No. 9193

Plumbers, Gasfitters and Drainlayers Board

REGISTRATION EXAMINATION, NOVEMBER 2015
LICENSED GASFITTER

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 15–17 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 17 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 2015 were provided with the following documents:

- AS/NZS 5601.2013 Part 1: General installations

- AS/NZS 5601.2013 Part 2: LP Gas installations in caravans and boats for non-propulsive purposes

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

Heating time   = $\dfrac{\text{mass of water (kg) × 4.2 × temp diff (ºC) × 100}}{\text{heat energy input per hour in kJ × efficiency (\%)}}$

Correction factor   = $\dfrac{\text{atmospheric pressure + supply pressure}}{\text{atmospheric pressure}}$

Gas rate (m³/h)   = $\dfrac{\text{volume (m³) × 3600}}{\text{time (seconds)}}$

SECTION A

QUESTION 1

Describe what is meant by each of the following terms as they relate to gasfitting.

(a) Room sealed appliance

_____

(1 mark)

(b) Flame roll out

_____

(1 mark)

(c) Explosive limit

_____

(1 mark)

(d) Lock out

_____

(1 mark)

(e) Lock up pressure

_____

(1 mark)

(f) Natural ventilation

_____

(1 mark)

(g) Adventitious ventilation

_____

(1 mark)

Total 7 marks

QUESTION 2

(a) Sketch a flame rectification flame failure system, and label each of its main components.

(5 marks)

(b) Describe the operation of a flame rectification system.

_____

_____

_____

_____

_____

(4 marks)

(c) Name TWO flame failure devices found in gas appliances other than flame rectification systems.

1 _____

2 _____

(2 marks)

Total 11 marks

QUESTION 3

(a) New gas pipework with a volume of 20 litres has been installed in a building.

The pipework requires testing before the walls are lined.

The installation is designed to operate at 6 kPa.

Complete the table below to show the test details.

Test Pressure	Stabilisation Time	Test Time	Maximum permitted pressure loss

(3 marks)

(b) Give THREE factors that could compromise the accuracy of the test in (a).

1 _____

2 _____

3 _____

(3 marks)

(c) List, in order, the FOUR tests that must be completed when carrying out additions or alterations to an existing gas installation.

1 _____

2 _____

3 _____

4 _____

(4 marks)

(d) A new gas cooker and associated pipework with a volume of 6 litres is installed in a caravan. The installation requires testing to ensure it is gas tight.

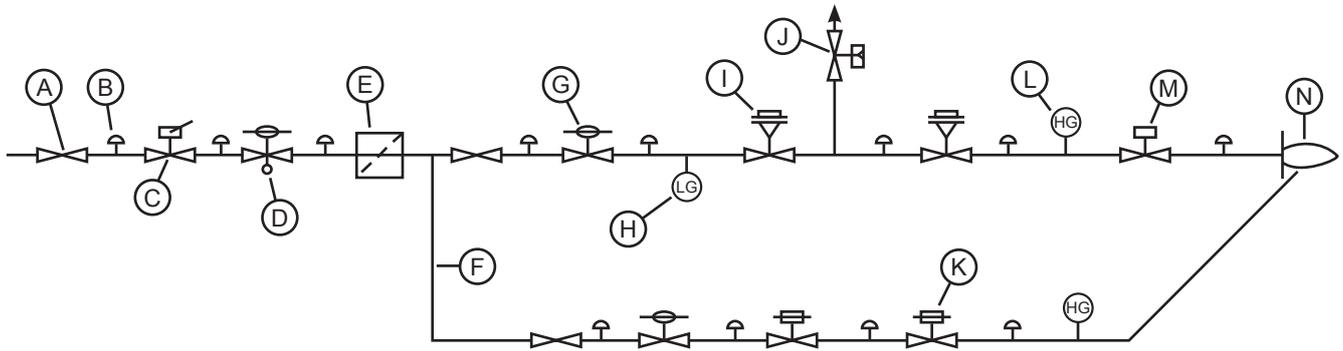Complete the table below so that the test details are in accordance with AS/NZS 5601 Part 2.

Name of Test			
Test pressure			
Stabilisation time		Test time	
Maximum permitted pressure loss			

(4 marks)

Total 14 marks

QUESTION 4

The schematic below shows the components of an industrial gas appliance.

Complete the table below identifying the items labelled A – N in the schematic above.

	Item		Item
A		H	
B		I	
C		J	
D		K	
E		L	
F		M	
G		N	

Total 7 marks

QUESTION 5

(a)   Give FIVE safety checks that should be carried out before starting work on a mobile scaffold.

1 _____

2 _____

3 _____

4 _____

5 _____

(5 marks)

(b)   Give TWO devices that reduce the risk of electrocution when using a power tool.

1 _____

2 _____

(2 marks)

(c)   Give FOUR actions that should be taken immediately after a worker has received a severe electric shock.

1 _____

2 _____

3 _____

4 _____

(4 marks)

Total 11 marks

QUESTION 6

(a) Complete the table below by giving the unit of measurement used for each item listed. The first item has been completed for you.

Item	Unit of measurement
Speed	km/h
Heating value of gas	
Carbon dioxide in flue gas	
Thermal expansion	
Flame speed	
Gas appliance energy consumption	

(5 marks)

(b) An imported appliance has been installed.

(i) The data plate on the appliance states that its hourly gas consumption is 42,000 BTU/h.

Convert the hourly gas consumption to MJ/h.

_____

_____

(1 mark)

(ii) The data plate on the appliance states that its operating pressure is 5 inches water gauge.

Convert the operating pressure to kPa.

_____

_____

(1 mark)

Total 7 marks

QUESTION 7

(a)   A consumer has complained of flu-like symptoms, including headaches and dizziness, while a gas-fired ducted air furnace is operating.

   (i)   State what these symptoms indicate.

_____

_____

(1 mark)

   (ii)   State what appliance fault is most likely to cause these symptoms.

_____

_____

(1 mark)

   (iii)   Give TWO likely reasons for the fault to have occurred.

   1   _____

   2   _____

(2 marks)

(b)   Give TWO reasons why the air supply for combustion in a gas-fired ducted air furnace is required to be piped from outside.

   1   _____

   2   _____

(2 marks)

Total 6 marks

QUESTION 8

A package burner consumes 6 m³/h of natural gas.

The burner is being converted to LPG.

- The package burner operates for nine hours each day.
- The heating value of natural gas is 40 MJ/m³
- The heating value of LPG is 95 MJ/m³
- 1 × 45 kg cylinder contains 2200 MJ of LPG.
- The gas to air ratio for natural gas is 1:10
- The gas to air ratio for LPG is 1:25

(a)   Calculate how many cubic metres of LPG per hour the package burner will consume once the conversion is complete.

_____

_____

(2 marks) ☐

(b)   Calculate in cubic metres the additional volume of air per hour the burner will consume when it has been converted to LPG.

_____

_____

_____

(3 marks) ☐

(c)   Calculate the number of 45 kg cylinders that are required to supply the package burner to enable it to operate for two weeks.
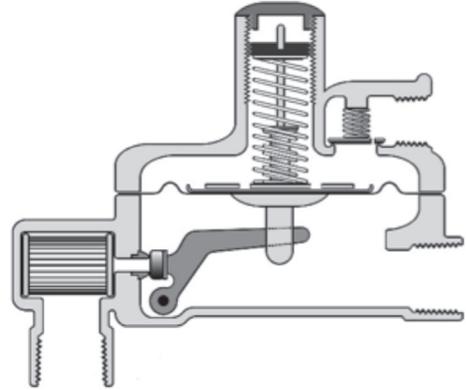
_____

_____

_____

(3 marks) ☐

Total 8 marks ☐

QUESTION 9

The diagrams below show different stages in the operation of a service regulator.

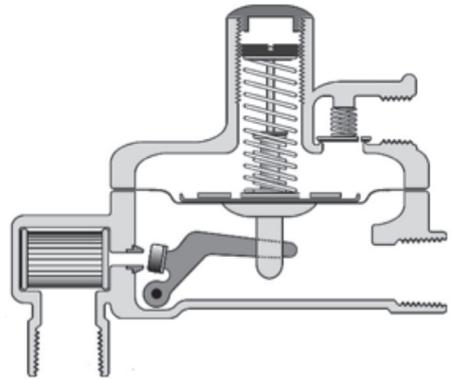Describe what is occurring in each of the stages shown.
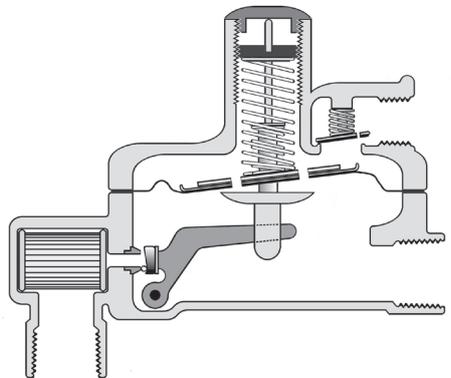
(a) _____
_____
_____
_____
_____
_____
_____

(3 marks) ☐

(b) _____
_____
_____
_____
_____
_____
_____

(3 marks) ☐

(c) _____
_____
_____
_____
_____
_____
_____

(3 marks) ☐

Total 9 marks ☐

QUESTION 10

(a)   Copper pipe is installed with galvanised pipe clips.

    (i)   Explain why it is necessary to insert rubber or similar insulators between the clips and the pipe.

_____

_____

(1 mark)

    (ii)   Explain what would happen if an insulator was not used.

_____

_____

(1 mark)

(b)   Describe what can happen to copper products if they are exposed to continual vibration.

_____

_____

(1 mark)

Total 3 marks

QUESTION 11

(a)   Explain why it is difficult to get butane to vaporise in cold weather.

_____

_____

(1 mark)

(b)   Explain why it is necessary to add odorant to natural gas.

_____

_____

(1 mark)

(c)   Explain why the odorant in (b) must have an unpleasant smell.

_____

_____

(1 mark)

(d)   Complete combustion is a result of a gas appliance working correctly.

Name TWO main flue gases produced in this situation.

1   _____

2   _____

(2 marks)

(e)   Name TWO products of incomplete combustion, and give the chemical symbol for each.

1   _____

2   _____

(2 marks)

Total 7 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. In what way does a thermopile differ from a thermocouple?

    A   A thermopile is constructed of a copper coil rather that a platinum one.

    B   The thermopile generates ohms rather than millivolts.

    C   The lifespan of a thermocouple is twice that of a thermopile.

    D   The core of a thermopile is removable for servicing.

    E   A thermopile is a collection of thermocouples within one probe.

2. According to AS/NZS 5601 Part 2, which of the following words makes a statement a recommendation?

    A   Can.

    B   May.

    C   Shall.

    D   Should.

    E   Will.

3. Which device is designed to shut off the gas supply if the mechanical ventilation for a room fails to operate?

    A   Carbon dioxide detector.

    B   Combustion air pressure switch.

    C   Energy cut off.

    D   Fan interlock.

    E   Flame rectification.

4. Which elements are present in both natural gas and LPG?

A   Carbon and hydrogen.

B   Hydrogen and nitrogen.

C   Hydrogen and oxygen.

D   Nitrogen and oxygen.

E   Propane and butane.

☐

5. According to AS/NZS 5601 Part 2, a cylinder compartment in a caravan must not be able to contain more than which of the following?

A   One 9 kg LPG cylinder.

B   Two 9 kg LPG cylinders.

C   One 15 kg LPG cylinder.

D   Two 15 kg LPG cylinders.

E   One 45 kg LPG cylinder.

☐

6. For gas pipework being installed in a caravan, pipe supports must be provided within what distance from a tee?

A   100 mm.

B   150 mm.

C   200 mm.

D   250 mm.

E   300 mm.

☐

7. When a caravan fitted with gas appliances requires ventilation, what is the maximum allowable distance between the floor and the low-level ventilation opening?

A   50 mm.

B   100 mm.

C   150 mm.

D   200 mm.

E   250 mm.

☐

8. According to AS/NZS 5601 Part 1, what is the maximum diameter hole permitted to be drilled in a joist, unless otherwise specified by the manufacturer?

A   25 mm.

B   32 mm.

C   40 mm.

D   45 mm.

E   50 mm

☐

9. According to AS/NZS 5601 Part 1, except in single occupancy residential premises, above-ground consumer piping must be identified when the operating pressure exceeds which pressure?

A   7 kPa.

B   10 kPa.

C   14 kPa.

D   100 kPa.

E   200 kPa

☐

10. Which government agency administers the gas installation high risk database?

A   Gas Association of New Zealand.

B   The Institute of Gas Engineers.

C   The Plumbers, Gasfitters and Drainlayers Board.

D   The local regional authority.

E   WorkSafe New Zealand.

☐

Total 10 marks ☐

For Examiner's use only

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
Section B		
Total		