LEARNER GUIDE

e-book

Training support material for:

MSMWHS217
Gas test atmospheres

Produced by:

EASY GUIDES
Australia Pty Ltd

PICTURE BASED. PLAIN ENGLISH. LEARNING MADE EASY.

SAMPLE

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PREPARE FOR GAS TESTING

Element 1

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Question 2. what are some typical gases you might find in confined spaces?

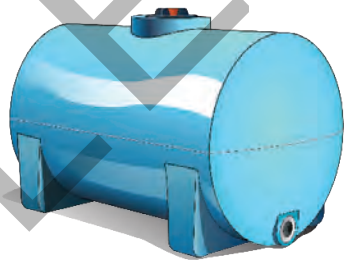
Oxygen (O2): Oxygen levels in confined spaces can vary, and in some cases, there may be a deficiency (oxygen levels below 19.5%) or enrichment (oxygen levels above 23.5%), both of which can be hazardous.

Hydrogen sulfide (H2S): This toxic gas is often found in sewers, manholes, and areas with organic materials undergoing decomposition. It has a foul odor at low concentrations but can be deadly at higher levels.

Methane (CH4): Methane is a flammable gas commonly found in confined spaces associated with natural gas, sewage, and agricultural facilities.

Carbon monoxide (CO): Carbon monoxide is a colourless, odorless, and highly toxic gas that can be present in confined spaces with combustion sources, such as furnaces and engines.

Ammonia (NH3): Ammonia can be found in refrigeration systems and industrial settings, and it is both irritating and potentially hazardous to human health.



Water storage tanks.

Ducts..

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Carbon dioxide (CO2): High concentrations of carbon dioxide can lead to oxygen displacement and asphyxiation in confined spaces.

Volatile organic compounds (VOCs): These compounds can be released in various industrial processes and may pose health risks.

Nitrogen dioxide (NO2): This reddish-brown gas is produced in combustion processes and can be present in confined spaces with engines or furnaces.

Chlorine (Cl2): Chlorine gas can be found in water treatment facilities and other industrial settings, and it is highly irritating and toxic when inhaled.

Dust and particulate matter:

Some confined spaces may have high levels of dust and particulate matter, which can pose respiratory hazards.

Roof spaces.

Pipes.

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Accuracy and sensitivity:

Ensure that the chosen equipment provides accurate and sensitive gas detection, especially when working with low concentrations of hazardous gases.

Alarm and data logging:

Determine if the equipment should have audible and visual alarms, as well as the capability to log and record data for compliance and reporting purposes.

Power source:

Choose between battery-powered, rechargeable, or wired options, depending on the availability of power sources in your workplace.

Compliance with standards:

Ensure that the selected equipment complies with relevant safety standards and regulations, such as those set by Australian Standards.

Wireless gas monitor.

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Hydrogen Sulfide (H2S): H2S is a toxic and foul-smelling gas that can be present in environments like sewage treatment facilities or confined spaces in the oil and gas industry.

Lower Explosive Limit (LEL): This sensor detects a range of combustible gases, including gases like methane, propane, and hydrogen, which can pose an explosion risk if they reach concentrations within their explosive limits (upper and lower).

Carbon Dioxide (CO2): In some situations, it's important to monitor CO2 levels to prevent oxygen depletion in confined spaces or areas where gases can accumulate.

These multi-gas detectors are typically portable and provide real-time readings of gas concentrations. They often have alarms and visual displays to alert workers when gas levels exceed safe limits, allowing them to take appropriate action, such as evacuating the area or donning protective equipment. Additionally, these monitors are calibrated and maintained regularly to ensure accuracy and reliability in detecting

Lower explosive risk (LEL) warns you of an explosion risk.

Enclosed underground spaces like tunnels, mines, or subways may have elevated CO2 levels due to limited air circulation.

Check calibration.

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Span calibration: Span calibration involves exposing the gas monitor to a known concentration of the target gas to calibrate its response. Follow these steps:

a. Attach the calibration gas cylinder to the gas monitor following the manufacturer's guidelines.

b. Initiate the span calibration mode on the gas monitor.

c. Allow the gas monitor to sample the calibration gas for the specified duration.

d. The gas monitor should display the gas concentration from the calibration gas. Make sure it matches the known concentration.

Adjust if necessary: If the gas monitor does not display the correct concentration, make necessary adjustments following the manufacturer's instructions. This typically involves using calibration adjustment knobs or software.

Confirm calibration: Perform a second span calibration to confirm that the gas monitor's response matches the known concentration.

Connect the gas monitor to the gas cylinder.

The gas monitor should sound an alarm.

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Record calibration data: Keep detailed records of the calibration process, including the date, time, calibration gas concentration, and any adjustments made. This documentation is essential for compliance and auditing purposes.

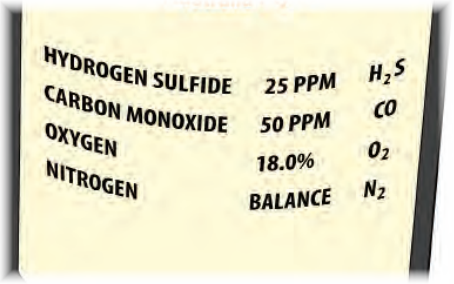
Final checks: Ensure the gas monitor is functioning correctly after calibration by conducting a functional test or bump test.

Calibration interval: Establish a regular calibration schedule based on manufacturer recommendations, industry standards, or local regulations. Regular calibrations ensure ongoing accuracy.

Training: Train personnel on the proper calibration procedure, including the use of equipment and safety precautions.

Remember that this is a general guideline, and specific gas monitors may have unique calibration requirements. Always check the manufacturer's instructions and guidelines for your particular gas monitor to ensure proper calibration and safety.

Check the readings on the gas monitor.



The readings should match the gas levels written on the gas cylinder.

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Question 7. You are preparing for gas testing. How do you find out the gas testing regime/sampling pattern required?

To determine the gas testing regime or sampling pattern required, you need to consider several factors, including the specific purpose of the gas testing, the type of gas or gases you are testing for, relevant safety regulations, and industry best practices. Here are the steps to find out the gas testing regime or sampling pattern:

Know your purpose: Understand why you're doing gas testing (e.g., safety, environmental monitoring).

Identify the gases: Work out which gases you need to test for.

Check the rules: Look at safety regulations and guidelines that apply to your situation.

Learn from experts: Talk to industry experts or organisations for advice.

Assess dangers: Understand how dangerous the gases are to decide how often you need to test.

Pick sampling spots: Choose where you'll take gas samples based on potential risks.

Choose testing methods: Decide on the right tools and methods for gas sampling.

Toxic gas sign.

Pick sampling spots.

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Question 8. How are gas contaminants measured?

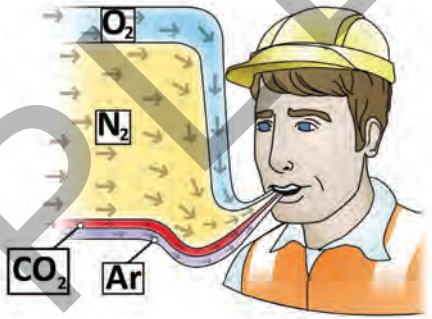
Measuring gasses

When we **gas test** an area, we test how much of a gas is in the area. The measurement we use for some gasses is different to other gasses. We measure some gasses in:

- Percentage of volume (%V)
- Parts per million (PPM)

You can also measure gasses in:

- Milligrams per cubic meter (mg/m^3)



Percent of volume (%V) means what percentage of the air we have tested is made up of that gas. For example, for us to breathe we need between 19.5% and 23.5% oxygen — 1% means 1 part in every 100 parts.

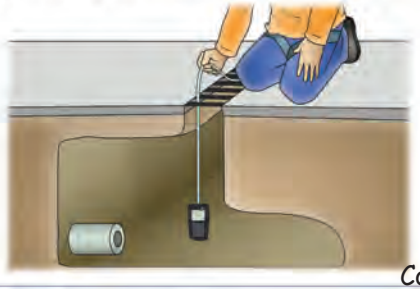
Some gasses can **injure** or **kill** you in very small quantities.

Carbon monoxide (CO) and Hydrogen sulfide (H_2S) are both good examples. We do not measure these gasses as percentages because the percentage would be too low.

For example:

- Hydrogen sulfide (H_2S) can kill you when levels are as little as 0.005%
- This is better shown as 50 parts per million. 1ppm means 1 part in every 1,000,000.

Milligrams per cubic meter (mg/m^3) means if you test a cubic meter of air, how many milligrams of a gas is in that air.



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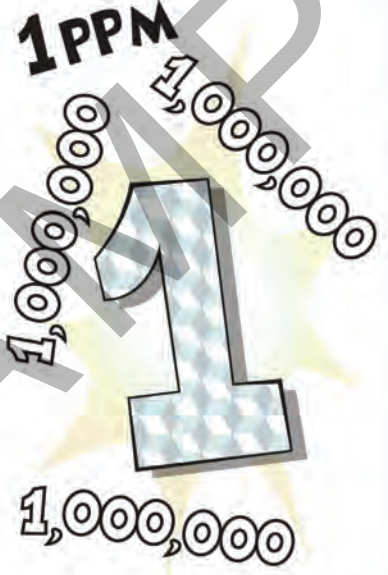
A simple way to remember these measurements is:

1% V means —
1 part in every 100

1 PPM means —
1 part in every 1,000,000



1 mg/m^3 means —
1 milligram of a gas in 1 cubic meter of air

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Question 10. What are the four dangers a gas monitor tests for?

If any of these things are at a dangerous level an **alarm** will go off on the gas monitor.

If you hear an alarm you know the atmosphere is **not safe**.

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Question 11. You are preparing for gas testing. How can you implement hazard control measures and use appropriate personal protective equipment (PPE)?

Identify and assess hazards: Understand the type of gases you'll be testing for and their potential risks.

Assess the testing environment, including confined spaces, tanks, pipelines, or other areas where gas may accumulate.

Develop a written plan: Create a detailed gas testing plan that outlines procedures, responsibilities, and safety measures.

Identify safe entry and exit procedures for confined spaces, including rescue plans.

Develop a written plan.

Select the right equipment: Choose appropriate gas detection equipment based on the specific gases you expect to encounter.

Ensure that gas detectors are properly calibrated and maintained.

Choose the right gas detection equipment.

Establish safe work practices: Implement proper isolation and lockout/tagout procedures to prevent the release of hazardous gases.

Establish safe work practices and procedures for gas testing, including who can perform the testing and under what conditions.

Ventilation: If possible, ensure adequate ventilation in the testing area to dilute and disperse any hazardous gases.

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Question 14. What are explosive limits

Explosive limits

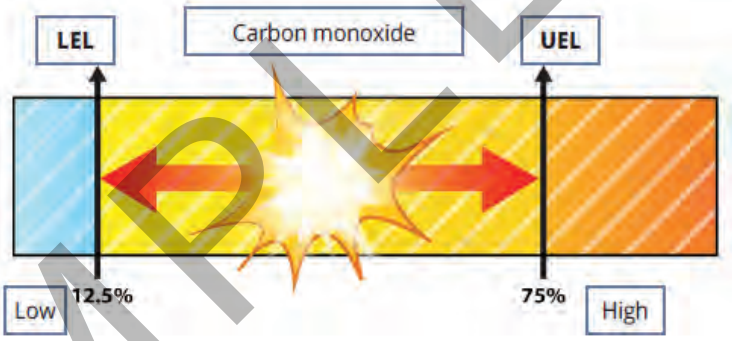
Some gasses can **explode** if they meet an ignition source (flame or spark).

For a gas to explode it needs to be at the right levels.

If the level of gas is too **low**, or too **high**, the gas will **not explode** even if there is an ignition source.

For example, carbon monoxide can explode if it makes up 12.5% of air in an environment.

If there is less than 12.5% it will **not** burn.



WARNING

Lower explosive limit (LEL)

Lower explosive limit (LEL) means the level of a gas is rising to a point that it could **explode**.

If your gas monitor sounds an LEL alarm, you **must** be very careful.

Do not do anything that could cause a spark. For example, using a power tool. If you do, the gas could explode.

Get out of the space as quickly as possible.

WARNING

Upper explosive limit (UEL)

Upper explosive limit (UEL) means the **highest level** of a gas that could **explode**.

Your gas monitor will **not** show the UEL.

If a gas level is at the UEL, you should be **already out of the space.**

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TEST GAS

Element 2

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Question 16. How do you use gas testing equipment to test gas as required?

Select the appropriate gas detection equipment: Choose the right gas detector for the type of gases you expect to encounter. Some detectors are specific to particular gases, while others can detect a range of gases.

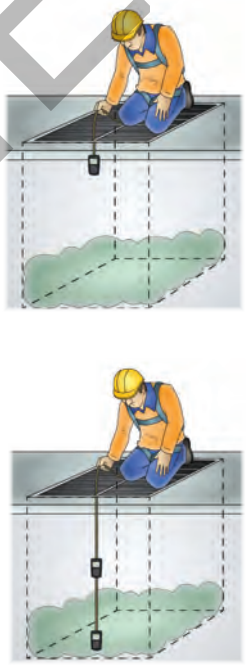
Calibration and pre-check: Before each use, ensure that the gas detection equipment is properly calibrated according to the manufacturer's instructions. Calibration verifies that the instrument is accurately measuring gas concentrations.

Perform a pre-check of the equipment to confirm that it is functioning correctly. Check the battery, sensors, alarms, and display.

Set baseline readings: In a clean and safe environment (an area free from the target gases), turn on the gas detector and allow it to establish baseline readings. These readings serve as a reference point for detecting changes in gas levels.

Properly wear personal protective equipment (PPE): Before conducting any testing, ensure that you and your team are wearing the appropriate PPE, including respiratory protection, gloves, eye protection, and any other necessary gear based on the potential hazards.

Sampling strategy: Determine the appropriate sampling strategy based on the specific conditions and gas being tested. This may involve using a handheld gas detector to sample the air at different locations or using a fixed



Test gas at different heights. Some gases may be heavier or lighter than air.

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Personal Protective Equipment (PPE): Ensure that anyone involved in addressing the gas issue is wearing the necessary personal protective equipment, including gas masks or respirators, if applicable.

Prevent ignition sources: Avoid activities that could create sparks, flames, or other ignition sources. Turn off electrical equipment and avoid using open flames or smoking in the area.

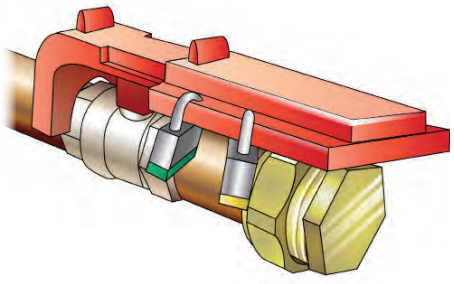
Control sources of gas: Identify and control any potential sources of the gas, such as leaks from gas pipes or tanks, to prevent further release.

Gas detection and monitoring: Continue to monitor gas levels and assess the situation regularly. Make sure that the gas levels are decreasing and that it is safe for people to re-enter the area.

Safety checks: Before allowing anyone to re-enter the area, conduct safety checks to ensure that gas levels are within acceptable limits and that it is safe to return.

Investigation: Once the situation is under control, investigate the cause of the unacceptable gas readings. This may involve conducting a thorough inspection to locate and repair any leaks or faults in gas

Wear necessary PPE before entering area.



If possible, isolate the source of the gas leak.

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Question 20. You are working in an area and find there is an unacceptable gas reading. How would you communicate needed actions to be taken to appropriate people?

Immediate response:

As soon as you detect the unacceptable gas reading, prioritise your safety and the safety of others. If it's safe to do so, move to a location with better air quality or evacuate the area.

Alert workmates:

If there are workmates or coworkers in the area, immediately alert them to the presence of the gas and the need to evacuate. Use clear and concise language to convey the urgency.

Emergency services:

Dial the emergency services number (e.g., 911) to report the gas emergency. Provide them with the following information:

The exact location of the incident.

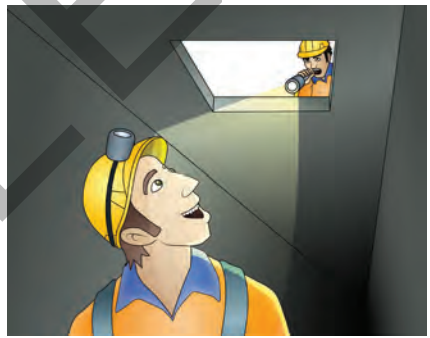
The type of gas you suspect is involved (if known).

The level and nature of the gas reading.

Any other relevant details that can assist emergency responders.

Gas utility company:

If the gas source is related to a utility or industrial process, contact the gas utility company or responsible person within your organisation. Provide them with the necessary information regarding the incident and gas levels.



Immediately tell workmates of the problem.

Contact the gas company about leak.

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MAINTAIN EQUIPMENT

Element 3

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Question 21. How do you clean gas testing equipment according to procedures?

Safety precautions:

Before starting any maintenance, ensure the equipment is turned off, and any gas sources are disconnected.

Inspect for damage:

Examine the equipment for any visible damage, such as cracks, dents, or loose parts. If you find any damage, address it according to the manufacturer's instructions or your organization's maintenance procedures.

Clean external surfaces:

Wipe down the external surfaces of the equipment with a clean, dry cloth to remove dust, dirt, and contaminants. Use a damp cloth with mild detergent if necessary, but avoid getting the interior wet.

Calibration gas cylinder:

If your gas testing equipment requires calibration, ensure that the calibration gas cylinder is clean and in good condition. Secure it properly.

Sensor cleaning (if applicable):

If your equipment has gas sensors, consult the manufacturer's guidelines for cleaning and maintaining the sensors. Some sensors may require periodic cleaning with specific cleaning solutions.

Clean external surfaces with a clean, dry cloth.

Make sure that the calibration cylinder is clean and in good condition.

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Record keeping:

Maintain detailed records of all maintenance activities, including calibration dates, sensor replacements, and any issues or repairs performed. This documentation is often required for compliance and quality assurance purposes.

TMP Document no.		TCD Dwg No.		Revision No.	
Date:	Time:	Location:			
Inspection/ changes	By:	Signed:	Changes authorised	By:	Signed:
Details/Comments:					

Keep a record of maintenance activity.

Train personnel:

Ensure that personnel using the equipment are properly trained in its maintenance and use. This includes knowing how to perform routine checks and maintenance tasks.

Replace consumables:

Replace any consumable items, such as filters or hoses, based on the manufacturer's recommended schedules.

Store properly:

When not in use, store the gas testing equipment in a clean, dry, and controlled environment. Protect it from extreme temperatures, humidity, and physical damage.

Store the gas testing equipment in a clean, dry, and controlled environment.

Regular maintenance and cleaning of gas testing equipment are critical to ensure its accuracy and reliability in detecting gas concentrations. Following manufacturer recommendations and your organization's procedures is essential for the safety of personnel and the integrity of the testing process.

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Fault-Finding Gas Monitoring Equipment

Refer to manufacturer's manual:

Consult the equipment's user manual or manufacturer's guidelines for specific troubleshooting steps and error codes. Follow the recommended procedures carefully.

Check for error codes or alarms:

If the equipment has a display or indicator lights, check for any error codes or alarms. These can provide valuable information about the issue.

Check for error codes or alarms.

Perform functional tests:

Follow the manufacturer's instructions to perform functional tests to identify any performance issues.

Inspect gas supply and connections:

Make sure that the gas supply to the equipment is adequate and that all connections, hoses, and fittings are secure. Leaks or interruptions in the gas supply can affect the equipment's accuracy.

Check for leaks in the gas supply.

Check power supply:

Verify that the power source, whether it's batteries or external power, is providing the required voltage and that the connections are secure.

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File organization:

Establish a systematic way to organize and store test records. Consider using a digital document management system or physical folders to keep records accessible and well-organised.

Retention period:

Be aware of the retention period required by your organization's policies or relevant regulations. Test records may need to be retained for a specific duration, often for compliance and auditing purposes.

By maintaining accurate and well-organized records of tests and results, you contribute to the equipment's reliability, safety, and compliance with industry standards and regulations. These records are invaluable for identifying trends, troubleshooting issues, and ensuring that the gas monitoring equipment functions as intended.

Keep records..

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