SAFETY TRAINING LEAFLET 03 INERT GASES (NITROGEN & ARGON)

AIGA 009.05/25

Asia Industrial Gases Association
No. 2 Venture Drive, #22-28 Vision Exchange, Singapore 608526
Tel: +65 67055642 Fax: +65 68633379
Internet: https://asiaiga.org | LinkedIn Profile: https://www.linkedin.com/company/asiaigaorg

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1 Introduction

1.1 Safety leaflets

Safety training leaflets summarise the basic operational safety knowledge which needs be known by employees working in the gas industry.

Refer to AIGA 009 *Safety Training of Employees* for the various combinations of leaflets which define the scope of safety training for a variety of specific jobs.

Each leaflet addresses a specific topic as identified in the title.

1.2 Comprehension tests

There is a comprehension test for each leaflet, included in **Appendix 1**.

Each test comprises several questions. To pass the test it is suggested that the employee should score 75% at the first attempt. Incorrect answers should be discussed to confirm understanding.

Appendix 2 includes the list of correct answers.

2 Inert gases

Nitrogen is often referred to by its chemical symbol N_2, Argon by its chemical symbol Ar. They are non-flammable, colourless, odourless and tasteless gases. Nitrogen is slightly lighter than air, while Argon is heavier than air. They are essential parts of atmospheric air which normally contains 79 % inert gases (78 % nitrogen + 1 % argon); the balance, 21 %, is oxygen.

2.1 Hazards of inert gases

- The inert gases are not toxic but do not support life and act as asphyxiants. When liquid nitrogen and argon evaporate, the gas produced is very cold and so is much heavier than air. Therefore, it can collect in areas below ground level and confined spaces, such as pits and trenches where the gas may be slow to disperse. A person can become unconscious immediately when entering an atmosphere which contains excessive proportions of inert gases (and, therefore, a shortage of oxygen). If the oxygen concentration is low, death can follow rapidly.
- Before entering vessels and enclosed spaces in which an accumulation of inert gases may have occurred, ensure that the atmosphere has been tested and that the oxygen content is within safe limits (19-23 %). A work permit is required - see Safety Training Leaflet 23 *Work Permit*. Always wear a personal oxygen-monitor
- Ensure that rooms or spaces where inert gases are stored or handled have either good ventilation or that their atmosphere is monitored for oxygen content.
- Do not stop ventilators in rooms where inert gases are stored or handled. Make sure that atmosphere monitoring systems are in operation.

2.2 Inert gases cylinder filling specific hazards and prevention measures.

- Contamination of cylinders with moisture or exposure to other type of stress such as fire or impact is hazardous as it causes corrosion or damage which in turn may cause a pressurised cylinder to burst. A cylinder inspection prior to filling is mandatory.
- You must know how to stop the cylinder filling process in case of an emergency.
- When not connected to the filling rack, cylinders must be capped and secured.

2.3 Liquid inert gases storage hazards and prevention measures

- Liquid inert gases are stored in registered pressure vessels. There is an identification plate on the vessel; you must know what the engraved information means. Tank pressure monitoring and control is critical, overpressure protections must be kept in good condition, operating instructions must be known, uncontrolled deviations must be reported.
- It is hazardous to overfill liquid storage tanks, level in the tank must be monitored.
- A liquid inert gas release in the atmosphere generates a thick cloud made of condensed moisture. Do not expose yourself to the cloud and try to get out of the cloud to breathe.

Appendix 1 – Inert Gases (Nitrogen & Argon) – Test Questions

Tick the correct answer (s) or write in the blank spaces as requested.

1. The inert gases are not toxic but do not support life and act as….?

   _____

2. Atmospheres in which nitrogen or argon accumulates are recognised by their characteristic smell:

   A. True **B.** False

3. If a cryogenic tank is filled with an inert cryogenic liquid it must be done_____ _____to avoid overfilling.

4. Tick at least three items of personal protection equipment that must be used when handling cryogenic liquids.

   A. Cryogenic gloves
   B. Face shield
   C. Safety harness
   D. Protective footwear
   E. Antistatic footwear
   F. Long-sleeved shirt

5. Which risks could be caused by spilled cryogenic inert gases?

   A. Oxygen enrichment
   B. Embrittlement of materials
   C. Risk of explosion
   D. Asphyxiation

6. Tick at least three characteristics of nitrogen:

   A. Tasteless
   B. Colourless
   C. Combustible
   D. Inert
   E. Flammable
   F. Toxic
   G. Odourless
   H. Similar density to air

7. The minimum percentage of oxygen in air for a safe environment is 19.5%

   A. True **B.** False

8. State three common properties of argon and nitrogen:

   _____

   _____

   _____

Appendix 2 – Inert Gases (Nitrogen & Argon) – Test Answers

1. Asphyxiants
2. B
3. "Slowly and the level monitored"
4. A, B, D and F
5. B and D
6. A, (tasteless), B (colourless), D (inert), G (odourless) and H (similar density to air)
7. A
8. * Inert. * Colourless.
   * Tasteless. * Compressed gases.
   * Odourless * Cryogenic liquid