

Welcome Contestants
Central Mine Rescue Contest
May 12 through May 14, 2016
Kellogg, Idaho

Field Written Examination KEY

Choose the most appropriate answer or answers for the questions that follow. Use the supplied score card to record your answers. Please ensure the marks you make are **dark** and **completely fill the box**. If you make a mistake you must completely erase the mark you've made. Improperly marked sheets can result in an incorrect answer.

1. When determining where to set up a bench area, the availability of water should be taken into consideration.
 - a. True (Page 1-4, paragraph 5 - An area that has work benches and where water is available should be set aside as an apparatus room where the apparatus can be cleaned, tested, and prepared for use by the bench person or by the team members.)
 - b. False

2. According to 30 CFR 49.6(a)(6), gas detectors must measure concentrations of methane in parts per million (ppm).
 - a. True
 - b. False (Correct, Page 2-3, Paragraph 5 - MSHA requires mine rescue stations serving underground M/NM mines to have four gas detectors appropriate for each gas which may be encountered at the mines served. In addition, gas detectors must measure concentrations of methane from 0.0 percent to 100 percent of volume, oxygen from 0.0 percent to at least 20 percent of volume, and carbon monoxide from 0.0 parts per million to at least 9,999 parts per million. [30 CFR 49.6(a)(6)].)

3. Gasses issuing into still air without mixing tend to _____.
 - a. Liquefy
 - b. Stink
 - c. Coagulate
 - d. Stratify (Correct, page 2-6, paragraph 5 - If you know the specific gravity of a gas, you will know where it will be located in the mine and where you should test for it. Gases issuing into still air without mixing tend to stratify according to the gas's specific gravity. Light gases or mixtures tend to stratify against the back and heavy gases or mixtures tend to stratify along the floor.)

4. The term used to express the range within which a gas will explode is the _____.
- Detonation range
 - Compression range
 - Conflagration factor
 - None of the above (Correct, page 2-7, paragraph 6 - The range of concentrations within which a gas will explode is known as its "explosive range." Figures representing the higher and lower limits of the explosive range are expressed in percentages.)
5. The amount of oxygen that must be present of an explosion to occur is typically expressed in parts per million (ppm).
- True
 - False (Correct, page 2-7, paragraph 7 - The amount of oxygen that must be present for an explosion to occur is also expressed as a percentage.)
6. Some of the gases found in normal air are soluble in water.
- True (Correct, Oxygen (pg. 2-13), CO₂ (pg. 2-15) and methane (pg. 2-22) are all soluble to some extent)
 - False
7. The specific gravity of Nitrogen is:
- 1.1
 - 0.8531
 - 1.34
 - 0.9674 (Correct, page 2-14)
8. When testing for carbon dioxide, you should test _____.
- At shoulder level
 - Above your head
 - At waist level
 - Down low, near the floor/ground/ sill (Correct, page 2-15, see detection methods)
9. In concentrations of 2 percent or higher carbon dioxide _____.
- Will burn and/or explode
 - Will cause you to breathe deeper and faster (Correct, page 2-15, When present in high concentrations (2 percent or higher), carbon dioxide causes you to breathe deeper and faster. Breathing air containing 5 percent carbon dioxide increases respiration 300 percent, causing difficult breathing. Breathing air containing 10 percent carbon dioxide causes violent panting and can lead to death.)
 - Will cause oxidation of steel

- d. None of the above
10. The explosive range for carbon monoxide in normal air is:
- a. 5 to 15%
 - b. 1 to 10%
 - c. 12.5 to 74.2% (Correct, page 2-16)
 - d. None of the above
11. When testing for carbon monoxide, you should hold your detector _____.
- a. At chest level (Correct, page 2-17, see detection methods)
 - b. Near your knees
 - c. Close to the back
12. In higher concentrations, oxides of nitrogen can have a smell and a taste.
- a. True (Correct, page 2-18, Color/Odor/Taste. Oxides of nitrogen are colorless at low concentrations and become reddish-brown at higher concentrations. They smell and taste like blasting powder fumes.)
 - b. False
13. The specific gravity of hydrogen is:
- a. 0.0925
 - b. 0.0695 (Correct, page 2-18)
 - c. 1.1
 - d. 1.657
14. Hydrogen Sulfide is most explosive at _____.
- a. 14.5 parts per million
 - b. 46.5 percent
 - c. 4.2 parts per million
 - d. 14.2 percent (Correct, page 2-19, Explosive Range and Flammability. Hydrogen sulfide is flammable and explosive in concentrations from 4.3 to 45.5 percent in normal air. It is most explosive at 14.2 percent.)
15. The specific gravity of Hydrogen Sulfide is:
- a. 1.1906 (Correct, page 2-19)
 - b. 1.321
 - c. 1.1001
 - d. 0.9101
16. Choose the **incorrect** statement below:
- a. Methane is explosive where there is at least 12.1 percent oxygen
 - b. Methane is toxic (Correct, page 2-22, it is considered an asphyxiant)
 - c. The explosive range of Methane is 5 to 15 percent.

- d. Methane is a gas
17. Temporary bulkheads can sometimes be made out of wood or metal.
- a. True (Correct, page 3-9, Temporary bulkheads are usually built of canvas brattice cloth or plastic. Sometimes, however, they are built of wood or metal.)
 - b. False
18. Mine doors are generally used to:
- a. Keep air from flowing to areas where it's not needed
 - b. Isolate separate splits of air
 - c. Form an airlock to allow equipment and people to pass through
 - d. All of the above (correct, page 3-11, They are used to completely close off a mine passage yet open to allow equipment and people to pass through. Mine doors are generally used to keep air from flowing to areas where it is not needed. They can also be used to isolate separate splits of air. Mine doors are usually hung in pairs, forming an air lock that prevents unnecessary air loss when one of the pairs of doors is opened. The doors should always be opened and closed one at a time in order to maintain the air lock.)
19. The command center should be consulted before making changes to ventilation because making the wrong alterations can _____.
- a. Cause changes in the air at the fresh air base
 - b. Force explosive gas over a fire or hot spot
 - c. Redirect and feed air to a fire
 - d. All of the above (Correct, page 3-15, **WARNING: The wrong alterations could cause changes in the air at the fresh air base, push deadly gases or smoke into areas where survivors are located, force explosive gases back over fire areas or hot spots and cause an explosion, or redirect and feed air to a fire.**)
20. A smoke tube is useful in determining the _____ of air.
- a. Direction
 - b. Velocity
 - c. A & B (Correct, page 3-16, The smoke tube is used mainly to determine what direction very slow-moving air is moving, and at what velocity.)
 - d. Moisture content
 - e. None of the above
21. A mine rescue team exploring a mine barefaced should _____.
- a. Continue exploring barefaced as long as smoke encountered is light brown & there isn't too much oxygen present.

- b. Continue exploration through an area that shows explosion damage to ventilation controls and some smoke, but SO₂ isn't present.
 - c. Stop exploration if they encounter smoke or damage. (Correct, page 4-6, "A bare faced crew should also stop exploration when they encounter smoke or damage".)
 - d. All of the above
22. The fresh air base coordinator has 3 basic responsibilities: Communication between the team and command center, _____, and coordinating & overseeing the activities of all personnel who are at the fresh air base.
- a. Making the decision on when to erect ventilation controls
 - b. Following the team's progress & marking the findings on the map (Correct, page 4-8, #2)
 - c. Contacting the next of kin when any injured miners are found
23. The team captain should make sure each team member's apparatus has been properly prepared and tested before going underground.
- a. True (Correct, page 4-17, #2 on the list of things to do before going underground)
 - b. False
24. If transportation is available and conditions permit, transportation should be used. It's important that you find and take only one to reduce traffic.
- a. True
 - b. False (Correct, page 4-24, take at least two in case one breaks down)
25. The captain should check the back before building an airlock and before fighting a fire.
- a. True (Correct, page 4-28, In addition to checking ground conditions routinely as the team advances, the captain should check the back in the area whenever the team builds an air lock or bulkhead, or erects a brattice line. Also, a check of the back should be made in the area before the team starts firefighting activities. This is very important to remember because the heat from the fire can greatly weaken the back.)
 - b. False
26. Dry chemical fire extinguishers function to remove heat from a fire.
- a. True
 - b. False (Correct, page 5-4, Dry chemical extinguishers operate on this principle. They function to chemically inhibit the oxidation of the fuel.)
27. When using a hand-held fire extinguisher, you should direct the stream of dry chemical about _____ of the flame edge.

- a. 6 inches ahead (Correct, page 5-7, To effectively and quickly put out the fire, you should direct the stream of dry chemical to about 6 inches ahead of the flame edge.)
 - b. 2 feet ahead
 - c. 2 feet behind
 - d. Into the center
28. Before going underground to explore or fight a fire the team should make sure that:
- a. The main fan is turned off
 - b. A guard is monitoring the operation of the fan (Correct, page 5-12, "When a team goes into a mine to explore or fight a fire, it should be concerned with two main things – spreading of the fire and the possibility of an explosion. Before going underground, the team should make sure that the **main fan is running**, that **a guard is monitoring the operation of the fan**, and that **tests are being made at the main exhausts** for any gases that may be present in the mine.")
 - c. Gases are being monitored at the intake
 - d. All of the above
29. The explosive gas hydrogen can be liberated when foam is used to fight a fire.
- a. True (Correct, page 5-16, "Additionally, hydrogen can be liberated when water or steam comes in contact with hot carbon materials. This situation occurs when water, water mist, or foam is used to fight fires.")
 - b. False
30. When using the "triage" system to sort victims there are ___ priority groups.
- a. 5
 - b. 2
 - c. 3 (Correct, page 6-5, Survivors can be categorized into three priority groups according to their condition or injuries.)
 - d. 4