2012 National Metal and Nonmetal Mine Rescue Contest

Technician Team Competition
Written Test (BioPak 240S)

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 (Bio Pak 240S) 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.

   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 M/NM 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. The demand valve is located at the upper end of the diaphragm exhalation travel stroke. In periods of heavy loads the user requirements may exceed those of the standard respirator function.

    A. True
    B. False

22. The Flow Restrictor admits a constant flow of oxygen directly into the breathing loop to replace volumes lost through user consumption and carbon dioxide. Metabolic consumption rate of a person subject to moderate work load is _____ lpm.

    A. 0.8 to 1.0
    B. 1.0 to 1.5
    C. 1.0 to 2.0
    D. None of the above

23. To conduct a flow test, open the oxygen cylinder valve and verify a flow reading of at least _____ lpm with oxygen cylinder at 3000 psig.

    A. 1.3
    B. 1.4
    C. 1.5
    D. 1.6

24. When conducting a high pressure leak test; the second tongue depressor is wedge into a one of the breathing chamber slots located 90º from the first tongue depressor.

    A. True
    B. False

25. During a low pressure leak test the BioPak is turned over and the test key is inserted into the slotted hole on the rear of the lower housing and turn the key _____ turn to lock into position.

    A. ¼ turn
    B. ½ turn
    C. ¾ turn
    D. 1 full turn

26. The breathing chamber O-rings and Vent valve O-rings need to be inspected and re-lubricated every 5 uses and Cristo-Lube or Dow-111 are the only lubricants approved by the manufacturer.

    A. True
    B. False

27. The alarm whistle will provide a 90 dB audible signal; the alarm is a one time signal that will signal the user when approximately one-hour of oxygen. The signal will last for 45-60 seconds.

    A. True
    B. False

28. Carbon Dioxide absorbent should not be exposed to the ambient atmosphere for more than _____ minutes during recharging and/or servicing.

    A. 15
    B. 30
    C. 45
    D. 60

29. When conducting a flow test; open the oxygen cylinder valve and verify a flow reading on the flow meter of at least _____ lpm with the oxygen cylinder at 3000 psig.

    A. 1.4
    B. 1.6
    C. 1.8
    D. None of the above

30. To replace the regulator assembly; remove the oxygen cylinder from the regulator yoke disconnection the Velcro strap around the cylinder and loosening the regulator yoke. Unthread the _____ screws holding the regulator and external regular support plate to the lower housing.

A. 3
B. 4
C. 5
D. 6