

**2010 National Metal and Nonmetal Mine Rescue Contest
Technician Team Competition (Draeger BG-4) – Written Test**

Please do not write on this test. Use the answer sheet provided.

10 Questions for multi-gas instrument (TMX412, iTX, and MX6 iBrid):

1. Which of the following may cause the combustible gas sensor to read lower than actual gas concentrations?
 - A. Silicone compound vapors
 - B. Oxygen deficient atmospheres
 - C. Sudden changes in atmospheric pressure
 - D. all of the above
 - E. only A and B

2. A functional (bump) test is defined as a brief exposure of the (gas) monitor to a known concentration of gas(es) for the purpose of verifying sensor and alarm operation and to measure the accuracy of the instrument.
 - A. True
 - B. False

3. High Over-Range (+OR or OR) or off-scale combustible gas reading may indicate an explosive concentration of combustible gas.
 - A. True
 - B. False

4. When the gas instrument is in non-latching mode, alarms set according to the Technician Team Competition in Contest Rule Book and exposed to 19.9% Oxygen, 0.9% Methane, 40.2 ppm Carbon Monoxide and 25.0 ppm Nitrogen Dioxide, it will _____.
 - A. be in high alarm condition
 - B. display "40" for the Carbon Monoxide reading
 - C. display "25.0" for the Nitrogen Dioxide reading
 - D. all of the above
 - E. only A and C

5. Marginal calibration occurs if the (gas) sensor's full span value or span reserve is between 50% – 70% of the applied (calibration) gas value\concentration.
 - A. True
 - B. False

6. For a low alarm condition (for the MX6 iBrid the audio and visual alarms are enabled), the gas instrument will activate only an audible alarm and the corresponding gas display or value will flash. For a high alarm, a visual alarm will also be activated.

A. True
B. False

7. The gas instrument indicate a "low battery warning or alarm" on the display by _____
(select answer under the options for your gas instrument)

For TMX412:

A. a flashing "B"

B. an empty battery
indicator

C. flashing "LOW BAT"

D. none of the above

For iTX

A. display "Battery Low
Starting Shutdown"

B. a flashing "B"

C. flashing "LOW BAT"

D. none of the above

For MX6 iBrid

A. display "Low Battery"
in red

B. a flashing "B"

C. flashing "LOW BAT"

D. none of the above

8. When does the oxygen (O₂) sensor receive its calibration for the gas instrument?

A. During the countdown timer
B. After zeroing is complete for the toxic and combustible sensors
C. During the "Sensor Configuration Gas" mode.
D. During the "Hygiene Function" mode.

9. During calibration of the gas instrument, what is the recommended flow rate?

A. 0.25 liter per minute (Lpm)
B. 0.5 liter per minute (Lpm)
C. 1.5 liter per minute (Lpm)
D. 2.0 liter per minute (Lpm)

10. For the gas instrument, the maximum display range for the (catalytic) combustible\methane\LEL sensor is _____

A. 5.0% Methane
B. 100% LEL
C. 50% LEL
D. Both A and B
E. Both A and C

10 Questions from MSHA Publication 3027 - Modules 2 and 3:

11. From the team's findings on the conditions of ventilation controls, the team will issue directions to the command center on how to reestablish ventilation in the mine.
- A. True
 - B. False
12. An anemometer actually measures linear feet of travel.
- A. True
 - B. False
13. The most accurate method of determining the air velocity using a smoke tube is to take readings at quarter points within the airway?
- A. True
 - B. False
14. Air containing 5 to 74.2 percent hydrogen will explode even when there is as little as 4 percent oxygen present?
- A. True
 - B. False
15. Heat from a fire in the mine will cause gases to expand and _____?
- A. be harder to disperse.
 - B. be dispersed more easily.
 - C. be diffuse more slowly.
 - D. both A and C
16. Gases issuing into still air without mixing tend to stratify according to the gas's specific gravity?
- A. True
 - B. False
17. Which of the following is not true for oxides of nitrogen, such as Nitrogen Dioxide and Nitric Oxide?
- A. will neither burn nor explode
 - B. are highly toxic
 - C. heavier than air
 - D. reddish-brown at low concentrations and dark brown at higher concentrations

18. Carbon dioxide is the most poisonous of the gases in afterdamp?

- A. True
- B. False

19. How many of the following statements are true?

- Carbon monoxide (CO) is flammable.
- Carbon monoxide is slightly soluble in water.
- Exposure to as little as 0.15 to 0.20 percent CO is extremely dangerous.
- As little as 500 ppm carbon monoxide can kill you in three hours.

- A. 1
- B. 2
- C. 3
- D. 4

20. Changes in pressure and temperature will have the following effect on a gas _____.

- A. an increase in pressure causes a gas to contract
- B. a decrease in temperature causes a gas to expand
- C. both A and B
- D. none of the above

10 Questions from Draeger PSS BG-4 Service Manual Rev. O:

21. The high pressure O₂ cylinder contains _____ of _____ % O₂?

- A. 350 liters of 95% O₂
- B. 425 liters of 97% O₂
- C. 425 liters of 99% O₂
- D. 400 liters of 99% O₂

22. The Carbon cylinder pressure is full at _____ psi?

- A. 3135 psi
- B. 3125 psi
- C. 3000 psi
- D. 3035 psi

23. The moisture trap relief valve opens \geq 15 psi?

- A. True
- B. False

24. The over pressure relief valve opens between ____ - ____ mbar.
- A. 1-3 mbar
 - B. 2-5 mbar
 - C. 1-5 mbar
25. When checking the minimum valve watch the pressure gage and the valve should open between ____ and ____ mbar.
- A. 0.5 and 2.0
 - B. 1.0 and 2.5
 - C. 0.1 and 1.5
 - D. 0.1 and 2.5
26. The maximum drying temperature for BG4 parts is ____ °C?
- A. 50°C
 - B. 55°C
 - C. 60°C
 - D. 65°C
27. The inhalation and exhalation valve on the BG-4 units which is in constant use is needs to be replaced?
- A. Every six months
 - B. Yearly
 - C. Every 2 years
 - D. Every 3 years
28. The pressure reducer need a through overhaul by experts every ____?
- A. 3 years
 - B. 4 years
 - C. 5 years
 - D. 6 years
29. The O-rings for the high pressure reduce on a BG-4 apparatus which is in constant use need to be replaced every ____?
- A. Year
 - B. 2 years
 - C. 3 years
 - D. 6 years

30. When inserting the speech diaphragm, remove o-ring and inspect for good condition. Lubricate with Dow Corning 110 or replace if necessary?

- A. True
- B. False