

2014 North Central Mine Rescue Contest Wilmington, IL

Written Test – Technician Team Competition

Industrial Scientific Multi-Gas Detector, MX6

*Directions: Select the letter preceding the **BEST** answer to each of the following questions.
Choose only one answer per question.*

MSHA Publication 3027 - Module 2 Mine Gases MSHA Publication 3027 - Module 3 Ventilation Metal and Nonmetal National Mine Rescue Contest Rules 2014

1. The technician team competition may include which of the following test components:
 - A. Two self-contained breathing apparatus
 - B. Back board
 - C. First Aid Kit
 - D. All of the above

2. Soluble gases may be released into mine air from groundwater.
 - A. True
 - B. False

3. During mine rescue and recovery work the command center directly approves all:
 - A. Ventilation Tests
 - B. Ventilation Construction
 - C. Ventilation Alterations
 - D. B and C only

4. The purpose of mine ventilation is to provide a velocity of air sufficient to remove harmful gases, dust, smoke and fumes.
 - A. True
 - B. False

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5. **Which of the following properties are associated with Hydrogen Sulfide gas:**
 - A. The gas is one of the most poisonous known.
 - B. The gas is not soluble in water.
 - C. The gas is yellowish, with an odor of rotten eggs.
 - D. All of the above.

6. **Line Brattice must be permanently installed for short duration ventilation applications.**
 - A. True
 - B. False

7. **Check Curtains or Run-Through Curtains are designed to:**
 - A. Close manually after you have passed through them.
 - B. Deflect the intake air current into a working area.
 - C. Fasten at the top and one side only.
 - D. All of the above.

8. **Which of the following properties are associated with Acetylene gas:**
 - A. The gas is highly flammable.
 - B. Found after methane explosions in air having a low oxygen content.
 - C. The gas is slightly toxic.
 - D. B and C only.

9. **If a mine ventilation system is badly damaged or is out completely, the distinction between intake and exhaust air on the mine map may not be valid.**
 - A. True
 - B. False

10. **Auxiliary fan tubing used to control and direct airflow to or from a mining area will be:**
 - A. Rigid tubing for forcing systems
 - B. Collapsible tubing for exhaust systems
 - C. Usually suspended from timbers or eye bolts
 - D. All of the above

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MX6 iBrid Multi-Gas Instrument Instruction Manual Revision 6, March 2013

- 11. The IR (infrared) methane sensor is not to be used for methane concentrations below:**
 - A. 2.5% in air.
 - B. 1.0% in air.
 - C. 5.0% in air.
 - D. 0.5% in air.

- 12. If a LCD sensor name is blinking, and black in color, it indicates a failed sensor.**
 - A. True
 - B. False

- 13. The confidence alarm can be activated only as an audible beep.**
 - A. True
 - B. False

- 14. Fully charging the MX6 lithium-ion battery pack will take approximately:**
 - A. 3 hours
 - B. 8 hours
 - C. 2 hours
 - D. 5 hours

- 15. Gas concentrations above a sensor's detection limit are displayed on the LCD as:**
 - A. Blinking red STEL.
 - B. Solid red HIGH.
 - C. Solid green OR.
 - D. Blinking red OR.

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- 16. Leather carrying cases can produce inaccurate readings with diffusion (non-aspirated) detection instruments if configured to measure which of the following gases?**
- A. Oxygen
 - B. Nitrogen Dioxide
 - C. Carbon Dioxide
 - D. Hydrogen Sulfide
- 17. The oxygen sensor warning alarm provides two, unique, audible alarms - a low-level warning for low-oxygen environments and a high-level warning for enriched-oxygen environments.**
- A. True
 - B. False
- 18. User configurable alarms include which of the following modes:**
- A. Vibrate
 - B. Audible
 - C. Visual
 - D. All of the above
- 19. Oxygen deficient atmospheres may cause combustible gas readings to be:**
- A. Higher than actual readings
 - B. Unaffected
 - C. Lower than actual readings
 - D. Latch over range (+OR)
- 20. If battery life remaining is less than one hour the battery icon flashes and an audible alarm is initiated.**
- A. True
 - B. False

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- 21. Sensor Menu – Zero All option will perform which of the following:**
- A. CO₂ sensor is zeroed first – if present.
 - B. O₂ sensor is calibrated – if present.
 - C. All toxic gas sensors are zeroed.
 - D. B and C are correct.
- 22. The MX6 alkaline battery pack should adhere to which of the following guidelines:**
- A. Use three alkaline cells.
 - B. Mixing batteries from different manufacturers is acceptable.
 - C. Battery packs can be replaced in a gassy area.
 - D. All of the above.
- 23. The MX6 should not be used in oxygen-enriched atmospheres.**
- A. True
 - B. False
- 24. Industrial Scientific recommends that a functional (bump) test be performed on every instrument:**
- A. Once every month.
 - B. Before each days use.
 - C. Before use in oxygen-deficient atmospheres.
 - D. At least weekly.
- 25. The recommended calibration gas flow rate is:**
- A. 5.0 LPM
 - B. 0.75 LPM
 - C. 1.0 LPM
 - D. 0.5 LPM

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26. **When sampling with a motorized pump and tubing - to let the sensors adequately react to any gases present allow:**
- A. One minute delay.
 - B. Two minute delay + two minutes per foot of tubing.
 - C. One minute delay + one minute per foot of tubing.
 - D. Two minute delay + two seconds per foot of tubing.
27. **Sudden changes in atmospheric pressure may cause temporary fluctuations in the combustible gas reading.**
- A. True
 - B. False
28. **The MX6's four steps of operation before each days use include which of the following:**
- A. Zero the instrument in fresh air.
 - B. Clean the water barrier of contaminants.
 - C. Calibrate the sensors.
 - D. Both A and C are correct.
29. **Instrument alarms are used during calibration to confirm alarm performance.**
- A. True
 - B. False
30. **The MX6 LCD screen may present any of the following "indicators" except:**
- A. Text box windows.
 - B. Escape button.
 - C. Radio buttons.
 - D. Single function buttons.

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ANSWER SOURCE KEY

MSHA Publication 3027 - Module 2 Mine Gases
MSHA Publication 3027 - Module 3 Ventilation
Metal and Nonmetal National Mine Rescue Contest Rules 2014

| Question | Answer | Source |
|----------|--------|--|
| 1 | A | 2014 Metal and Nonmetal Mine Rescue Contest Rules, Technician Team Competition, Page 61, General Rule 1 <i>Comments:</i> Back board removed 2014, First aid kit removed 2014, Gas detector and Communications system must also be included. |
| 2 | A | Mine Gases, Module 2, Page(s) 2-7, Solubility <i>Comments:</i> True |
| 3 | D | Mine Ventilation, Module 3, Page(s) 3-21 – Building Ventilation Controls Mine Ventilation, Module 3, Page 3-3 – Introduction <i>Comments:</i> Ventilation testing is not under command center control as it will not alter mine conditions |
| 4 | B | Mine Ventilation, Module 3, Page(s) 3-4 <i>Comments:</i> Volume not velocity, Also must provide adequate oxygen |
| 5 | A | Mine Gases, Module 2, Page(s) 2-19 and 20 <i>Comments:</i> It is water soluble, It is colorless |
| 6 | B | Mine Ventilation, Module 3, Page(s) 3-24 – Line Brattice <i>Comments:</i> Can be held in place by team members |
| 7 | B | Mine Ventilation, Module 3, Page(s) 3-9 – Check Curtains <i>Comments:</i> Close automatically, Fasten at the top only |
| 8 | D | Mine Gases, Module 2, Page(s) 2-24 <i>Comments:</i> It is combustible, but it will not support combustion. |
| 9 | A | Mine Ventilation, Module 3, Page(s) 3-6 – Note to Trainer <i>Comments:</i> Normal production conditions may no longer be valid |
| 10 | C | Mine Ventilation, Module 3, Page(s) 3-10 – Auxiliary Fans and Tubing <i>Comments:</i> Flexible for forcing, Rigid for exhaust |

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ANSWER SOURCE KEY

MX6 iBrid Multi-Gas Instrument Instruction Manual Revision 6, March 2013

| Question | Answer | Source |
|----------|--------|---|
| 11 | C | Rev 6, pg. 6, Warnings and Cautionary Statements <i>Comments:</i> Specified in Manual. |
| 12 | B | Rev 6, pg. 15, Normal Operation Mode – NOTE: <i>Comments:</i> Black color indicates normal operation, Blinking indicates alarm condition. |
| 13 | B | Rev 6, pg. 24, Configuration Menus - Alarms <i>Comments:</i> The alarm can be audible, visual, vibration – and any combination of the three. |
| 14 | B | Rev 6, pg. 11, Charging the Batteries <i>Comments:</i> Specified in Manual. |
| 15 | D | Rev 6, pg. 15, Normal Operation Mode – NOTE: <i>Comments:</i> STEL is an alternative alarm indicator. |
| 16 | B | Rev 6, pg. 5, Warnings and Cautionary Statements <i>Comments:</i> The other three gases are specifically exempted. |
| 17 | B | Rev 6, pg. 8, Key Features – Audio Indicator <i>Comments:</i> Only a single audible alarm for either event. |
| 18 | D | Rev 6, pg. 24, Configuration Menus <i>Comments:</i> Latch and Confidence Beep are included in the alarm menu – but are not alarms. |
| 19 | C | Rev 6, pg. 4, Warnings and Cautionary Statements <i>Comments:</i> The sensor needs O ₂ to respond, standard wheatstone bridge response. |
| 20 | A | Rev 6, pg. 12, Charging the Battery – NOTE: <i>Comments:</i> Visible and audible warnings. |
| 21 | D | Rev 6, pg. 19, Zero All Option <i>Comments:</i> CO ₂ is calibrated last with Zero Air. |
| 22 | A | Rev 6, pg. 6, Warnings and Cautionary Statements – Conditions of Use <i>Comments:</i> Mixing manufacturers is not recommended, Individual alkaline batteries can be replaced in a gassy area – not packs. |
| 23 | A | Rev 6, pg. 4, Warnings and Cautionary Statements <i>Comments:</i> Specified in Manual. |

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ANSWER SOURCE KEY

iTX Multi-Gas Instrument
Instruction Manual
Revision 9, September 2011

| Question | Answer | Source |
|----------|--------|---|
| 24 | B | Rev 6, pg. 18, Calibration Policy <i>Comments:</i> Confirms correct operation between calibration events. |
| 25 | D | Rev 6, pg. 20, Calibrate Option <i>Comments:</i> Minimum acceptable flow rate. |
| 26 | D | Rev 6, pg. 5, Warning and Cautionary Statements <i>Comments:</i> Sample travel delay time. |
| 27 | B | Rev 6, pg. 4, Warning and Cautionary Statements <i>Comments:</i> May impact Oxygen reading. |
| 28 | A | IBRID MX6 Four Steps of Operation Guide <i>Comments:</i> Water Barrier is not included, Bump Test is required, Clear peak readings. |
| 29 | B | Rev 6, pg. 19, Calibration Options <i>Comments:</i> Alarms are deactivated during calibration to save battery life. |
| 30 | B | Rev 6, pg. 13, Menu Operation Basics <i>Comments:</i> There is no “Escape” button – the “Cancel” button serves this purpose. |