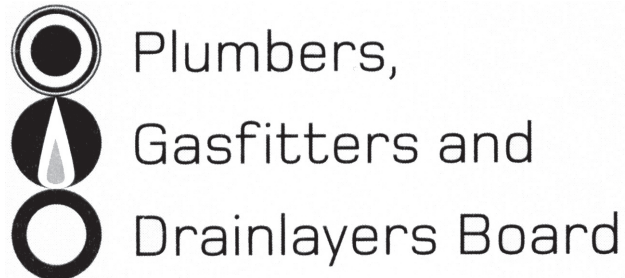


No. 9193



REGISTRATION EXAMINATION, JUNE 2009  
**GASFITTING**

ANSWER SCHEDULE



## ANSWER 1

- (a) They must cross at an angle of not less than 45°  
They must have a vertical separation of not less than 100mm. (2 marks)
- (b) • Poor combustion leading to sooting in base of heater  
• Poor flue gas dilution leading to overheating of the flue  
• Possible spillage of products into cupboard  
• Poor heater efficiency  
• Carbon monoxide present in flue gas (Any 2, 1 mark each), (2 marks)
- (c) **Overgassing** and **underaeration** (lack of air).  
High gas consumption. (2 marks)
- (d) Wind direction to avoid downdraught.  
500mm clearance from roof.  
For a flat roof, not able to harm persons, i.e. 2 m above roof. (Any 2, 1 mark each), (2 marks)

**Total 8 marks**

## ANSWER 2

- (a) Not less than 20mm per m run. (accept equivalents). (1 mark)
- (b) Light appliance and allow it to reach working temperature  
Hold a cool surface such as a mirror, or a smoke taper, in front of the heater hood and check that products of combustion are not passing out into the room.  
Flue gas detector may be used instead of cool surface or taper. (2 marks)
- (c) Any four of the following 1mark each:  
• Insulation of the room,  
• Airflow through the room,  
• Setting of gas rate,  
• Burner aeration rate,  
• Flue draught,  
• Room volume  
• Position of the appliance  
• Ventilation (4 marks)

(d) The burner is over gassed

The burner is short of air

Flame vitiation

Flame impingement

Blocked flue

(Any 2, 1 mark each), (2 marks)

**Total 9 marks**

### ANSWER 3

- (a) • Rigidly mounted on a permanent structure
- Clearance or protection at back of heater
  - In area of good ventilation, no overhangs
  - Close as possible to major uses
  - Clear of openings into building
  - Clear of trees and other vegetation
  - Clear of physical damage or with protection barrier
  - Flue clear of neighbouring property
  - Clearance from gas meter
  - Not causing nuisance

(Any 6 – ½ mark each)

**Total 3 Marks**

### ANSWER 4

- (a) (i) Atmospheric pressure will be lower at level 15 than at ground level (1 mark)
- (ii) Natural Gas gauge pressure will be higher at level 15 (1 mark)
- (iii) The pressure will be lower at level 15 as LPG is heavier than air. (2 marks)

(b) Any four, 1 mark each

- Inadequate pipe sizing
- Blockage in pipework due to dust (corrosion), water, or other material
- Addition of a high consumption appliance increasing demand
- Fault at Point of Supply (meter, supply regulator, cylinder empty)
- Fault upstream of POS – service capacity or cylinder size/evaporation

(4 marks)

**Total 8 Marks**

## ANSWER 5

(a) Any three, 1 mark for method and 1 mark for material protected.

- Galvanising – Iron/steel
- Tape wrapping – Iron/steel, copper
- Plastic coating – Copper/steel/aluminium
- Cathodic protection – Steel
- Painting – Iron and steel

(6 marks)

- (b) (i) Filter
- (ii) Pressure Regulator
- (iii) Low gas pressure detector
- (iv) 3-way valve

(4 marks)

**Total 10 Marks**

## ANSWER 6

(a) (i) Volume of pipe work  
=  $0.7854 \times d^2 \times \text{length}$

$$\begin{aligned} &= (0.7854 \times 36/1000 \times 36/1000 \times 15) + (0.7854 \times 19/1000 \times 19/1000 \times 40) \\ &= 0.0153 + 0.0113 \text{ m}^3 \\ &= 0.0266 \times 1000 \text{ litres} \\ &= \underline{26.6 \text{ litres}} \end{aligned}$$

(3 marks)

(ii) As the volume is less than 30 litres, appendix D applies.

(½ mark each), (1 mark)

(b) Flue surface area =  $3.142 \times d \times \text{Height}$   
=  $3.142 \times 0.150 \times 12$   
=  $5.652 \text{ m}^2$

(2 marks)

Weight of flue pipe =  $5.652 \times 25$   
= 141.43 kg

(1 mark)

**Total 7 Marks**

## ANSWER 7

(a) 1 mark for each stage as shown

Test dial =  $60/5 = 12$  rev/hour (1 mark)

Consumption =  $12 \times 0.05 = 0.60$  m<sup>3</sup>/hr (1 mark)

Energy input =  $0.06 \times 40 = 24$  MJ/hr (1 mark)

Energy Output = input x efficiency =  $24 \times 0.70 = 16.8$  MJ/hr (1 mark)

Output in kW =  $16.8/3.6 = 4.66$  kW (1 mark)

(b) Energy passed would Increase (1 mark)

**Total 6 Marks**

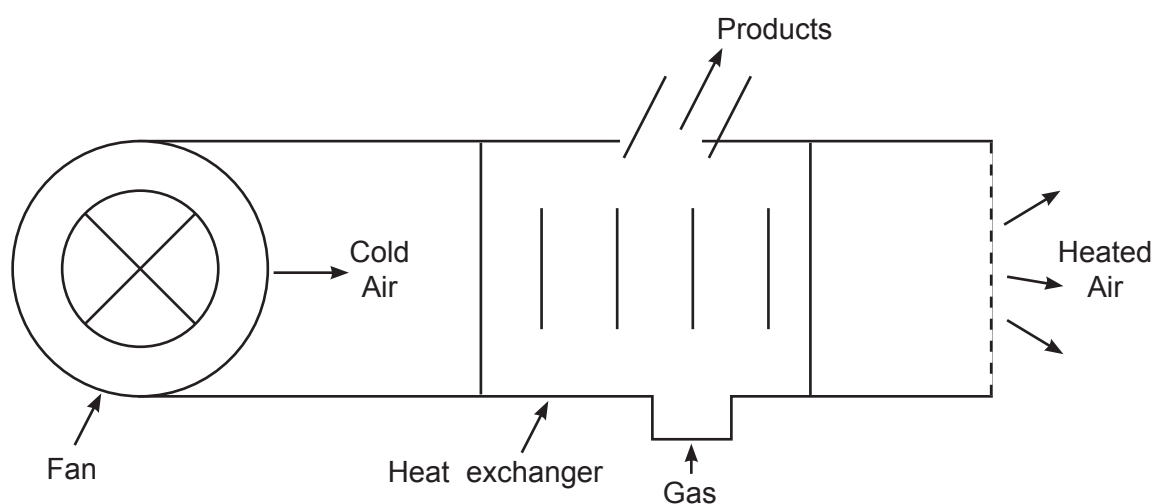
## ANSWER 8

(a) All three of the following, 1 mark each

- Proper operation of the appliance
- Proper operation of the flue system
- Maintain safe ambient conditions (3 marks)

(b) (i) Drawing showing key aspects, (1 mark each)

- Heat exchanger
- Fan (with air coming in)
- Room Air flow
- Gas and Products of combustion flow
- General layout of heater



(5 marks)

(ii) Four heaters spread around the supermarket and suspended at high level with flues to the outside atmosphere

(1 mark each), (2 marks)

**Total 10 Marks**

## ANSWER 9

(a) (i) **Overheat shut off**

Type: Bi-Metal

Purpose: To shut off gas if thermostat fails

(2 marks)

(ii) **Thermostat**

Type: Snap acting rod and tube

Purpose: Senses the water temperature and controls the gas to the burner

(2 marks)

(iii) **Flame Failure**

Type: Thermo-electric

Purpose: Monitors pilot flame and shuts all gas off if pilot goes out

(2 marks)

(b) (i) To establish that combustion fan is running before gas is turned on and to shut the burner down if fan fails

(2 marks)

(ii) To allow the pressures to be set separately and to ensure that the pressures remain constant to both main and pilot burner. To ensure pilot flame is not affected when main flame is established.

(2 marks)

(c) Appropriate size

Swept clean of soot and other debris

Sound and free from leaks

No dampers or other obstructions

Not used for any other purpose

Has space for loose material to collect below appliance flue spigot

Has good pull and no down draughts

Is terminated in a safe location

Of solid construction

(Any 5 – 1 mark each), (5 marks)

**Total 15 Marks**

## ANSWER 10

- (a) A flueless space heater discharges the products of combustion into the room. The products contain water vapour. The water vapour condenses when it comes into contact with a cool surface such as windows. (3 marks)
- (b) Increasing ventilation to allow products to escape to outside air will reduce the condensation (1 mark)

**Total 4 Marks**

## ANSWER 11

- (a) They do not contain poisonous gases such as carbon monoxide (1 mark)
- (b) Leaking gas can catch fire (explode) and can cause suffocation due to lack of air. (2 marks)

(c)

Type of gas	Natural gas	LPG
Main constituent(s)	Methane	Propane
		Butane
Relative density compared with air	0.5 – 0.7	1.5 – 1.9
Heating (calorific) value (MJ/m <sup>3</sup> )	38-44	90 to 110
Volume of air required for combustion of 1 cubic metre of gas	9 to 11	22 to 27
Lower explosive limit (% gas in air)	4 to 6	2 to 3.5
Upper explosive limit (% gas in air)	14 to 16	8 to 11

Answers for one gas type only required.

Any answer within range shown 1 mark each. Deduct 1 mark if gas type not selected

(6 marks)

**Total 9 Marks**



## ANSWER 12

(a) Any 5 of the following:

- Name or mark of appliance supplier
- Identification of type and model
- Gas type
- Max and min gas supply pressure
- Burner pressure
- Max overpressure
- Input rating

(1 mark for each), (5 marks)

(b) (i) Pipework test is to ensure the pipework is gastight before connecting any appliances (2 marks)

(ii) Installation test is to ensure the entire installation, including appliances, is gastight before connection to the gas supply (2 marks)

(iii) Leakage test is carried out on existing gas installations before work is started to ensure the installation does not have a significant leak. (2 marks)

**Total 11 Marks**





