

# ***2012 National Metal and Nonmetal Mine Rescue Contest***

## **Technician Team Competition Written Test (Dräger BG-4)**

### **Directions:**

- 1. Find the correct answer to each of the questions.**
- 2. Select only one answer per question.**
- 3. Then, fill in the corresponding circle on the answer sheet for each numbered question.**

**Good Luck!**



***July 31, 2012***

# 2012 Metal/Nonmetal National Mine Rescue Contest

## Technician Team (Dräger BG-4) Competition – Written Test

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

1. Oxygen deficient atmospheres may cause readings of combustible (methane) gas to be higher than the actual concentration.
  - A. True
  - B. False
2. Oxygen enriched atmospheres may cause readings of combustible (methane) gas to be lower than actual concentrations.
  - A. True
  - B. False
3. Silica can affect the combustible gas sensor and may cause readings to be lower than actual gas concentrations.
  - A. True
  - B. False
4. Sudden changes in atmospheric pressure will not cause temporary fluctuations in the oxygen readings.
  - A. True
  - B. False
5. The manufacturer recommends that a functional (bump) test be performed on the gas instrument after each day's use.
  - A. True
  - B. False
6. The iTX and MX6 multi-gas instrument is certified for use within an ambient temperature of - 45° C to 60° C.
  - A. True
  - B. False

7. When the battery life is nearing the end, the following occurs (answer the question for your instrument):

For the iTX, with a minimum of 30 minutes of battery life, the unit will emit a periodic tone.	For the MX6 iBrid, if the remaining runtime is less than 30 minutes, "Low Battery" is displayed.
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- A. True  
B. False
8. Marginal calibration if the span reserve is between \_\_\_\_\_ to \_\_\_\_\_ of the applied (calibration) gas value/concentration.
- A. 20 % to 60 %  
B. 40 % to 60 %  
C. 60 % to 80 %  
D. None of the above
9. While in the normal operational mode the screen on your instrument shows the battery at the \_\_\_\_\_ of the screen.
- A. top middle  
B. top right  
C. bottom middle  
D. bottom right  
E. None of the above
10. When the gas instrument is in non-latching mode, alarms set according to the Technician Team Competition in the MNM National Mine Rescue Contest Rule book exposed to 20.4% Oxygen, 1.2% Methane, 40.0 ppm Carbon Monoxide, and 2.0 ppm Nitrogen Dioxide, it will \_\_\_\_\_.
- A. be in high alarm condition  
B. display "40" for Carbon Monoxide reading  
C. display "2.0" for Nitrogen Dioxide reading  
D. All of the above  
E. Only B. and C.  
F. None of the above
11. During exploration of a mine and the mine rescue team loses communication with the command center the captain has the authority to change the ventilation during an emergency.
- A. True  
B. False

12. The basic principle underlying mine ventilation is the air always moves from low pressure regions to high pressure regions. Therefore, in order to get the air to flow from the intake to the exhaust, the exhaust air must be at a higher pressure than the intake.
- A. True
  - B. False
13. An anemometer is a small sort of windmill with a mechanical counter for recording the number of revolutions caused by the moving air current. A regular anemometer for is measuring velocities from \_\_\_\_\_ to \_\_\_\_\_ feet per minute.
- A. 110 to 2,000
  - B. 150 to 2,000
  - C. 120 to 2,000
  - D. None of the above
14. Carbon monoxide is explosive and flammable. It is highly toxic even in very low concentrations. It doesn't take much CO to interfere with your blood's oxygen-carrying capacity because the gas combines with hemoglobin \_\_\_\_\_ to \_\_\_\_\_ times more than oxygen.
- A. 100 to 300
  - B. 150 to 300
  - C. 200 to 300
  - D. None of the above
15. Hydrogen at high concentrations can replace oxygen in the air and act as an asphyxiant. Also hydrogen is highly explosive. The explosive range is \_\_\_\_\_ to \_\_\_\_\_ in air with as little as 5 % oxygen.
- A. 4.0 to 74.2 %
  - B. 12.5 to 74.2 %
16. Under 30 CFR §49.6(a)(6), MSHA requires mine rescue stations serving underground metal and nonmetal mines to have \_\_\_\_\_ gas detectors appropriate for each gas which may be encountered at the mines served.
- A. One
  - B. Two
  - C. Four
  - D. Six
17. Carbon Dioxide is a normal component of air and is a product of incomplete combustion; it also a by-product of respiration process. In some mines, it liberated from the rock strata.
- A. True
  - B. False

18. Sulfur Dioxide is very toxic, irritating gas that is dangerous even in small concentrations; as little as \_\_\_\_\_ % to \_\_\_\_\_ % is dangerous to life.
- A. 0.01 to 0.02
  - B. 0.02 to 0.03
  - C. 0.03 to 0.04
  - D. 0.04 to 0.05
19. Nitrogen Dioxide is very toxic even small amounts will irritate your throat. It mixes with moisture in your lungs to form acids that corrode the respiratory passages and causes them to swell. Exposure to .015% can be fatal.
- A. True
  - B. False
20. Specific gravity is not the only factor that determines how quickly a gas will diffuse; temperature and pressure also affect it. A decrease in temperature makes a gas diffuse more rapidly; an increase in pressure also speeds up the rate of diffusion.
- A. True
  - B. False
21. When checking the drain valve; set the RZ tester on positive pressure pumping. The drain valve should open at 10 mbar.
- A. True
  - B. False
22. Checking the Exhalation Valve; set RZ tester on negative pressure pumping. Tightly pinch inhalation hose with your hand. Pump once until 10 mbar is indicated on the pressure gauge. If the system does not reach 10 mbar replace exhalation valve.
- A. True
  - B. False
23. Checking the relief valve; set the RZ tester on positive pressure pumping and continue pumping until the relief valve opens; the opening pressure on the gauge should lie between \_\_\_\_\_ and \_\_\_\_\_ mbar.
- A. 1.5 and 1.9 mbar
  - B. 2 and 5 mbar
  - C. 0.1 and 2.5 mbar
  - D. None of the above

24. High pressure leak test; when the cylinder pressure is over 2600 psi/180 bar: Icon “close cylinder appears on the backlight display; the alarm beeps \_\_\_\_\_ times close the cylinder valve.
- A. One
  - B. Two
  - C. Three
  - D. Four
25. Checking the minimum valve; set the RZ tested on “negative pressure pumping” the minimum valve in the breathing bag is heard to open at a value between \_\_\_\_\_ and \_\_\_\_\_ mbar.
- A. 1.5 and 1.9 mbar
  - B. 2 and 5 mbar
  - C. 0.1 and 2.5 mbar
  - D. None of the above
26. The BG4 Panorama Nova Mask is made of EPDM or silicone material with a polycarbonate or Plexiglas lenses and has a peripheral vision of \_\_\_\_\_ %.
- A. 92 %
  - B. 94 %
  - C. 95 %
  - D. None of the above
27. Dräger recommends under moderate service conditions: for temperatures of up to 104° F (40° C) the period of use is up to \_\_\_\_\_ hours with ice in the cooler.
- A. 1-hour
  - B. 2-hour
  - C. 3-hours
  - D. 4-hours
28. Checking the Battery capacity for the Sentinel; if symbol “battery warning 2” is displayed the red LEDs will flash constantly and on power up 4 short beeps will sound.
- A. True
  - B. False
29. When checking the constant dosage valve; set RZ tester on positive pressure pumping set dosage 0.5 – 2 L/min. The Constant metering quantity should lie between 1.5 and 1.9 L/min when the cylinder pressure is at 2400 to 3000 psi.
- A. True
  - B. False

30. The BG4 minimum valve activates between 1 and 2.5 mbar and provides approximately 80 l/min flow.

- A. True
- B. False