No. 9196

Plumbers, Gasfitters and Drainlayers Board

CRAFTSMAN EXAMINATION, JUNE 2007

GASFITTING

ANSWER SCHEDULE

ANSWER 1

(a) **As soon as practicable advise the owner or occupier** of the property where the danger exists **and the Secretary of Energy/Commerce**.

(2 marks)

(b) Extensions, **Additions** and replacements to installations

Alterations to installations that result in repositioning or control changes

Repair work carried out on an installation after a notified incident

(Any TWO – 1 mark each) (2 marks)

Total 4 marks

ANSWER 2

(a) **Weight** of pipework **not to impair structure**

Thermal effects on pipework – expansion and contraction

Seismic and vibrational effects on pipework

Material compatibility between pipe and supports

(Any THREE) 3 marks

(b) Adequacy of **ventilation** for space

Clearance from combustible surfaces and materials

Suitably and **securely supported**

Not affected by nearby mechanical devices used to displace air

Appliance suitable for location

(Any THREE) 3 marks

(c) **Minimise** effect of **downdraught**

Prevent ingress of material or substances that could impair performance

Prevent entry of combustion products back into any building

Prevent harm to any person

(Any THREE) 3 marks

Total 9 marks

ANSWER 3

(a)

Gas	Main Components
Natural Gas (NG)	Methane
(LPG) Liquefied Petroleum Gas	Propane, Butane
(TLP) Tempered Liquefied Petroleum Gas	LPG, Air
Town Gas (TG)	Coal gas
Biogas	Methane, Carbon Dioxide

(1 mark each) (5 marks)

(b) At very low temperatures butane will not evaporate and is left in the cylinder when the propane is drawn off.

(2 marks)

(c) 1 Change to 100% propane

2 Use a liquefied gas supply with a vaporiser

(2 marks)

(d) Any TWO:

1 The variation between the ambient surrounding temperature and the confined LPG

2 The size of the exposed surface area of the container

3 The area of the container in contact with the confined liquid (wetted area).

(2 marks)

Total 11 Marks

ANSWER 4

(a) **Relief valve,**

Slam Shut valve,

Overpressure shut off valve,

Monitor regulator.

(4 marks)

(b) **Hunting is the cycling of the outlet pressure due to the influence of other equipment in the installation. It can be prevented by using a pilot** or relay operated regulator, or by providing a surge tank to dampen oscillations.

(3 marks)

(c) Any SIX:

Likelihood of **damage due to vehicles, or vandals**

Clearance from **electrical equipment**,

Clearance from **other sources of ignition**,

Clear of **openings into buildings**

Well ventilated,

Access in an emergency and for maintenance.

Insulated from surrounding building sound

(6 marks)

Total 13 marks

ANSWER 5

(a) Apply pressure correction (1 mark)

(b) By automatic correction device Apply pressure factor (2 marks)

Total 3 marks

ANSWER 6

Heater output = Water flow x Temperature rise x Sp ht

= 15 x 60 x (40 – 12) x 4.2

= 900 x 28 x 4.2 (1 mark)

= 105840 kJ ÷1000

= 105.8 MJ (1 mark)

Heater input = Output ÷ Efficiency

$= 105.840 \times \frac{100}{75}$

= 141.120 MJ (1 mark)

Gas rates = Heater input ÷ CV

$= \frac{141.120}{40}$

= 3.528 m^3/h (1 mark)

Total 4 marks

ANSWER 7

(a) Any EIGHT:

Weight of appliance when filled.

Access to the roof space.

Access around appliance for maintenance.

Illumination for maintenance.

Clearance from combustibles such as roof lining, etc.

Ventilation.

Seismic restraints.

Overflow tray required if damage could occur to adjoining property.

Suitable position for flueing.

(4 marks)

(b) Room volume = 5.000 x 3.200 x 2.700 = 43.200 m^3

Heat input = 43.200 x 0.360 = 15.552 mJ/h.

(2 marks)

(c) Min room volume = $\frac{\mathbf{12}}{0.4}$ = 30 m^3

Min floor area = $\frac{30}{2.400}$ = **12.500 m^2**.

(2 marks)

(d) 1 Heater must have an open flue.

2 Heater must be **fitted with flame safeguard**.

3 Permanent and adequate ventilation.

(3 marks)

(e) It can provide **localised and direct heating** in a large building,

It **does not take up floor space**.

(½ mark for each) (1 mark)

(f) Any FOUR:

Installed above the work area either on wall or suspended on chains,

Positioned to **radiate heat down** on to work bench,

At a height specified in the installation instructions to prevent localised hotspots,

Positioned **clear of any fire detection equipment** such as sprinkler system,

Not subject to physical damage due to movement of materials.

Ventilation requirement

Clear of combustible materials

(Any FOUR, 1 mark each) (4 marks)

Total 16 Marks

ANSWER 8

(a) Must only be **used in conjunction with a forced extraction** ventilation system,

All make up **air must be drawn from outside**,

Make Up Air Heater **burner must only work when extraction fans are running**,

Suitable for **heating large commercial/industrial areas**

(1 mark each) (4 marks)

(b) (i) Reason – Flue runs at **very high temperatures** due to no dilution air.

(ii) Conditions – Flue **not interconnected with any other** type of appliance,
Flue **material not less durable than 1.26 mm mild steel**, (thicker than normal)
Flue **no closer than 450 mm to unprotected combustible material**,
Flue to outside atmosphere without risk of downdraught.

(½ mark each) (2 marks)

(c) **Isolating valve and union on each appliance**.

Located **accessible for service**.

Main isolation valve for total gas source.

(3 marks)

(d) Any THREE:

1 **Avoids** the need for a **long and expensive flue** to above roof level,

2 **Overcomes** problems with **appliance spillage** due to wind turbulence, etc.,

3 **Allows products of combustion to be discharged at low levels** due to high dilution rate (less than 1% CO_2).

4 **Lower flue temperatures**

5 Prevents condensation

(3 marks)

Total 13 marks

ANSWER 9

(a) (i) Automatic – Burner fires up, varies the output rate and shuts down **without any manual requirements**

(ii) Semi-automatic – burner **turned on by hand but all other operations controlled by thermostat**

(iii) Manual – Burner **turned on, ignited, controlled and shut off by operator**.

(3 marks)

(b) Set boiler in operation and allow **conditions to stabilise**

Carry out sampling with **burner on full fire**

Take samples from **base of flue, close to outlet of combustion chamber**

Take samples using a **probe positioned in the centre of flue** before the D.D.D.

(4 marks)

(c) Any TWO:

To **monitor performance** of burner

To **improve efficiency** of the appliance

Minimise harmful emissions

(Any TWO – 1 mark each) (2 marks)

(d) (i) A vaporiser **increases the rate at which liquid** from the storage tank **is converted into a vapour.**

(ii) Two-stage regulation enables LPG to be **supplied at a higher pressure** from the tank to the regulator controlling the burner pressure, and enable **pipes of small diameter** to be used.

(4 marks)

Total 13 marks

ANSWER 10

(a)

Period	**All equipment in operation during period**	**Pilot gas valve (open/shut?)**	**Main gas valve (open/shut?)**
Pre-purge	Fan	Shut	Shut
Start flame Ignition	Fan and Igniter	Open	Shut
Start flame proving	Fan, and FFD	Open	Shut
Main Flame establishment	Fan, and FFD	Open	Open

NB. For 6 marks table in total must be correct, ie no part marks (critical safety issue)

Total 6 marks

ANSWER 11

(a) (i) Total **height** of flue

(ii) Lengths of **lateral runs**

(iii) **Material** to be used (heat loss)

(iv) **Location** (inside or outdoors)

(v) **Size of flue outlet on appliance**

(vi) Appliance **gas input rate**

(½ mark each up to 6) (3 marks)

(b)

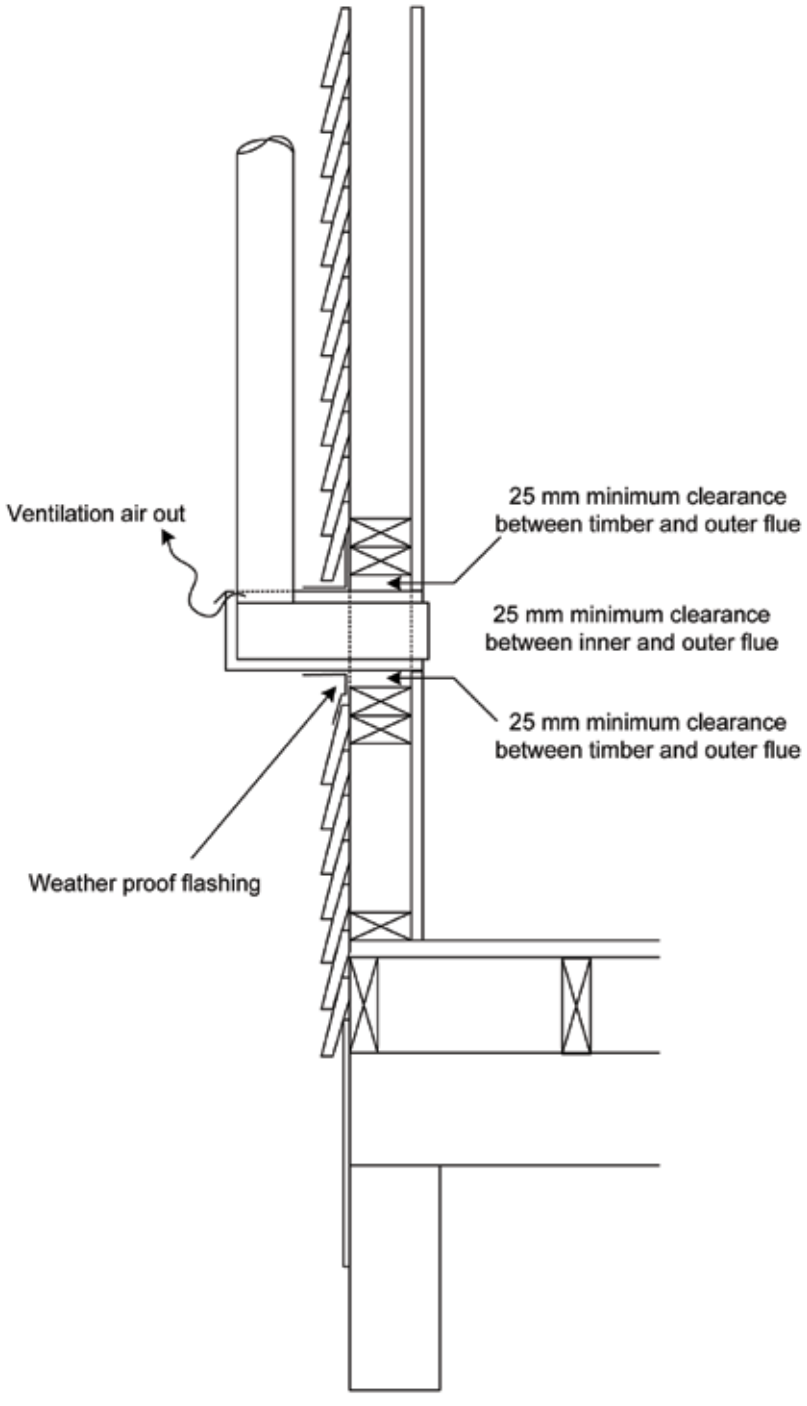

Diagram (1 mark)

25mm clearance between inner/outer flue (1 mark)

25mm clearance between outer flue and combustibles (1 mark)

Flashings (1 mark)

Clarity (1 mark)

Total 8 marks