

**2017 Northern Mine Rescue Contest
Written Exam**

**Technician Team Competition
Dräger BG-4**



**June 5, 2017
Clymer, New York**

Please do not write on this test. Use the answer sheet provided.

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Directions: Fill in the corresponding bubble on your Scantron sheet to indicate the letter preceding the correct answer to each of the following questions. Select only one answer per question.

10 Questions from PSS BG-4 Service Manual - Rev O:

1. The maximum temperature for BG-4 apparatus is ____ degrees Fahrenheit.
 - A. 120
 - B. 140
 - C. 160
 - D. 180

2. A composite oxygen bottle for the BG-4 has a service life of ____ years.
 - A. 10
 - B. 15
 - C. 18
 - D. 20

3. The carbon cylinder pressure is full at ____ psi.
 - A. 3,000
 - B. 3,135
 - C. 3,175
 - D. 3,200

4. The use of ice in the BG-4 is only required at ambient temperatures above ____ degrees Fahrenheit.
 - A. 25
 - B. 32
 - C. 35
 - D. 40

5. The Minimum Valve on the BG-4 provides approximately ____ L/min flow.
 - A. 50
 - B. 60
 - C. 70
 - D. 80

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6. The Minimum valve on the BG-4 should open between ____ and ____ mbar.
- A. 0.1 and 2.0
 - B. 0.1 and 2.5
 - C. 1.0 and 2.0
 - A. 2.0 and 2.5
7. The pressure reducer is required to have a thorough overhaul every ____ years.
- A. 6
 - B. 8
 - C. 10
 - D. 12
8. The bypass valve delivers ____ L/min.
- A. 25
 - B. 30
 - C. 50
 - D. 55
9. When switching off the Sentinel, simultaneously press the right and left hand buttons until a single sharp audible “bleep” sounds. Then, release buttons. For ____ seconds the Sentinel shows the battery status. Then, the Sentinel switches off.
- A. 3
 - B. 5
 - C. 7
 - D. 10
10. When detaching the breathing hoses from the plug-in Coupling, turn the ____ ring counterclockwise until it disengages, then push it back and remove the breathing hose.
- A. coupler
 - B. crush
 - C. bayonet
 - D. wedding

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10 Questions from MX6 iBrid Operation Guide – Rev 14:

11. According to the manufacturer's Recommended Procedure Frequency, an MX6 iBrid should be calibrated _____.
- A. if the unit is dropped
 - B. before first use and monthly thereafter
 - C. whenever the unit fails a bump test
 - D. All of the above
12. During a gas-alarm condition, sensor types are displayed as _____ and gas readings are displayed as _____.
- A. solid black text / blinking red numerals
 - B. blinking black text / solid red numerals
 - C. solid red text / blinking red numerals
 - D. blinking black text / blinking red numerals
13. On the gas-monitoring display screen, the battery charge level indicator (icon) is located in _____ of the screen.
- A. the upper left corner
 - B. the upper right corner
 - C. the lower left corner
 - D. the lower right corner
14. When calibrating the instrument, gas should be applied at a flow rate of _____.
- A. 0.25 liter per minute
 - B. 0.5 liter per minute
 - C. 0.75 liter per minute
 - D. 1.0 liter per minute
15. When the user activates the "Zero All" function, if there is a CO₂ sensor present in the instrument it will be zeroed first and zero air must be applied.
- A. True
 - B. False
16. When the Low Battery (message) and battery charge level indicator (icon) simultaneously begin to flash, there is less than _____ of battery life remaining.
- A. 30 minutes
 - B. 15 minutes
 - C. 10 minutes
 - D. None of the above

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17. If “ERR” is displayed in place of a gas reading, it indicates that ____.
- A. a data-related function has failed for the respective sensor
 - B. the respective sensor needs to be replaced
 - C. the respective sensor needs to be calibrated
 - D. the respective sensor has detected an over range condition
18. If “System Alarm” is displayed on the screen (with an Error Code and a 4-digit number beginning with 3), _____.
- A. the instrument is no longer functional
 - B. a critical hardware or system fault has occurred
 - C. a qualified person should contact Industrial Scientific for assistance
 - D. All of the above
19. To view details for any of the 15 most recent alarm events, start by selecting the “View” drop down menu on the display screen.
- A. True
 - B. False
20. After calibrating the instrument, the peak readings should be cleared.
- A. True
 - B. False

10 Questions from MSHA Publication 3027 - Module 2 and Module 3:

21. When barometric pressure falls, the pressure on the gas is _____. The gas _____.
- A. decreased / responds by contracting
 - B. decreased / is more concentrated
 - C. decreased / diffuses more quickly
 - D. None of the above
22. Some gases found in mines are toxic. The degree to which these gases will affect you depends on the _____, how toxic the gas is and how long you are exposed to the gas.
- A. specific gravity of the gas
 - B. solubility of the gas
 - C. rate of diffusion of the gas
 - D. None of the above.

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23. Asphyxiating gases _____.
A. displace oxygen in the air
B. cause suffocation
C. will not harm you if you are wearing a functioning SCBA
D. All of the above
24. Wearing an SCBA during exploration will protect you from all toxic gases found in the mine.
A. True
B. False
25. The explosive range of a gas is the concentrations within which a flammable gas can explode when there is _____ present.
A. a specific amount of oxygen
B. an ignition source
C. no ventilation
D. None of the above
26. Inundations of water in a mine may release water-soluble gases. Some of these gases may include:
A. methane (CH₄), hydrogen sulfide (H₂S), sulfur dioxide (SO₂), and radon (Rn)
B. oxygen (O₂), hydrogen sulfide (H₂S), sulfur dioxide (SO₂), and radon (Rn)
C. carbon dioxide (CO₂), hydrogen sulfide (H₂S), sulfur dioxide (SO₂), and radon (Rn)
D. All of the above
27. Acetylene is combustible and it will support combustion.
A. True
B. False
28. Whether you use mechanical ventilation or natural ventilation, in order to get the air to flow from the intake to the exhaust, the exhaust air must be at a lower pressure than the intake.
A. True
B. False
29. A medium-velocity (or "regular") anemometer is used to measure velocities from _____.
A. 0 to 2,000 feet per minute
B. 120 to 2,000 feet per minute
C. 120 to 10,000 feet per minute
D. None of the above

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30. The “Damps” are the names that early miners gave to mixtures of gases. One of these mixtures was called “afterdamp” because it is usually found after a mine fire or explosion. Which of the following is not true for afterdamp?
- A. Afterdamp may be oxygen-deficient.
 - B. In afterdamp, carbon monoxide is the most poisonous gas found.
 - C. Afterdamp will burn or explode when ignited.
 - D. Afterdamp is toxic to breathe.

Bonus Question (-1 discount)

31. Medical oxygen bottles should have a “USP” label on it. The USP stands for ____.
- A. Universal Service Protocol
 - B. Universal Service Plan
 - C. United States Patent
 - D. United States Pharmacopoeia

ANSWER KEY

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<u>Question</u>	<u>Answer</u>	<u>Source</u>
1.	B.	140 degrees, page 16 (Q 1 – 10 - PSS BG-4 Service Manual, Rev O)
2.	B.	15 years, pages 40 / 45
3.	A.	3,000 psi, page 45
4.	B.	32 degrees, page 3
5.	D.	80 L/min, page 46
6.	B.	0.1 and 2.5 mbar, page 29
7.	A.	6 years, page 38
8.	C.	50 L/min, page 44
9.	A.	3 seconds, page 33
10.	C.	bayonet, page 4
11.	D.	Page 12 (Q 11 – 20 - MX6 iBrid Operation Guide, Rev 14)
12.	B.	Page 19
13.	C.	Page 17
14.	B.	Page 37
15.	B.	Page 36
16.	C.	Page 20
17.	A.	Page 20
18.	D.	Page 21
19.	B.	Page 25
20.	A.	Page 11
21.	C.	Module 2, pg. 2-6 (Q 21 – 30 – MSHA Publication 3027)
22.	D.	Module 2, pg. 2-9
23.	D.	Module 2, pg. 2-10
24.	B.	Module 2, pg. 2-10
25.	A.	Module 2, pg. 2-7
26.	D.	Module 2, (see description of each gas)
27.	B.	Module 2, pg. 2-24
28.	A.	Module 3, pg. 3-5
29.	B.	Module 3, pg. 3-16
30.	C.	Module 2, pg. 2-27
31.	D.	United States Pharmacopeia (Not in listed references)

The United States Pharmacopoeia (USP) is a listing (compendium) of drugs licensed for use in the U.S. with the analytical standards necessary to establish purity suitable for human use. Drugs meeting these requirements must include labeling that demonstrates compliance with USP standards. To be labeled Oxygen, USP, the gas cylinder must contain a minimum of 99.0 percent oxygen by volume and be odor free. The label must specify whether the oxygen gas was produced by fractional distillation of air (air-liquefaction process) or other means. If produced from liquid air, the cylinder contents may be labeled USP without an analysis for either CO₂ or CO.