

**2008 METAL and NONMETAL NATIONAL MINE RESCUE CONTEST
MAYSVILLE, KENTUCKY
TMX412 MULTI-GAS INSTRUMENT WRITTEN TEST
25 QUESTIONS WITH ANSWERS**

From MSHA Training Module 3: MINE VENTILATION

1. To obtain the "flow" of air through a mine there must be a difference in both air velocity and pressure between the intake and exhaust airways.
 - A. True
 - B. False (False on page 8 states "there must be a difference in **air pressure** between the intake and exhaust airways.")

2. An anemometer actually measures linear feet of travel.
 - A. True (True on page 27)
 - B. False

3. The only purpose of an air lock is to separate two different atmospheres and minimize air leakage between the two atmospheres.
 - A. True
 - B. False (False on page 38 states "is to separate two different atmospheres **while still permitting miners to enter and exit without mixing the atmospheres**".)

4. In natural ventilation, warm air displaces cold air in the mine due to the differences in _____ of the workings.
 - A. elevation
 - B. temperature
 - C. velocity
 - D. both A and B (answer on page 9)
 - E. None of the above

From MSHA Training Module 2: MINE GASES

5. The rate of diffusion is greatly decreased by higher velocities of air currents or by turbulence in the air.

- A. True
- B. False (answer on page 10, last paragraph states "rate of diffusion is greatly **increased** by higher velocities)

6. Gases respond to cold (lower temperatures) by contracting and by diffusing more rapidly.

- A. True
- B. False (False on page 12 states "diffusing more **slowly**".)

7. A gas is a substance without _____.

- A. a definite shape
- B. a definite volume
- C. a definite weight
- D. all of the above
- E. both A and B (answer on page 10, "a gas is a substance with neither a definite shape nor volume.")

8. _____ is (are) factor(s) that determines how quickly a gas will diffuse or disperse.

- A. Specific gravity
- B. Temperature
- C. Pressure
- D. all of the above (answer on page 15, 1st paragraph)
- E. both B and C

9. In the presence of normal air, the explosive range for hydrogen is _____.

- A. 4.0% to 15.0%
- B. 4.0% to 74.2% (answer on page 15)
- C. 10.0% to 74.2%
- D. 5.0% to 80.0%

10. An indication of oxides of nitrogen gases is/ are _____.
- A. the odor of blasting powder fumes
 - B. the odor of "rotten egg"
 - C. a reddish-brown color
 - D. both A and C (answer on page 16, 4th paragraph and 35)
 - E. both B and C
11. An asphyxiating gas will _____.
- A. cause suffocation
 - B. displace oxygen
 - C. produce an oxygen-deficient atmosphere
 - D. all of the above (answer on page 19)
 - E. both B and C
12. Breathing air containing _____ carbon dioxide causes violent panting and can lead to death.
- A. 2 percent
 - B. 5 percent
 - C. 10 percent (answer on page 30)
 - D. 20 percent
13. The explosive range for methane is 5 to 15 percent when there is at least _____ oxygen.
- A. 5.1 percent
 - B. 10.1 percent
 - C. 12.1 percent (answer on page 43)
 - D. 16.1 percent

TMX-412 Instruction Manual REV 10

14. Silicone compound vapors may cause readings of combustible (methane) gas to be _____ than gas concentrations.
- A. higher
 - B. the same
 - C. lower (answer on page 3, 4th item)

15. Sudden changes in atmospheric pressure may cause temporary fluctuations in the _____ reading.

- A. carbon monoxide
- B. methane
- C. nitrogen dioxide
- D. oxygen (answer on page 3, 6th item)
- E. all of the above

16. A fully charged (nickel-cadmium) battery pack will operate a four-gas configured TMX-412 for up to _____ hours.

- A. 10 (answer on page 8, last paragraph)
- B. 12
- C. 16
- D. None of the above

17. After the instrument is turned ON, the following startup screen(s) will be displayed (automatically) _____.

- A. SENSOR CONFIGURATION
- B. WARM-UP TIMER
- C. Both A and B (answer on page 9 under 4.2 TURNING THE TMX412 ON AND OFF)
- D. none of the above

18. To clear the combustible gas over-range alarm, the combustible gas level must be _____ CH₄ to clear the combustible gas over-range condition.

- A. 0%
- B. less than 1%
- C. less than 2%
- D. less than 5% (answer on page 12, first NOTE)

19. The minimum flow rate for calibration of the methane sensor is _____.

- A. 0.25 liters per minute
- B. 0.5 liters per minute (answer on page 13 first NOTE)
- C. 1.0 liters per minute
- D. 2.0 liters per minute

20. When zeroing is complete the instrument display will indicate O2 CAL and will show the current full span value of the oxygen sensor. The oxygen sensor will be spanned to _____ in approximately 30 seconds.
- A. 20.0
 - B. 21.0 (answer on page 13, 1st dot states "spanned to 21.0")
 - C. 21.9
 - D. none of the above
21. The maximum measuring range for the combustible/methane sensor is _____
- A. 5.0% Methane (answer on 27 under MEASURING RANGE: LEL and CH4(Methane))
 - B. 100% Methane
 - C. 50% LEL
 - D. both A and C
22. Sudden changes in atmospheric pressure has no effect on any of the gas readings for the TMX412.
- A. True
 - B. False (False on page 3, 5th item "Sudden changes in atmospheric pressure may cause temporary fluctuations in the oxygen reading.")
23. After the warm-up sequence has been completed, the TMX412 will enter the normal operating mode and will be continuously monitoring all calibrated sensors.
- A. True (True on page 9, under 4.2, 6th paragraph)
 - B. False
24. The battery indicator is automatically configured for the type of battery installed in the instrument.
- A. True
 - B. False (False, on page 17, 1st paragraph under 6.3 BATTERY states "The BATTERY option allows the user to select the type of battery installed in the unit. The setting configures the battery indicator to accurately display the discharge rate of the selected battery type.")
25. All installed sensor types are shown on the Sensor Configuration screen during instrument start-up.
- A. True (True on page 22, NOTE, 2nd sentence states "All installed sensor types are shown on the Sensor Configuration screen during instrument start-up.")
 - B. False