

## QUESTION 1

**(a) Leakage test for existing installations**

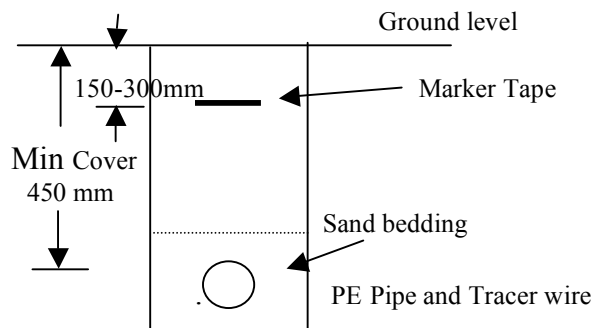
The leakage test for existing installations shall be carried out as follows:

- ☐ Ensure all gas appliance pilots are turned off and all but the last control device (or tap) on each gas appliance is in the open position
- ☐ Depressurize the installation
- ☐ Attach a suitable pressure gauge
- ☐ Ensure the meter control valve or the cylinder valve, if applicable, is not passing gas by watching the pressure gauge to ensure there is no pressure rise due to leakage of gas for 5 minutes
- ☐ Pressurize the installation to operating pressure or 2.0 kPa, whichever is the greater
- ☐ Isolate the pressure source and commence the leakage test
- ☐ Measure the loss of pressure during a test period of 5 minutes.

If the pressure loss is equal to or less than the maximum pressure drop specified in the Standard the test is satisfactory.

(6 marks)

b)



( $\frac{1}{2}$  mark each item)  
(3 marks)

- c) Any TWO:  
PE pipe does not corrode  
PE pipe requires fewer joints  
PE pipe is more flexible and lighter to handle  
Cost effective  
Non conductive

(2 marks)

- d) Any THREE:  
Gas pressure  
Required gas flow  
Length of pipeline  
Type of gas  
Pipe Material

(3 marks)

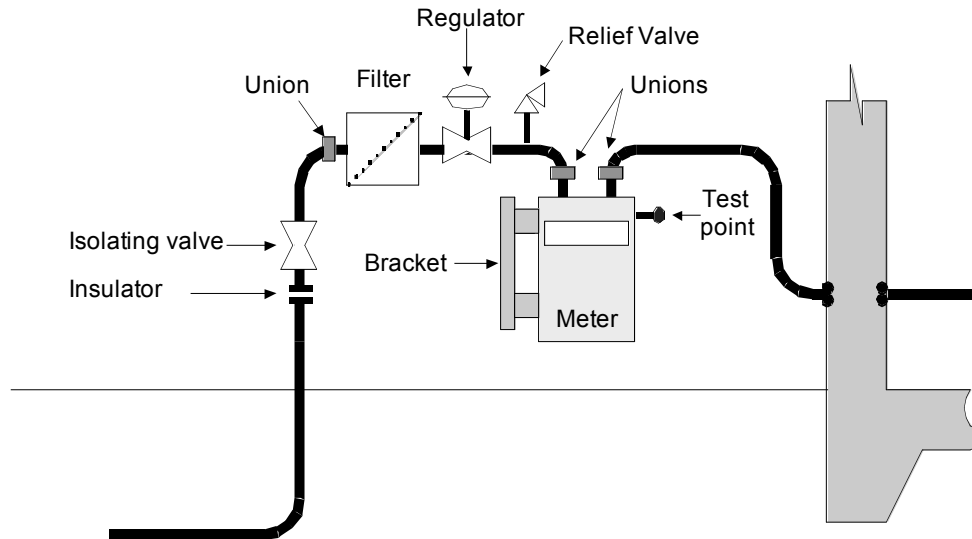
(Total 14 Marks)

## QUESTION 2

- (a) Material: Denso and PVC tape (1 mark)
- Purpose: Denso provides waterproof barrier  
PVC applied over Denso to protect Denso from damage (2 marks)
- Process: Denso spirally applied to bare pipe, overlapped to ensure double cover (2 marks)  
(5 marks)
- (b) Pipe subject to higher rate of corrosion due to moisture levels.  
Pipe subject to physical damage. (2 marks)
- (c) Any FOUR  
Sleeved to prevent shear forces  
Sealed to prevent leakage into building  
Sufficient depth to prevent physical damage  
Avoid imposed load due to differential settlement  
Protected against corrosion  
Prevent weakening of structure. (1 mark each)  
(4 marks)
- (d) Any FIVE  
Duct must be ventilated  
Duct must have openings top and bottom  
Duct must have access for inspection and maintenance  
Pipe must be supported and anchored  
Pipe must be kept away from steam or other hot pipes  
Allowance must be made for expansion  
Pipe must be able to be identified (5 marks)
- (e) An insulating joint provides electrical separation between buried and above ground  
pipework corrosion protection systems.  
To protect against stray electrical currents. (2 marks)  
(Total 18 marks)

## QUESTION 3

- a) Complete the line diagram below to show the gas meter and associated equipment that is required to connect a metal gas service riser pipe to a domestic installation. Name each item. Give correct symbols.



**Note:** Filter, Regulator, Relief valve often an integrated unit

(5 marks)

- ☐ Insulator
  - ☐ Isolating Valve
  - ☐ Filter
  - ☐ Regulator
  - ☐ Relief Valve
  - ☐ Meter
  - ☐ Union connections
  - ☐ Bracket
  - ☐ Meter not on ground
  - ☐ Test point
- ½ mark each

- b) (1) Not to obstruct exit in case of fire,  
 (2) So that any gas leaking from the meter set does not enter the house.  
 (3) Avoid damage to meter by persons or vehicles

(Any 2)  
 (2 marks)

- c)  $0.025 \times 2 = 0.05 \text{ m}^3/\text{min}$   
 $0.05 \times 60 = \underline{3 \text{ m}^3/\text{hr}}$

(2 marks)

- d) To ensure that if the pipework is carrying any stray electrical currents a spark is not created or a shock obtained when the pipes are separated.

(1 mark)  
(Total 10 marks)

## QUESTION 4

- (a) Any SIX
- Proximity to most frequent uses of hot water
  - Position where flue can be installed safely
  - Adequacy of ventilation
  - Base of sufficient strength to support weight
  - Proximity to a drain
  - Availability of gas connection
  - Position of water connections
  - Structure to attach seismic restraint
  - Location

(½ mark each)

(3 marks)

- b) Any FIVE
- Need to keep combustible material clear of heater and flue
  - Need to keep ventilators clear
  - Need to keep Down Draught Diverter clear
  - What to do if there is a smell of gas
  - How to recognise smell of gas
  - How to turn gas supply to heater off
  - Not to store any flammable material in cupboard
  - Not to store chemicals in cupboard

(1 mark each)

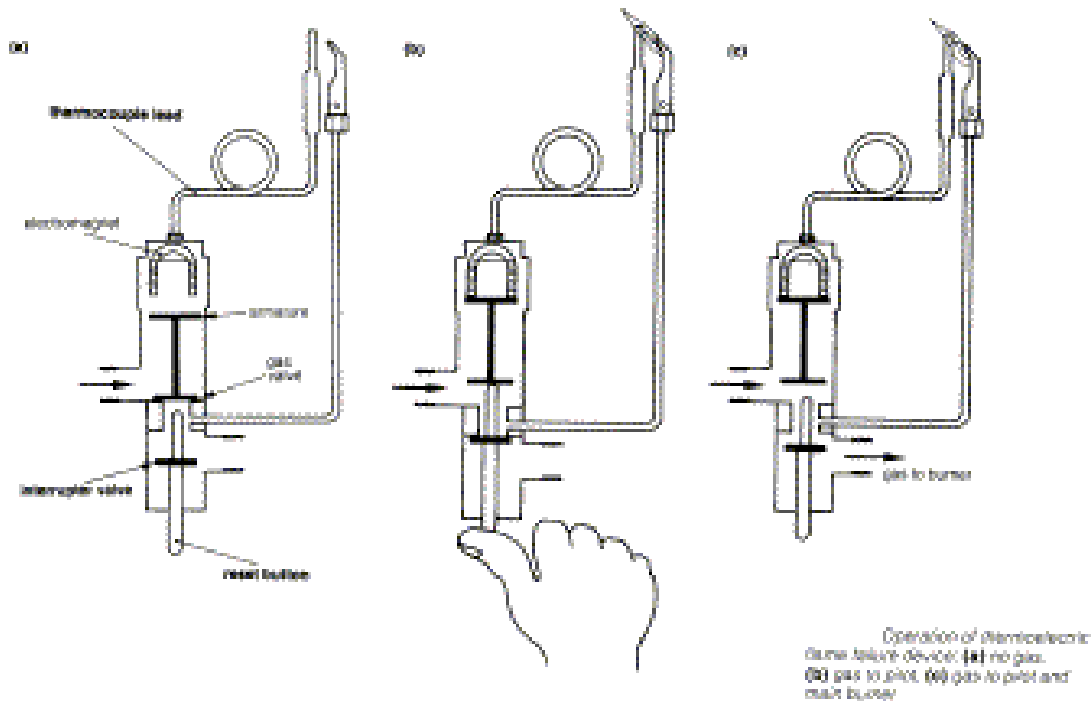
(5 marks)

(Total 8 marks)

## QUESTION 5

- a. With the aid of a neat diagram, describe the operation of a thermo electric flame failure device suitable for use on a domestic gas appliance

The device consists of wires from two dissimilar metals that are joined at one end which is called the junction. When the junction is heated by a flame a small electric current is produced. When used as a flame failure device the wires that are connected to the junction carry current to an electro magnetic gas valve which is kept shut by spring pressure. The valve and spring are compressed when the ignition sequence is initiated and when the flame is established heat is applied to the junction and the small current is produced that energises the electro magnet and holds the gas valve open. When the flame goes out the current is stopped, the electro magnet is de-energised and the spring pressure forces the gas valve shut and cuts off the gas.



(4 marks)

NB 1 mark each correct description

1 mark diagram

- b) Air for combustion is drawn in directly from outside  
Combustion takes place in a room sealed chamber  
The products are discharged directly outside  
The air inlet and outlet have the same point of discharge

(ANY THREE, 1 mark each)

(3 marks)

- c) Sized correctly for the hallway  
Area well ventilated  
Adequate air movement around the appliance (not under an overhang)  
Clear of curtains and other combustibles

(ANY THREE, 1 mark each)

(3marks)

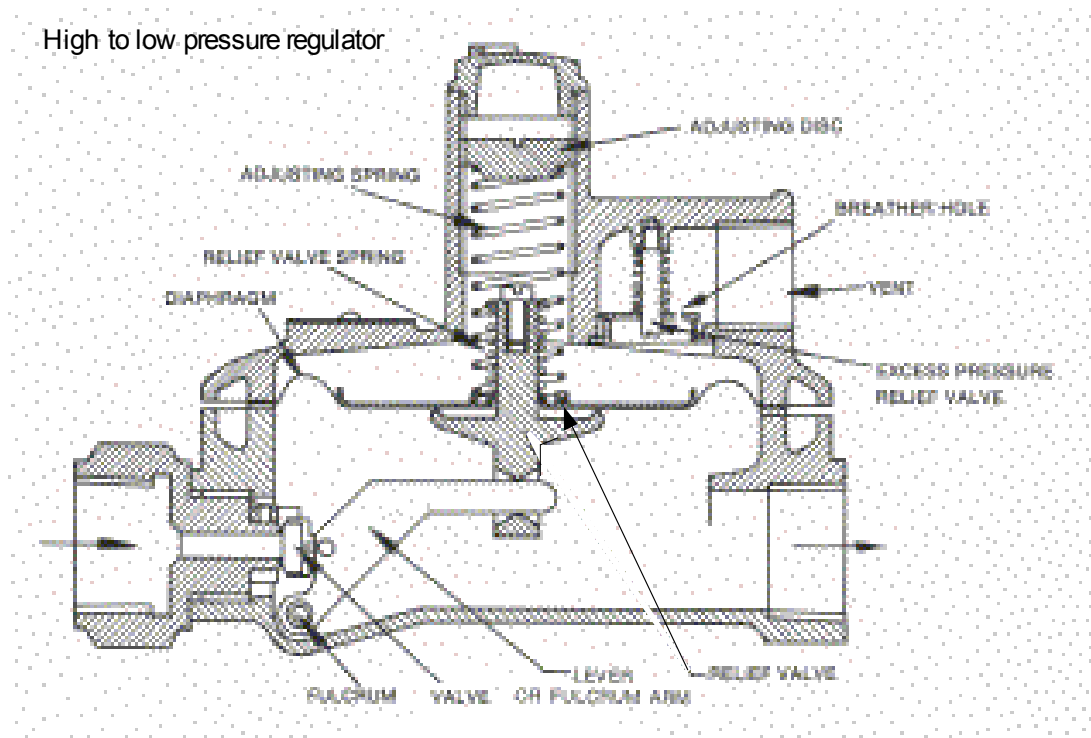
(Total 10 marks)



- d) Name the regulator type and name the parts A to k shown in the following illustration.

Name: **High to low pressure service regulator**

- A. Adjusting disc
- B. Breather hole
- C. Vent
- D. Excess pressure relief valve
- E. Relief valve
- F. Lever or fulcrum arm
- G. Valve
- H. Fulcrum
- I. Diaphragm
- J. Relief valve spring
- K. Adjusting spring (loading spring)



(0.5 marks per correct answer)

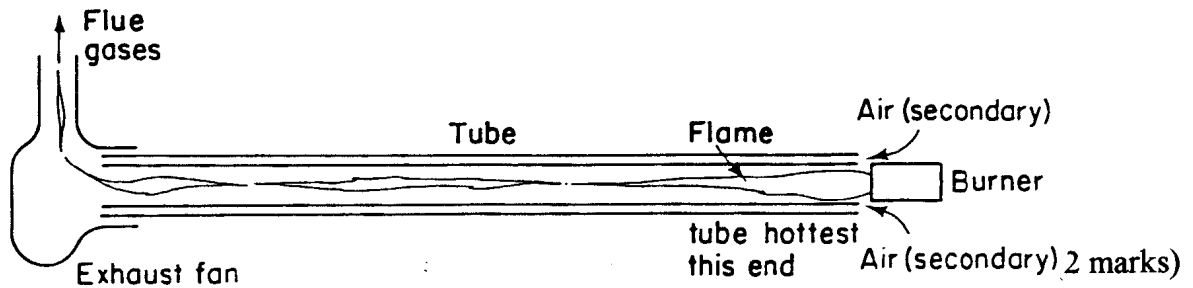
(6 marks)

(Total 16 marks)

## QUESTION 6

- (a) A non-luminous radiant tube heater consists of a burner firing into a heavy-duty tube. At the far end of the tube is a fan that sucks the products of combustion through the tube and pushes them out through a short flue. The suction draws in the appropriate combustion air with the gas. The units have automatic controls. Reflectors are often fitted above the tube to reflect the heat downwards.

(4 marks)



(Total 6 marks)

- (b) Positioned at high level to radiate down onto work areas, away from damage and sprinkler systems

(2 marks)

- (c) Hoods are provided with extractor fans that discharge outside.

(2 marks)

- (d) Air flow sensing device  
Temperature limit switch

(2 marks)

- (e) The purge period is to ensure that the heater, combustion chamber and outlet ductwork are swept clear with air before the ignition cycle starts.

(2 marks)

(Total 14 marks)

## QUESTION 7

Provide a high rate of heat input to vaporise the liquid LPG, and ensure only gas is supplied into the consumer's installation.

(Total 2 marks)

## QUESTION 8

Flame is non-luminous

It has a blue appearance

It has three well-defined cones

It is steady and almost silent in operation

(Total 2 marks)

## QUESTION 9

- (a) Propane  
Butane

(2 marks)

- (b) i) A gas which does not react with any other substance  
ii) Any ONE: Carbon Dioxide, Nitrogen, Argon

(2 marks)

- (c) (1) The burner is over gassed  
(2) The burner is short of air  
(3) Flame vitiation  
(4) Flame impingement

(2 marks)

(Total 6 marks)

## QUESTION 10

- (1) Any TWO  
Wind direction to avoid downdraught.  
500 mm clearance from roof.  
Not on an external wall.  
For a flat roof, not able to harm persons, i.e. 2 m above roof.  
200mm clearance from other terminals  
(1 mark each)  
(2 marks)
- (2) Not less than 20 mm per m run.  
(1 mark)  
(Total 3 marks)

## QUESTION 11

Any FIVE:

External to the building,  
Away from areas of physical damage,  
Position not liable to flooding,  
Upright and on a firm base,  
Means of securing to prevent tipping  
Well ventilated,  
Clear of openings into building,  
Clear of combustion sources (ignition)  
Clear of readily combustible materials  
Clear of drains and gulleys

(5 marks)

QUESTION 12

The Plumbers, Gasfitters and Drainlayers Board.  
The consumer.

(Total 2 marks)