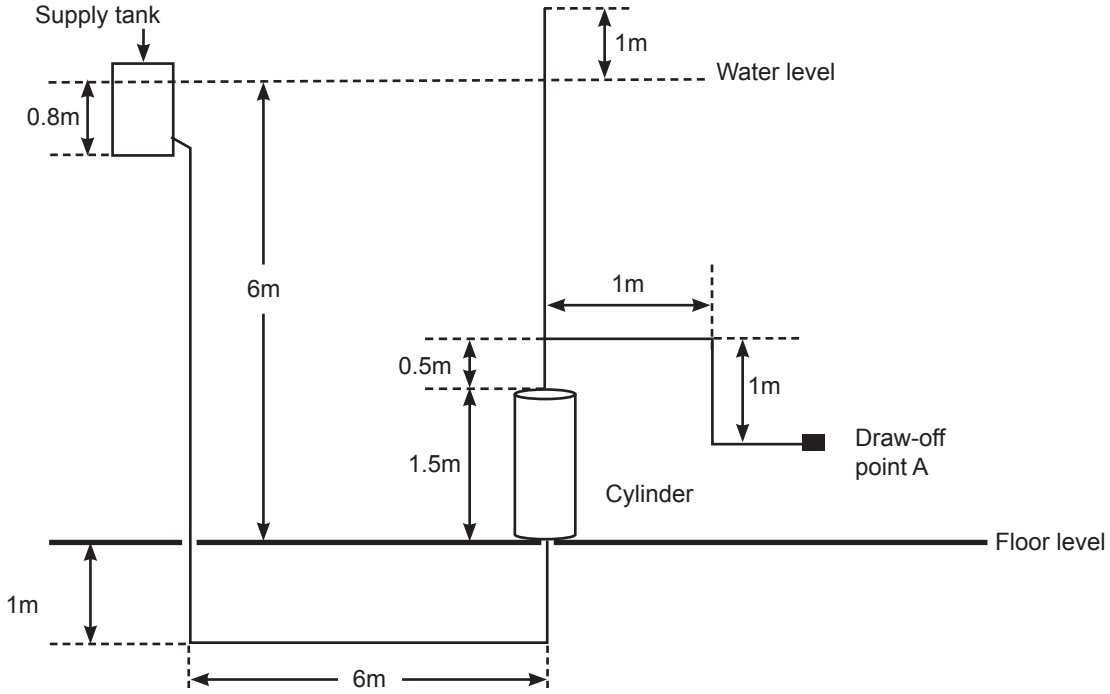
Calculate, in litres, the amount of water in the tank. Show all working to 3 decimal places.

(2 marks)

Total 10 marks

QUESTION 5

(a) The drawing below represents the pipe work and outlet from a low pressure storage hot water system fed by a supply tank.



Do NOT use rounded values in answering the following.

(i) Calculate the pressure in kPa at the base of the cylinder.

(½ mark)

(ii) Calculate the pressure in kPa at the draw-off point A.

(½ mark)

(iii) Calculate the pressure in kPa at the top of the cylinder.

(½ mark)

(iv) Calculate the pressure in kPa at the base of the supply tank.

(½ mark)

QUESTION 5 (cont'd)

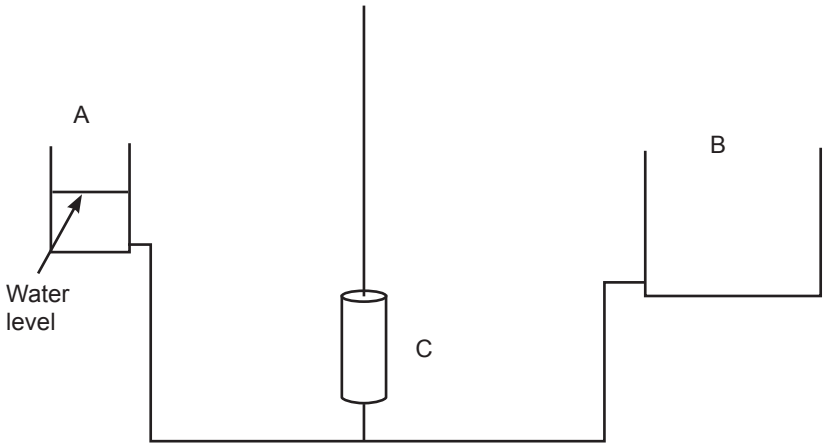
(b) The diagram below shows three containers.

The containers are linked together by a pipe.

Container A is rectangular. It holds 1500 litres.

Container B is rectangular. It holds 3000 litres.

Container C is cylindrical. It holds 300 litres. It has a 20mm vent pipe.



Container A is half full, as shown.

(i) Draw a line on the diagram to show the level of water in container B.

(ii) Draw a line on the diagram to show the level of water in system C.

(iii) Give a reason for your answers (i) and (ii).

_____

_____

(2 marks)

(c) Explain what determines the water pressure at the outlet on a low pressure open vented hot water system.

_____

_____

(1 mark)

Total 5 marks

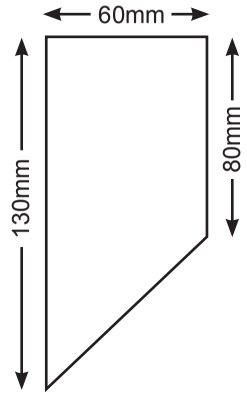
QUESTION 6

The drawing below shows a cutaway section of a cylindrical metal tube.

The drawing is not to scale.

Using the measurements given, on the page opposite develop an accurate full size pattern for the construction of this tube. Do not allow for laps.

Formula:
C = 3.142 × D
where
C = Circumference
D = Diameter



Not to scale

Total 5 marks

QUESTION 7

(a) Indirect water heating is often used in the heating and circulation of hot water.

(i) Give THREE reasons why indirect water heating systems may be used.

1 _____

_____

2 _____

_____

3 _____

_____

(6 marks)

(ii) Give another name commonly used in the plumbing industry for an indirect hot water heater.

_____

(1 mark)

(iii) Give TWO types of heat exchanger used in indirect water heating systems.

1 _____

2 _____

(2 marks)

QUESTION 7 (cont'd)

(b) An air conditioning system is to be commissioned.

Part of the system incorporates a water spray.

(i) Give the main function of the water spray.

_____

(1 mark) ☐

(ii) State the effect the water spray will have on humidity.

_____

(1 mark) ☐

(iii) Give TWO methods of managing the excess water from the water spray.

1 _____

2 _____

(1 mark) ☐

Total 12 marks ☐

QUESTION 8

(a) Using your knowledge of New Zealand Building Code clause G13/AS1 Foul Water, complete the following measurements in relation to the termination point of an open ventilation pipe serving discharge pipes directly connected to the foul water drainage system.

(i) Be at least _____ m above ground level.

(ii) Be above windows and other openings by at least _____ mm.

(iii) Be at least _____ mm above roofs.

(iv) Be clear of any deck having pedestrian access by at least _____ m both horizontally and vertically.

(v) Be clear of eaves and parapets by at least _____ mm both horizontally and vertically above.

(vi) Be clear of air intakes by at least _____ m in any direction.

(3 marks)

(b) The New Zealand Building Code Clause G13/AS1 Foul Water gives requirements that apply to the installation of ventilation pipes for discharge stacks.

Give THREE requirements, excluding clearances, that the ventilation pipe must meet.

1 _____

_____

2 _____

_____

3 _____

_____

(3 marks)

(c) (i) Name TWO Acts of Parliament under which sanitary plumbing work is regulated.

1 _____

2 _____

(2 marks)

QUESTION 8 (cont'd)

(ii) Compliance documents for the New Zealand Building Code contain several clauses.

State the title of each of the following clauses.

G12: _____

B2: _____

E2: _____

G1: _____

(2 marks)

Total 10 marks

QUESTION 9

Answer the following questions based on your knowledge of the New Zealand Building Code Clause G13/AS1 Foul Water.

(a) (i) State the purpose of a water trap.

_____

_____

(1 mark)

(ii) State the minimum depth of water seal that must be retained in a trap under normal working conditions.

_____

(1 mark)

(iii) A discharge pipe is losing trap seal by siphonage.

Give TWO methods by which the siphonage could be stopped.

1 _____

2 _____

(2 marks)

(b) (i) Water traps for sanitary fixtures must have provision for cleaning.

State the type of trap that must be installed when a water trap draining a shower floor is not accessible.

_____

(1 mark)

(ii) State the requirement for the location of a water trap serving a sanitary fixture.

_____

(1 mark)

QUESTION 9 (cont'd)

(iii) Give FOUR situations where a single water trap may serve a combination of multiple outlets.

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

(4 marks)

Total 10 marks

QUESTION 10

(a) One method of making a water tight joint between copper tube and a male connector is by using a manipulative joint.

Give TWO types of manipulative joint, and describe how each is formed.

Type 1: _____

Description: _____

_____

_____

Type 2: _____

Description: _____

_____

_____

(3 marks)

(b) A centrifugal pump is being used to pump water.

The pump is running.

(i) Give FOUR possible causes of NO water flowing at the discharge point of the pipeline.

1 _____

2 _____

3 _____

4 _____

(2 marks)

QUESTION 10 (cont'd)

(ii) Give FOUR possible causes of LOW DISCHARGE of water at the discharge point of the pipeline.

1 _____

2 _____

3 _____

4 _____

(2 marks)

(c) A foot valve is installed on the suction pipe of a water pump.

(i) State the purpose of the foot valve.

_____

_____

(1 mark)

(ii) State how the pressure is maintained in a pumped system having a flooded suction line.

_____

_____

(1 mark)

Total 9 marks

QUESTION 11

(a) (i) Describe what happens when metals are welded together.

_____

_____

(ii) State how brazing differs from welding.

_____

(2 marks)

(b) One method of welding or brazing uses oxygen and acetylene gas cylinders.

(i) Describe the types of construction used for each of these cylinders.

Oxygen: _____

Acetylene: _____

(ii) State what an acetylene cylinder contains apart from gas.

_____

(2 marks)

(c) Give, in order, the steps in the procedure for solvent welding a short length of uPVC pressure pipe into a socket.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(3 marks)

Total 7 marks

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