

# 2014 North Central Mine Rescue Contest Wilmington, IL

## Written Test – Technician Team Competition

### Biomarine SCBA, Biopak 240R

*Directions: Select the letter preceding the **BEST** answer to each of the following questions.  
Choose only one answer per question.*

**MSHA Publication 3027 - Module 2 Mine Gases**

**MSHA Publication 3027 - Module 3 Ventilation**

**Metal and Nonmetal National Mine Rescue Contest Rules 2014**

1. The technician team competition may include which of the following test components:
  - A. Two self-contained breathing apparatus
  - B. Back board
  - C. First Aid Kit
  - D. All of the above
  
2. Soluble gases may be released into mine air from groundwater.
  - A. True
  - B. False
  
3. During mine rescue and recovery work the command center directly approves all:
  - A. Ventilation Tests
  - B. Ventilation Construction
  - C. Ventilation Alterations
  - D. B and C only
  
4. The purpose of mine ventilation is to provide a velocity of air sufficient to remove harmful gases, dust, smoke and fumes.
  - A. True
  - B. False

## BioPak 240R Closed-Circuit Breathing Apparatus

5. **Which of the following properties are associated with Hydrogen Sulfide gas:**
- A. The gas is one of the most poisonous known.
  - B. The gas is not soluble in water.
  - C. The gas is yellowish, with an odor of rotten eggs.
  - D. All of the above.
6. **Line Brattice must be permanently installed for short duration ventilation applications.**
- A. True
  - B. False
7. **Check Curtains or Run-Through Curtains are designed to:**
- A. Close manually after you have passed through them.
  - B. Deflect the intake air current into a working area.
  - C. Fasten at the top and one side only.
  - D. All of the above.
8. **Which of the following properties are associated with Acetylene gas:**
- A. The gas is highly flammable.
  - B. Found after methane explosions in air having a low oxygen content.
  - C. The gas is slightly toxic.
  - D. B and C only.
9. **If a mine ventilation system is badly damaged or is out completely, the distinction between intake and exhaust air on the mine map may not be valid.**
- A. True
  - B. False
10. **Auxiliary fan tubing used to control and direct airflow to or from a mining area will be:**
- A. Rigid tubing for forcing systems
  - B. Collapsible tubing for exhaust systems
  - C. Usually suspended from timbers or eye bolts
  - D. All of the above

## BioPak 240R Closed-Circuit Breathing Apparatus

User Instructions – Revision G, March 2013

Benchman Manual – Revision M, March 2013

How to Successfully Wash, Disinfect, and Dry Your BioPak 240 Revolution

MSDS – Germicidal Detergent No. 201N, 202N, 204N, 205N, 264N

BioPak 240R Overview

11. **A pre-packed carbon dioxide scrubber canister may be used if:**
  - A. Each canister has an O-ring installed.
  - B. The use-by date on the label has not yet expired.
  - C. The canisters have been pre-packed for less than one year.
  - D. The canisters must be sealed air-tight in the apparatus.
  - E. All of the above.
  
12. **The maximum heat-assisted drying temperature for all cleaned components is:**
  - A. 200°F.
  - B. 120°F.
  - C. 90°F.
  - D. 140°F.
  
13. **The maximum charging pressure of the Oxygen cylinder is 4000 psi.**
  - A. True
  - B. False
  
14. **Prior to each use of the BioPak 240R which of the following must be installed:**
  - A. Moisture control sponges.
  - B. A new RMS alarm monitor battery.
  - C. Anti-crush rings.
  - D. Kevlar breathing hose covers.
  
15. **Preparing the coolant canister includes all of the following except:**
  - A. Place clean coolant canister into the freeze form.
  - B. Place freeze forms on a level surface in the freezer.
  - C. Freeze for a minimum of 6 hours at 20°F.
  - D. Date and initial maintenance tag under “Ice Placed in Freezer”.

## BioPak 240R Closed-Circuit Breathing Apparatus

- 16. The recommended apparatus duration of use with cooling canisters installed is one hour at 41°C to 60°C (105°F to 140°F)**
- A. True
  - B. False
- 17. When conducting a low pressure leak test – activating the emergency bypass valve empties gas into the breathing chamber raising the pressure to:**
- A. Between 2” and 4” water column.
  - B. Between 6” and 8” water column.
  - C. Between 10” and 12” water column.
  - D. Between 1” and 2” water column.
  - E. None of the above.
- 18. The phase change module (PCM) provides an optional method for:**
- A. Carbon dioxide gas removal.
  - B. Water vapor removal.
  - C. Air cooling.
  - D. Particulate control.
  - E. All of the above.
- 19. The electronic monitor’s LED will flash blue to remind the user that ice needs to be added to the BioPak:**
- A. True
  - B. False
- 20. When conducting a high pressure leak test – the oxygen cylinder’s pressure must be above 3000 psi to begin the test.**
- A. True
  - B. False

## **BioPak 240R Closed-Circuit Breathing Apparatus**

- 21. BioPak 240R apparatus that have been placed into long term storage should have the long term maintenance procedures performed:**
- A. Every three months.
  - B. Every twelve months.
  - C. Every six months.
  - D. Every month.
  - E. None of the above.
- 22. When conducting a constant flow test – at 3200 feet elevation: With the O<sub>2</sub> cylinder pressure listed - which O<sub>2</sub> flow result indicated a passing test:**
- A. Cylinder Pressure 1800 psi – O<sub>2</sub> flow of 1.6 lpm.
  - B. Cylinder Pressure 2200 psi – O<sub>2</sub> flow of 1.8 lpm.
  - C. Cylinder Pressure 1600 psi – O<sub>2</sub> flow of 2.0 lpm..
  - D. Cylinder Pressure of 2800 psi – O<sub>2</sub> flow of 1.2 lpm.
  - E. None of the above.
- 23. The apparatus must be cleaned and disinfected as soon as possible after each use with a 10% bleach solution.**
- A. True
  - B. False
- 24. The BioPak 240R's oxygen cylinder must be:**
- A. Retired from service 25 years after the date of manufacture.
  - B. Tested annually with the BioPak Service Kit.
  - C. Hydro-static tested every 5 years from the date of manufacture.
  - D. Christo-Lube coated on the valve collar exterior O-ring.
  - E. All of the above.
- 25. The electronic monitor LED signals provide the wearer with which of the following system status signals:**
- A. Flashing Green = System OK.
  - B. Flashing Red + Horn Sounding = End of Service Life.
  - C. Flashing Blue = Ice Reminder.
  - D. Flashing Red + Horn Sounding = System Fault
  - E. All of the above.

## BioPak 240R Closed-Circuit Breathing Apparatus

- 26. A center section O-ring inspection - can be triggered by which of the following:**
- A. Annually, or
  - B. 25 uses of the apparatus, or.
  - C. Apparatus failure during a high or low pressure leak test, or
  - D. All of the above.
- 27. Anti-fog solution must be applied to the respirator lens before each use.**
- A. True
  - B. False
- 28. When conducting a high pressure leak test – which of the following is incorrect:**
- A. Use oxygen safe leak detection fluid.
  - B. Wait 30 seconds after leak detection fluid is applied.
  - C. The presence of bubbles indicates a leak
  - D. Depressurize unit to begin repairs.
  - E. None of the above (all are correct).
- 29. When conducting an inspection of the breathing diaphragm – which of the following would not be included:**
- A. Quarterly inspection for apparatus in long term storage.
  - B. Inspect the diaphragm for signs of wear, cracking, and/or rot.
  - C. Disassemble the vent valve to inspect, clean and lubricate parts.
  - D. Reassemble taking care to ensure proper diaphragm alignment.
  - E. None of the above (all are included).
- 30. Failure to install the carbon dioxide scrubber's moisture pad can lead to:**
- A. Scrubber canister flooding.
  - B. Elevated carbon dioxide levels in breathing gas.
  - C. Possible injury or death.
  - D. All of the above.

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### ANSWER SOURCE KEY

**MSHA Publication 3027 - Module 2 Mine Gases  
MSHA Publication 3027 - Module 3 Ventilation  
Metal and Nonmetal National Mine Rescue Contest Rules 2014**

Question	Answer	Source
1	A	<b>2014 Metal and Nonmetal Mine Rescue Contest Rules, Technician Team Competition, Page 61, General Rule 1</b> <i>Comments:</i> Back board removed 2014, First aid kit removed 2014, Gas detector and Communications system must also be included.
2	A	<b>Mine Gases, Module 2, Page(s) 2-7, Solubility</b> <i>Comments:</i> True
3	D	<b>Mine Ventilation, Module 3, Page(s) 3-21 – Building Ventilation Controls</b> <b>Mine Ventilation, Module 3, Page 3-3 – Introduction</b> <i>Comments:</i> Ventilation testing is not under command center control as it will not alter mine conditions
4	B	<b>Mine Ventilation, Module 3, Page(s) 3-4</b> <i>Comments:</i> Volume not velocity, Also must provide adequate oxygen
5	A	<b>Mine Gases, Module 2, Page(s) 2-19 and 20</b> <i>Comments:</i> It is water soluble, It is colorless
6	B	<b>Mine Ventilation, Module 3, Page(s) 3-24 – Line Brattice</b> <i>Comments:</i> Can be held in place by team members
7	B	<b>Mine Ventilation, Module 3, Page(s) 3-9 – Check Curtains</b> <i>Comments:</i> Close automatically, Fasten at the top only
8	D	<b>Mine Gases, Module 2, Page(s) 2-24</b> <i>Comments:</i> It is combustible, but it will not support combustion.
9	A	<b>Mine Ventilation, Module 3, Page(s) 3-6 – Note to Trainer</b> <i>Comments:</i> Normal production conditions may no longer be valid
10	C	<b>Mine Ventilation, Module 3, Page(s) 3-10 – Auxiliary Fans and Tubing</b> <i>Comments:</i> Flexible for forcing, Rigid for exhaust

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<b>User Instructions – Revision G, March 2013</b> <b>Benchman Manual – Revision M, March 2013</b> <b>How to Successfully Wash, Disinfect, and Dry Your BioPak 240 Revolution</b> <b>MSDS – Germicidal Detergent No. 201N, 202N, 204N, 205N, 264N</b>		
Question	Answer	Source
11	E	<b>Benchman Manual, pg 14, Turn Around Maintenance Procedure, 1.2, Carbon Dioxide Scrubber Pre-Packing Procedure.</b> <i>Comments: Specified in manual</i>
12	B	<b>Benchman Manual, pg 10, Turn Around Maintenance Procedure, 1.3, Cleaning / Disinfection</b> <i>Comments: Specified in manual</i>
13	B	<b>Benchman Manual, pg 11, Turn Around Maintenance Procedure, 1.5, Oxygen Cylinder</b> <i>Comments: The maximum pressure is 3000 psi.</i>
14	A	<b>User Instructions, pg 8, Apparatus Description, 2.9, Optional Attachments.</b> <b>Benchman Manual, pg 8, Special or Critical User’s Instructions.</b> <i>Comments: Alarm monitor battery good for 200 hours, Anti-crush rings = optional, Kevlar hose covers = optional</i>
15	C	<b>Benchman Manual, pg 11, Turn Around Maintenance Procedures, 1.4, Coolant Canister.</b> <i>Comments: Minimum time is 8 hours at 10° F.</i>
16	A	<b>User Instructions, pg 12, Preparation for Use, 3.6, Coolant Canister Installation.</b> <b>Benchman Manual, pg 42, Apparatus Specifications – Note:</b> <i>Comments: Specified in Manual.</i>
17	B	<b>Benchman Manual, pg 13, Turn Around Maintenance Procedure, 1.9, Low Pressure Leak Test</b> <i>Comments: Specified in Manual.</i>
18	C	<b>User Instructions, pg 9, Apparatus Description, 2.9, Optional Attachments</b> <i>Comments: Specified in manual.</i>
19	A	<b>User Instructions, pg 7, Apparatus Description, 2.7, Alarming System</b> <i>Comments: Specified in Manual.</i>
20	B	<b>Benchman Manual, pg 15, Long Term Maintenance Procedure, 2.6, High Pressure Leak Test</b> <i>Comments: 3000 psi is the cylinder maximum operating pressure, 1500 psi is the minimum gas pressure for the test.</i>

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Question	Answer	Source
21	C	<b>Benchman Manual, pg 15, Long Term Maintenance Procedure</b> <i>Comments: Specified in manual</i>
22	C	<b>Benchman Manual, pg 12, Turn Around Maintenance Procedure, 1.8, Constant Flow Test</b> <i>Comments: Below 5280 ft Elevation: Cylinder Pressure 1500 – 2000 Flow 1.8 to 2.4 lpm, Below 5280 ft Elevation: Cylinder Pressure 2000 – 3000 Flow 1.9 to 2.5 lpm.</i>
23	B	<b>Benchman Manual, pg 10, Turn Around Maintenance Procedure, 1.3, Cleaning/Disinfection.</b> <b>MSDS Germicidal Detergent No. 201N, 202N, 204N, 205N, 264N.</b> <i>Comments: Only Biomarine cleaners/disinfectants are approved for use.</i>
24	C	<b>Benchman Manual, pg 17, General Service Procedures, 3.3, Oxygen Cylinder</b> <i>Comments: Retirement is 15 years, The BioPak Service Kit cannot test the O<sub>2</sub> cylinder, Lube is not to be used on the O<sub>2</sub> cylinder.</i>
25	E	<b>User Instructions, pg 7, Apparatus Description, 2.7, Alarming System</b> <i>Comments: Specified in manual</i>
26	D	<b>Benchman Manual, pg 17, General Service Procedures, 3.1, Scheduled Component Inspection</b> <i>Comments: Specified in manual</i>
27	B	<b>User Instructions, pg.10, Preparation for Use, 3.2, Mask Preparation</b> <b>Benchman Manual, pg. 11, Turn Around Maintenance Procedure, 1.6, Facemask</b> <i>Comments: The 240R facemask is supplied with a permanent anti-fog film – solution is not needed.</i>
28	B	<b>Benchman Manual, pg 15, Long Term Maintenance Procedure, 2.6, High Pressure Leak Test</b> <i>Comments: The wait time is 60 seconds.</i>

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Question	Answer	Source
29	A	<b>Benchman Manual, pg 17, General Service Procedures, 3.1, Scheduled Component Inspection</b> <b>Benchman Manual, pg 29, Parts List, 5.8, Diaphragm Assembly</b> <i>Comments:</i> Annual inspection frequency of long term storage units.
30	D	<b>User Instructions, pg 3, Warnings</b> <b>User Instructions, pg 11, Preparation for Use, 3.5, Carbon Dioxide Scrubber Installation</b> <i>Comments:</i> Specified in manual.