

2024 KMI Mine Rescue Competition

Technician Team – Written Test

1. The air we breathe is actually a mixture of gases. Clean, dry air at sea level is made up of 78 percent nitrogen and 21 percent oxygen. The remaining one percent is made up of argon, carbon dioxide, and small traces of other gases. Which of the following is one of the trace gases?
 - a. Carbon monoxide
 - b. Neon
 - c. Radon
2. Very violent explosions are possible when air contains more than ____ to ____ percent hydrogen.
 - a. 4, 5
 - b. 5, 6
 - c. 7, 8
3. The working level is a measure of the potential _____ particle energy of radon daughters in the mine atmosphere.
 - a. Alpha
 - b. Beta
 - c. Gamma
4. It is actually a mixture of carbon dioxide, nitrogen, and air. _____ is produced by methane fires and explosions, so it also probably contains carbon monoxide. This mixture is oxygen-deficient so it makes breathing difficult, and can cause suffocation.
 - a. Afterdamp
 - b. Blackdamp
 - c. Firedamp
5. The type of equipment used in the mine (electrical, compressed air, or diesel) will also affect which gases are present. However, for all mines, rescue teams must know how to test for oxygen deficiency and _____.
 - a. Methane
 - b. Nitrogen dioxide
 - c. Carbon monoxide
6. When the oxygen content of air drops to about 17 percent, you'll begin to breathe faster and deeper because your body is trying to compensate for the lack of oxygen. A ____ percent concentration or less is almost always fatal.
 - a. 9
 - b. 7
 - c. 6
7. When present in high concentrations (____ percent or higher), carbon dioxide causes you to breathe deeper and faster.
 - a. 1
 - b. 2
 - c. 5

8. _____ is produced by the incomplete combustion of carbon materials during fires and explosions. It may also be liberated when water or steam comes in contact with hot carbon materials during firefighting.
- Carbon monoxide
 - Hydrogen
 - Nitrogen
9. Hydrogen sulfide is one of the most poisonous gases known. Slightly higher concentrations of _____ percent can lead to bronchitis or pneumonia.
- .005 to .01
 - .02 to .07
 - .07 to .10
10. Explosive Range and Flammability. Ethane – from _____ percent in normal air.
- 1.86 to 8.41
 - 2.12 to 9.35
 - 3 to 12.5
11. _____ fans are used mostly in mines having little overburden.
- Blower
 - Exhaust
 - Auxiliary
12. If you are not wearing breathing protection when working with the smoke tube, you should be careful not to come in contact with the smoke. It is extremely irritating and can cause _____.
- Asphyxiation
 - Coughing
 - Choking
13. The auxiliary fan can be used to either exhaust or force the air. The tubing, which is usually suspended from timbers or _____ bolts, carries the air to or away from the mining area. This tubing can be either rigid (for exhausting systems) or collapsible (for forcing systems).
- Roof
 - Rib
 - Eye
14. Overcasts are used more often. They are usually built with concrete block walls sealed against the sides and floor, and with some type of airtight roof made of pre-stressed concrete, _____, or steel beams.
- Channel iron
 - Railroad ties
 - Metal plates
15. There may also be a sliding door or _____ in a permanent bulkhead for adjusting the flow of air. If one of these regulator doors has been opened to allow miners to pass through, it must always be closed to the position in which it was found.
- Openings
 - Window
 - Gate

16. The officials at the command center need to receive accurate information from the team regarding the ventilation controls and _____. They need to be kept well-informed about conditions underground so that they can make the appropriate decision as to what changes to make in the ventilation.
- Ground conditions
 - Air lines
 - Missing miners
17. There are times when a team will be asked to determine the direction and _____ of airflow in a certain section of the mine.
- Quantity
 - Velocity
 - Quality
18. If shafts are used as the two main airways, the exhaust airway is referred to as the _____ shaft.
- Vent
 - Upcast
 - Downcast
19. Each velocity measurement in a quadrant should be repeated several times to determine an accurate average. Abnormal high and low measurements should be discarded, and the remainder averaged. A correction will then have to be made to the averaged figure because the air travel at the quarter points will average about _____ percent high.
- 5
 - 10
 - 15
20. Crosscut – For single-level, room-and-pillar mines: A passageway driven at right angles between an entry and its parallel aircourse (or aircourses) for ventilation purposes. For multi-level mines: A tunnel driven perpendicular to the main _____ system of the mine.
- Ventilation
 - Vein
 - Transportation
21. The use of leather cases can produce inaccurate readings with diffusion (non-aspirated) gas detection instruments for specific monitoring applications. Leather cases should be used ONLY as carrying cases, and NOT for continuous monitoring, with diffusion instruments configured to measure gases other than O₂, CO, CO₂, _____, and combustible gases (LEL/CH₄).
- H₂S
 - NO₂
 - SO₂
22. Based on sample-line length, the minimum time recommended for the air sample to reach the instrument's sensors using a line length of 60' is _____ (mm:ss).
- 02:20
 - 03:20
 - 04:00

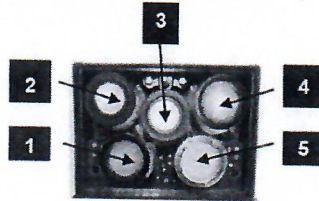
60
^ 2
120

23. During a gas-alarm condition, sensor types are displayed as _____ text and gas readings are displayed as solid red numerals.
- Solid red
 - Solid black
 - Blinking red
 - Blinking black

24. Do not store instruments with _____ installed.
- Lithium packs
 - Alkaline batteries
 - Battery packs

25. If the user selects "Start", the bump test is started for this sensor. The sensor must reach a gas reading of _____% or greater (user selectable in configuration menu) of the applied gas (calibration) concentration within 60 seconds (user selectable in configuration menu) to pass.
- 50
 - 60
 - 75

26. The Methane (CH₄) [0-5 % vol] sensor is installed in position _____. (See Diagram below)
- 1
 - 4
 - 5



27. For compliance determinations required by 30 CFR 75, Subpart D, the monitor must display "_____" and "%VOL" during the monitor's start-up sequence.
- PPM
 - CH₄
 - Sensors
28. The _____ process allows qualified personnel to review and adjust a unit's settings.
- Calibration
 - Configuration
 - Bump Test
29. Sudden changes in atmospheric pressure may cause temporary fluctuations in the _____ reading.
- Oxygen
 - Methane
 - Carbon monoxide
30. Low battery warning: When less than _____ remain, the message and icon flash; an audible alarm (when enabled) is also activated.
- 10 minutes
 - 30 minutes
 - 60 minutes