No. 9196

Plumbers,
Gasfitters and
Drainlayers Board

REGISTRATION EXAMINATION, JUNE 2011

CERTIFYING GASFITTER

ANSWER SCHEDULE

ANSWER 1

(a) Isolated from the gas supply, vented to atmosphere, purged immediately and displaced by inert gas.

(2 marks)

(b) (i) 3.141 × 0.025 × 0.025 × 9 = 0.01767 (1 mark)
3.141 × 0.016 × 0.016 × 12 = 0.00965 (1 mark)
3.141 × 0.010 × 0.010 × 10 = 0.00380 (1 mark)
0.00314 × 2 = 0.00628 (1 mark)

0.01767 + 0.00968 to 0.00628 = 0.00336

Volume = 0.035 m^3 33.6 litres (1 mark)

(ii) Size of Installation Large (1 mark)

(6 marks)
Total 8 Marks

ANSWER 2

Size	Quantity
25 mm	2
40 mm	3 + 6 = 9
50 mm	7 + 3 = 10

(1 mark)
(2 marks)
(2 marks)
Total 5 Marks

ANSWER 3

Flue Section	Size
A	175 mm
B	125 mm
C	100 mm
D	125 mm
E	100 mm

(2 marks)
(1 mark)
(1 mark)
(1 mark)
(1 mark)
Total 6 Marks

ANSWER 4

(a)
- Flue gas temperature.
- Carbon dioxide CO_2
- Oxygen O_2 (3 marks)

(b) Any THREE:
- Appliance has reached equilibrium or steady state operation.
- Burner is operating at full fire.
- Readings are taken in the centre of the flow of products of combustion.
- As close as possible to the appliance. (3 marks)

(c) (i) Excessive draught increases stack temperature resulting in decreased combustion efficiency.

(ii)
- Insufficient draught can result in condensation.
- Carbon monoxide formation
- Flue gas spillage
- Production of soot.

(2 marks)

Total 8 Marks

ANSWER 5

(a) $\frac{101.3 + 6.5}{101.3} = 1.064$ (2 marks)

$16.85 \times 1.064 = 17.9\ m^3$ (1 mark) (3 marks)

(b) Any THREE:
- Gas inlet pressure.
- Maximum gas flow rate.
- Pipe size.
- Gas type.

(3 marks)

(c) Any TWO:
- Rotary will operate at high pressures.
- Rotary has greater capacity for size of meter.
- Rotary produces steady/smooth output.
- Rotary meter is smaller.

(2 marks)

Total 8 marks

ANSWER 6

(a) Any SIX – (1 mark each):

- Working pressure (reset to 2.75 kPa).
- Main burner injectors reduced in size.
- Pilot burner injector replaced.
- Controls, Valves, replacing or adjusting.
- appliance regulator diaphragms, springs if necessary.
- Ventilation arrangements.
- Aeration.
- Data Plate. (6 marks)

(b)
- Pipe size.
- Labels. (2 marks)

Total 8 Marks

ANSWER 7

125 × 125 = 15,625 mm (1 mark)

Table F2 allows up to 216MJ (1 mark)

Total 2 Marks

ANSWER 8

Any TEN:

1 Hot water tap is opened.
2 Min. flow rate of 2.5lpm. The Water Flow Sensor sends a pulse signal to the PCB.
3 Fan completes a pre purge.
4 The igniter starts sparking.
5 Gas Inlet Solenoid Valves open.
6 The Proportional Gas Flow Regulating Valve allows adequate gas for ignition.
7 Gas ignites at the Burner.
8 Flame sensor detects burner flame.
9 the PCB adjusts the hot water temperature by opening and closing the Gas Solenoid Valves, the Proportional Gas Flow Regulating Valve and via the Water Flow Servo Motor to ensure the selected temperature of hot water is delivered.(Modulation)
Hot tap is closed.
10 The pulse signal from the Water Flow Sensor stops.
11 Burner flame is extinguished by closing Gas Solenoid Valves.
12 The post purge operation then commences.
13 Once the post-purge operation ends the Fan stops.

(½ mark for each correct operation, ½ mark for each in correct order)

Total 10 Marks

ANSWER 9

Any THREE:

- Leakage of gas within the installation is outside the tolerance of a soundness test or is in excess of one-fifth of the lower explosive limit.
- A pipe containing gas or intended to contain gas is not capped or securely closed to prevent leakage or flow of gas (except where ending in a burner or relief valve).
- The safety controls are inoperative or the safety controls fail.
- The flue associated with any gas appliance is incorrectly installed.
- Installed permanent ventilation required for safe operation has been closed off or is absent.

Unsafe, in respect of any distribution system, gas installation, fittings, gas appliance, or associated equipment, means that there is a significant risk that a person may suffer serious harm, or that property may suffer significant damage, as a result of dangers arising from the use of, or passage of gas through, the distribution system, gas installation, fittings, gas appliance, or associated equipment.

(Total 3 Marks)

ANSWER 10

(a)

Installation Pressure Drop/m	0.009 - 0.011 (1 mark)
Length of Longest Run	25 - 28 m (1 mark)

Pipe Section	MJ	Section Length	Diameter
A - B	345 (½ mark)	6.5 - 8 (½ mark)	25 mm (1 mark)
B - C	90 (½ mark)	0.5 - 1 (½ mark)	20 mm (1 mark)
B - D	245 (½ mark)	3 - 4.5 (½ mark)	25 mm (1 mark)
D - E	160 (½ mark)	4.5 - 5.5 (½ mark)	20 mm (1 mark)
D - F	85 (½ mark)	5.5 - 7.5 (½ mark)	20 mm (1 mark)
F - G	40 (½ mark)	6.5 - 8 (½ mark)	15 mm (1 mark)
F - H	45 (½ mark)	6.5 - 8.5 (½ mark)	15 mm (1 mark)

(16 marks)

(b) Pressure drop = 0.00233 kPa (1 mark)
Rating = 335 MJ/h (1 mark)
Diameter = 20 mm (1 mark)

Total 19 Marks

ANSWER 11

(a)
- Improved efficiency.
- Lower flue temperatures allow the use of PVC flues.
- The use of a fan for expelling flue gases allows for flexibility in locating the boiler.

(1½ marks)

(b) Any THREE:
- A drain pipe must be fitted to remove the condensate to a suitable discharge point.
- Relative parts of the boiler must be manufactured from corrosion resistant materials as the condensate is mildly acidic.
- The condensing appliance will require power to operate because flue gas temperature is so low a fan will be required to expel it.
- The heat emitters in the heating system may need to be increased in size due to the requirement for a lower returning water temperature to aid the condensation process.
- Costs (installation and purchase).

(1½ marks)

Total 3 Marks

SECTION B

1. C Oxygen depletion pilot.
2. B The valve will not operate fast enough in event of flame loss.
3. A The quick recovery water heater has a higher MJ rating.
4. D The chemicals circulating in the pool can damage the water heater.
5. B Over temperature situations will allow the device to interrupt the flame failure circuit, shutting off the gas supply.
6. E The baffle collapses into the burner chamber blocking the primary flue.
7. C Five times the volume held by the meter.
8. E The volume is indicated on the meter badge.
9. D The allowance for a gas taking up less volume while under pressure.
10. A 75 mm.
11. C 15%.
12. E Butane.
13. A 0.03 m^3.
14. A The air is contaminated by hair sprays which pass through the burner.
15. D 65°C.
16. D 75 mm.
17. A 60°C.
18. C 0.8 mm.
19. A 0.0492 m^2.
20. C 40 mm.

Total 20 Marks