

Vulcan Mine Recovery Exercise

Problem Booklet

Instructions

Read the problem situation described on the next page. Next, answer each of the 12 questions. Do them one at a time. Don't jump ahead, but you may look back to earlier questions and answers. Some questions ask you to select all of the answers that you think are correct. Other questions ask you to select only one answer unless you are told to "Try again!" Follow the directions for each question.

After you have selected a choice to a question, look up its number on the answer sheet. Select your answer(s) to each question by rubbing the developing pen between the brackets on the answer sheet. A hidden message will appear and tell you if you are right. When you have finished, you will learn how to score your performance.

Background

The mine is wet and gassy in 52 inch coal with a good sandstone top and entries 18 feet wide.

Ventilation is 36,000 cfm at the exhaust fan.

The face is 4700 feet from the portal.

A three inch water line with 90 psi runs into the section. Fire hoses are present throughout the mine and on the section.

Just before the shift, the 001 section, first panel right off the East mains, was firebossed and the ventilation was good.

The coal seam dips about 6 degrees to the south. The 001 section advances to the south.

Halfway through the second shift, a methane ignition occurred at the face of the #4 entry of the 001 section while coal was being cut. The continuous miner operator, the miner helper, and the section foreman were burned. The four other miners on the section removed the three injured miners from the section, knocked the power at the section power box, provided first aid to the injured, reported the ignition and injuries, and brought the injured out. The burned miners have been sent to a local hospital.

Problem

You are the mine foreman. You have just returned from an errand. When you arrive at the mine office you learn of the ignition from your assistant mine foreman and the four uninjured miners from the section.

Turn the page and answer Question A.

Question A

Questions that you should ask immediately include: (Select as MANY as you think are correct.)

1. Is everyone out of the mine?
2. How long is it until sunset?
3. Has someone notified the mine superintendent, MSHA and state officials?
4. What are the details of the ventilation and conditions on the section?
5. To what hospital were the burned miners taken?
6. How long ago did the ignition occur?
7. Was there any fire on the section after the ignition?
8. Has the main power to the mine been shut off?
9. Is the fan still operating?
10. Have the members of the 001 section had their annual refresher training within the last year?
11. What is the appearance and condition of the air in the returns at the surface?
12. What was today's production for the 001 section before the ignition?
13. How many years has the 001 section foreman worked in this job?

When you have made your selection(s), do the next question.

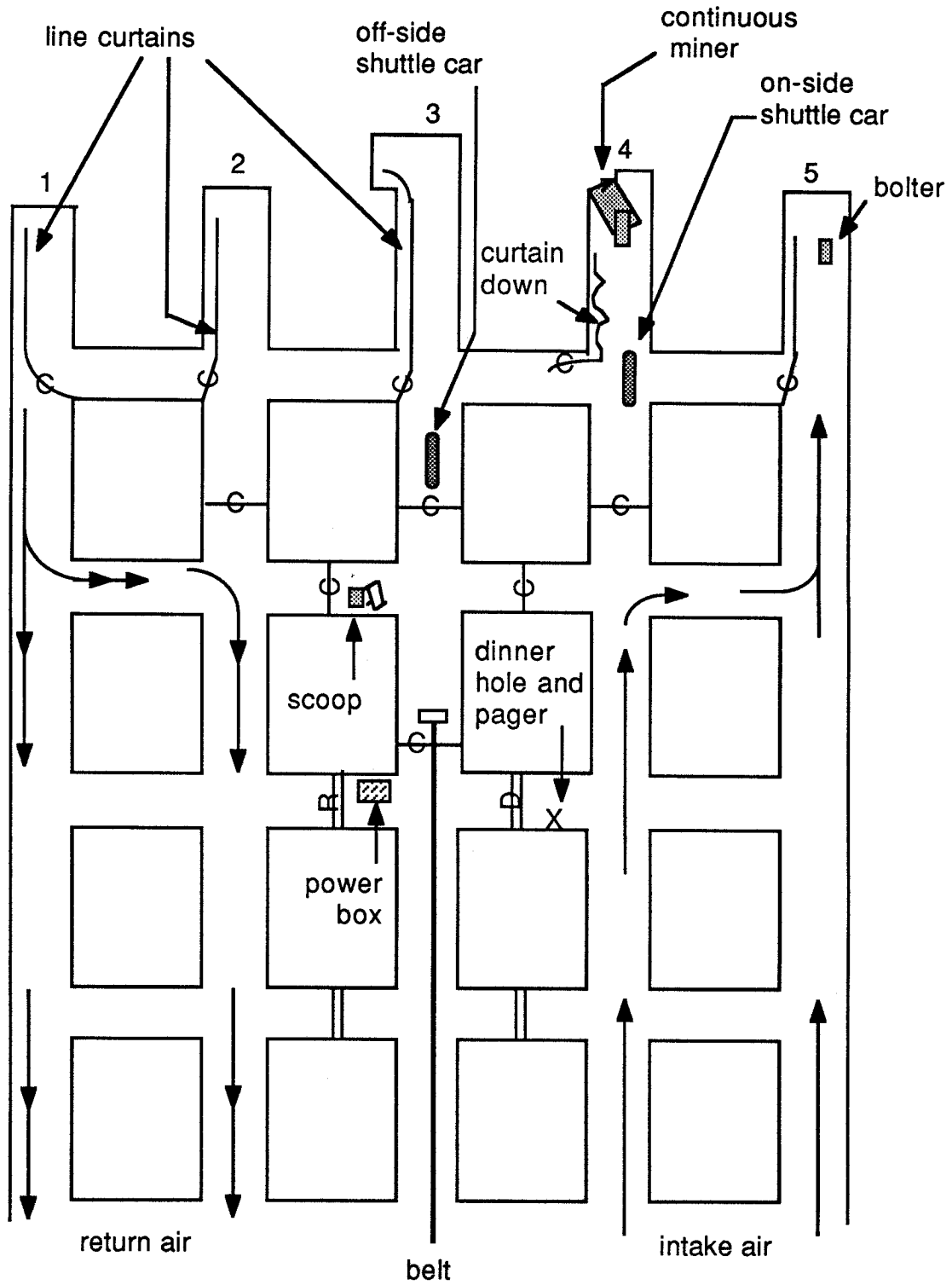


Figure 1: Map showing section ventilation and conditions

Question B

At this point what actions should you take? (Select as MANY as you think are correct.)

14. Order the mine fan shut down.
15. Knock the power to the whole mine, but leave the fan running.
16. Send one of the miners to another phone. Tell him to keep trying to locate the mine superintendent by calling his home, his associates, secretary, etc.
17. Using a battery operated scoop, immediately take the 002 section foreman and the brattice man from the 001 section into the 001 section and restore ventilation in #4 entry.
18. Send one certified miner to monitor the air in the returns at the exhaust fan for gases and smoke and have this person report to you periodically.
19. Send a miner to the company office to check if the 001 section miners have had annual refresher training within the last year.
20. Ask the utility man where brattice material is stored on the 001 section.

When you have made your selection(s), do the next question.

Question C

Given the information you have collected so far, which of the following conditions do you suspect on the 001 section? (Choose only ONE unless you are told to "Try again!")

21. There is an active mine fire on the section, possibly involving the continuous mining machine and its oil, as well as some coal.
22. There is a water inundation of section 001 at the face in entry #4.
23. There is a blackdamp inundation of section 001 at the face in entry #4.
24. Methane liberation, probably at the face of the #4 entry, is still fairly high.
25. Coal is on fire somewhere on the section. The fire is producing methane and hydrogen.

Question D

You decide to get ready for a trip into the mine to the 001 section. What equipment will you assemble? (Select as MANY as you think are correct.)

26. Two methane detectors
27. Two oxygen detectors
28. A carbon monoxide detector
29. One SCSR for each person entering the mine
30. A current mine map and a map of 001 section
31. Three extra pairs of gloves
32. A flame safety lamp
33. A portable telephone and line on a reel
34. A brass hammer, nails, and brattice material
35. A stretcher and first aid kit
36. A 40 to 50 foot rope to serve as a life line
37. Two dry chemical fire extinguishers and 6 to 8 bags of rock dust
38. An anemometer
39. Four mine rescue breathing units
40. Chalk and pen to mark on the maps and on the roof and rib
41. Extra fuses for the power box on the section

When you have made your selection(s), do the next question.

Question E

One MSHA and one state inspector arrive. They talk with you. You give them all the information you know at this time. They ask you to lead the group in. Who else will you take with you? (Choose only ONE unless you are told to "Try again!")

42. The foreman from 001 section
43. The available miner who is most familiar with the mine's ventilation, the 001 section, and who is also a certified mine examiner
44. The shuttle car driver from the 001 section who witnessed the ignition, although he is not a certified mine examiner
45. The brattice man from the 001 section, although he is not a certified mine examiner
46. Two mine rescue team members from the company headquarters which is 100 miles away

Question F

You have selected the 002 section foreman to go in with you and the inspectors. What procedures will you establish for entering and traveling in the mine? (Select as MANY as you think are correct.)

47. Walk in the entire way from the portal in the #5 entry intake airway.
48. Take a permissible battery operated rubber-tired scoop in through the #4 entry intake airway.
49. Have the person at the mouth of the exhaust fan continue to monitor the return air for gases and smoke while you are underground.
50. Have someone monitor the mine phone in the mine office and also continue to try to locate the superintendent.
51. Use a hand held spotter to monitor for methane as you travel inby.
52. Travel in the #4 entry so you can inspect the stoppings on the way in.
53. Stop the scoop at each mandoor. Get off. Feel the mandoor to see if it is hot. If it is not, open the door slightly. Inspect the air in the belt entry for smoke. Then take methane, carbon monoxide, and oxygen readings in the belt entry by holding the instruments through the mandoor.
54. After taking gas readings, enter the belt entry and call to the surface at each of the three mine phones as you travel inby. Tell the surface what you have found, where you are going next, and when you should be at the next phone. Ask for the latest information about the gases in the return air at the surface.
55. Tell each person in the scoop to break open their SCSR, put it on, and breathe with it on the way in to the section.
56. Remind each person to carry their SCSR with them at all times while traveling into and working on the section.
57. At each mandoor, stop the scoop. Have someone get off, go into the belt entry and take gas readings. Then, have the person go through the second mandoor into the #2 and #1 return entries to make gas readings.

When you have made your selection(s), do the next question.

Question G

You are now near the face of section 001. Which position marked on the section map on the following page (Figure 2) is the best place to park the scoop? (Choose only ONE unless you are told to "Try again!")

58. Position A

59. Position B

60. Position C

61. Position D

62. Position E

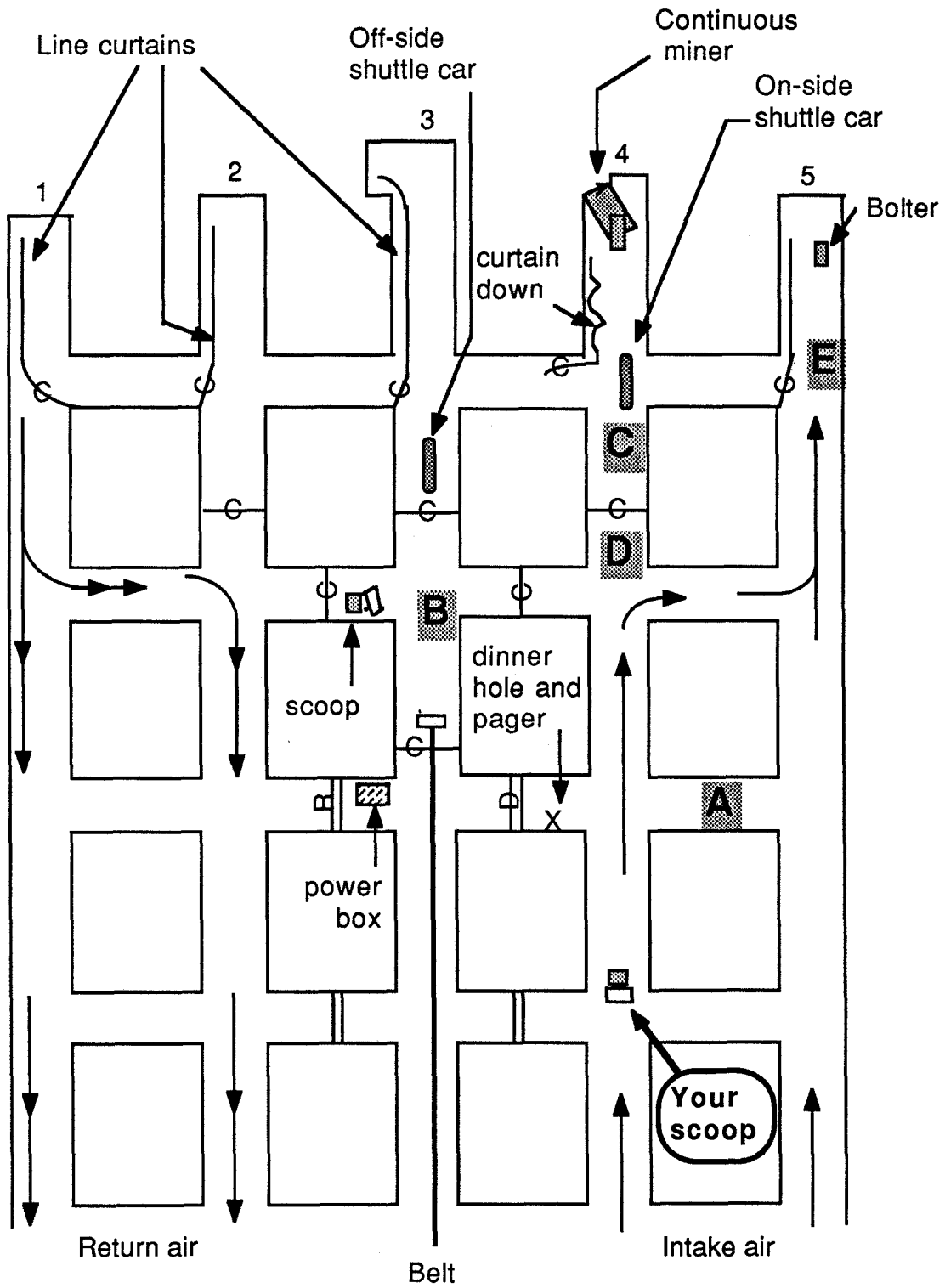


Figure 2: Map showing possible places to park the scoop (positions marked in large bold letters)

Question H

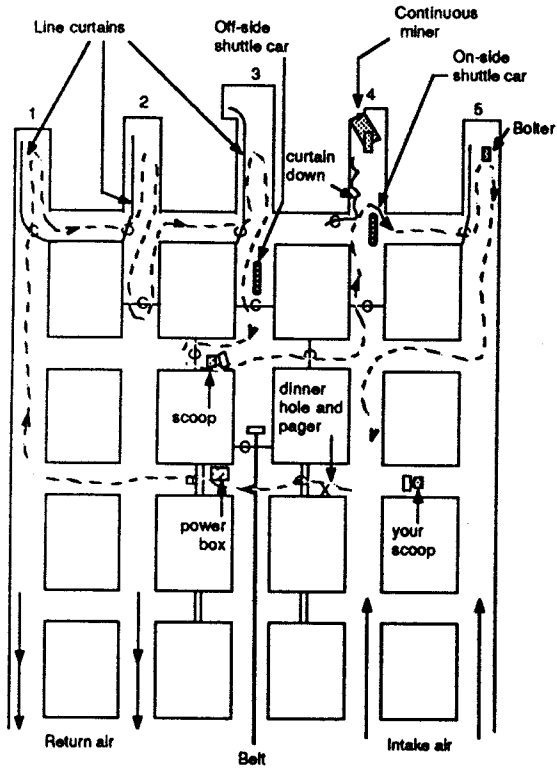
Now you have parked the scoop. Which route will you take to the face to check the ventilation and the condition of the section? See Figure 3 on the next page. (Choose only ONE unless you are told to "Try again!")

63. Route A

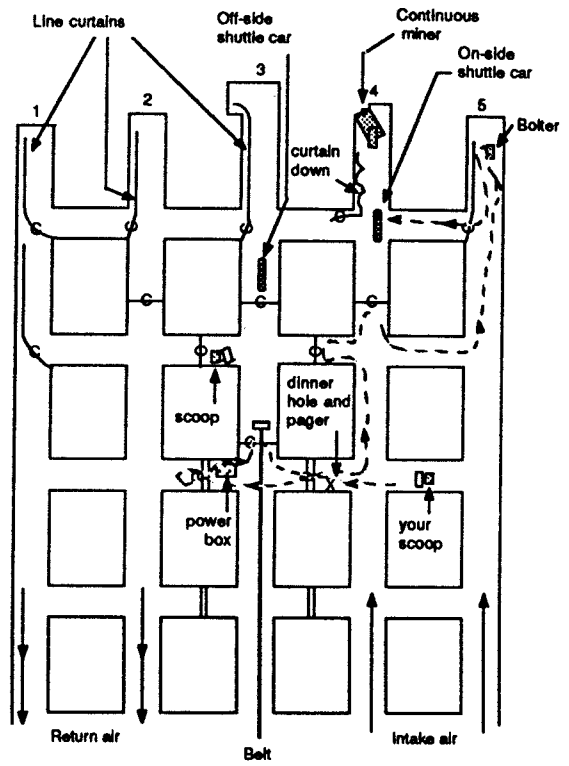
64. Route B

65. Route C

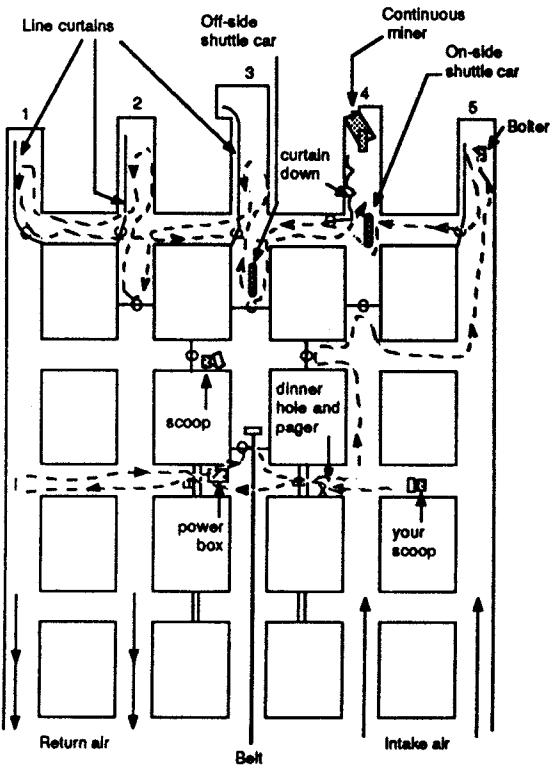
66. Route D



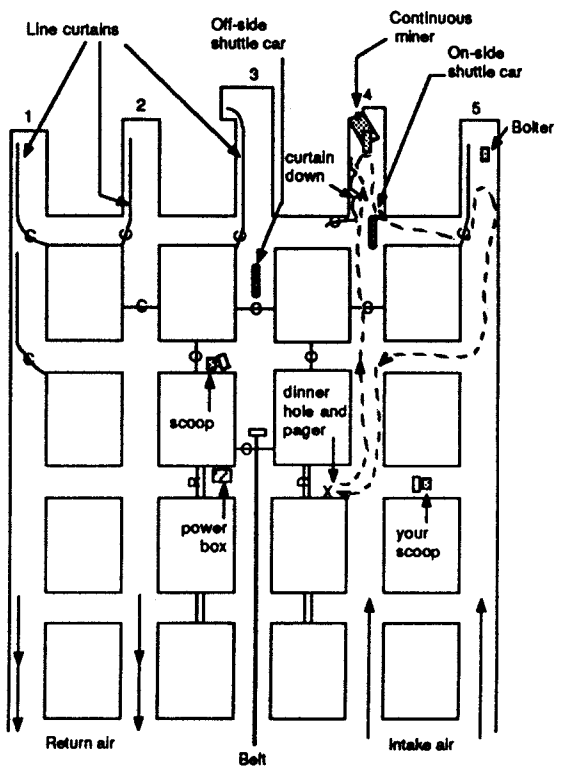
Route A



Route B



Route C



Route D

Question I

You have taken the route to the face shown on the map on the next page (Figure 4). The Xs along the route mark the places where you took gas readings. The A marks the place where you took an anemometer reading. You find no methane, no carbon monoxide, and 20.90% oxygen at points X1 through X7. You calculate 13,000 cfm air flow at point A. At point X8 you find the methane to be 3.5%, the oxygen to be 18%, and 0.00% carbon monoxide. What will you do now? (Select as MANY as you think are correct.)

67. Enter the face of #4 entry and travel toward the continuous miner and keep measuring the gases.
68. Shut off your cap lamps. Look into the #4 entry. Look for any signs of glowing coals or fire.
69. Shine your lights into the face of # 4 entry. Look for signs of smoke.
70. Make a gas check at the outby end of the shuttle car.
71. Travel through the last open crosscut all the way to the #1 entry, measuring the gases as you go.
72. Use the brattice cloth you brought with you. Hang a line curtain from the left corner of the #4 pillar, across the crosscut on the right of the on-side shuttle car, and along the right rib of the #4 entry. Extend the curtain a little at a time toward the face of the #4 entry, keeping fresh air blowing over you.

When you have made your selection(s), do the next question.

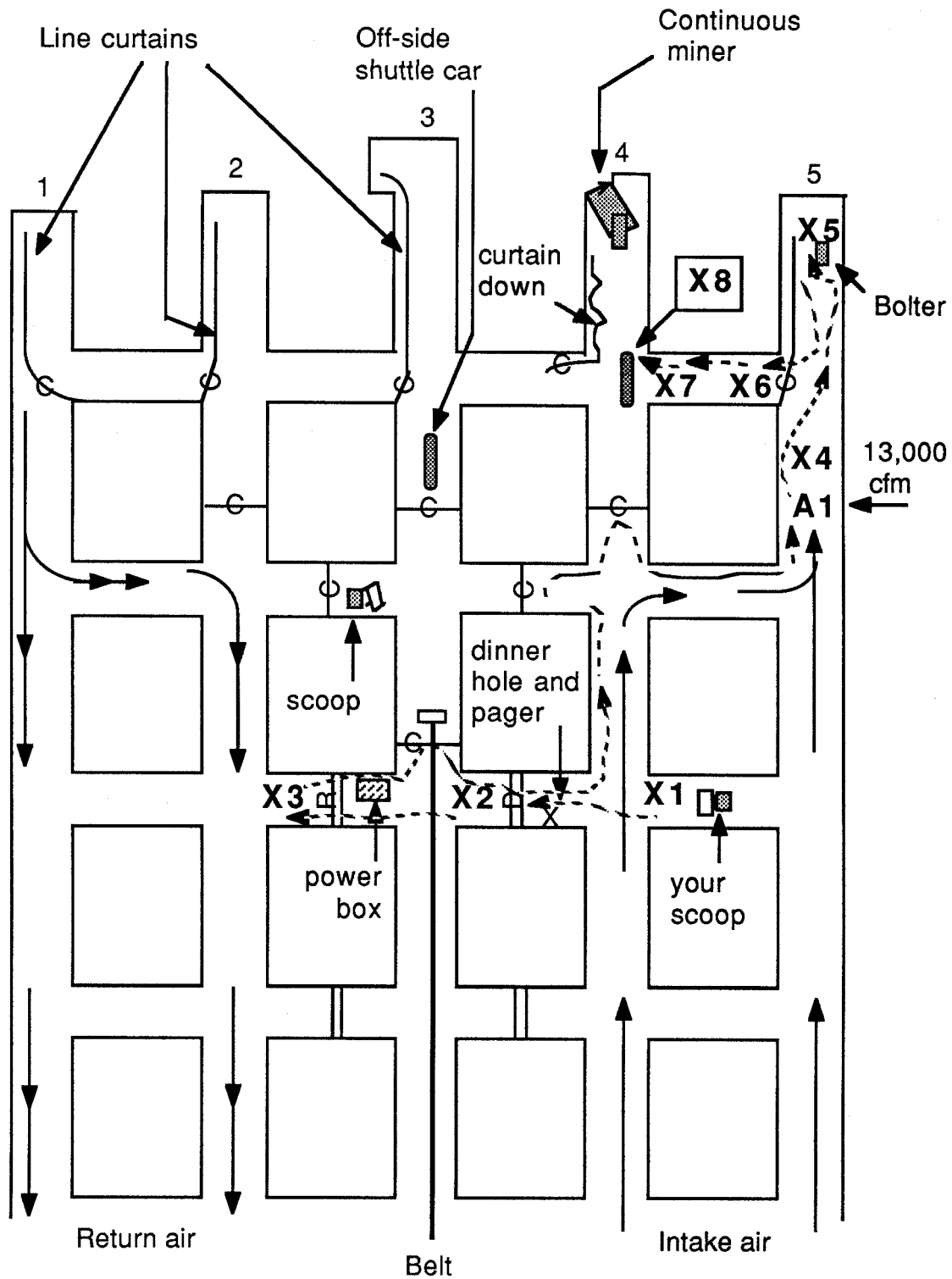


Figure 4: Position of gas and air readings (Xs = gas readings, A = air flow)

Question J

You send the section foreman to call out at the pager and report that you have restored ventilation on the section, but that the methane is still 2.5% at the face of the #4 entry. What action should you take at this time? (Choose only ONE unless you are told to "Try again!")

73. Ask the surface to turn on the power to the mine. You then turn the power on at the power box on the section and tram the continuous miner out of the entry.
74. Ask for advice from the surface where engineering personnel and other specialists may now be available.
75. When he calls out, tell the section foreman to ask the surface personnel to reverse the fan.

Question K

All four of you are near the tailpiece. As you are getting ready to come out of the mine, you hear what sounds like a large roof fall. The check curtain in the #3 entry near the face billows toward you. When you move up the beltway and look under the curtain, you see a lot of dust. When you hold your methane detector under the curtain, it reads 10%. See the map on next page (Figure 5). What will you do now? (Select as MANY as you think are correct.)

76. Go to the #4 entry and up to the face to see if there has been a roof fall so you can make an accurate report to the surface about conditions on the section.
77. Report what you have observed to the surface and immediately leave the face area.
78. Take a methane reading at the scoop before using it to leave the section.
79. Leave the scoop where it is and walk out of the mine.
80. Monitor for methane all the way out as you tram to the surface.
81. Travel out in the scoop in the #5 entry in the intake airway.

When you have made your selection(s), do the next question.

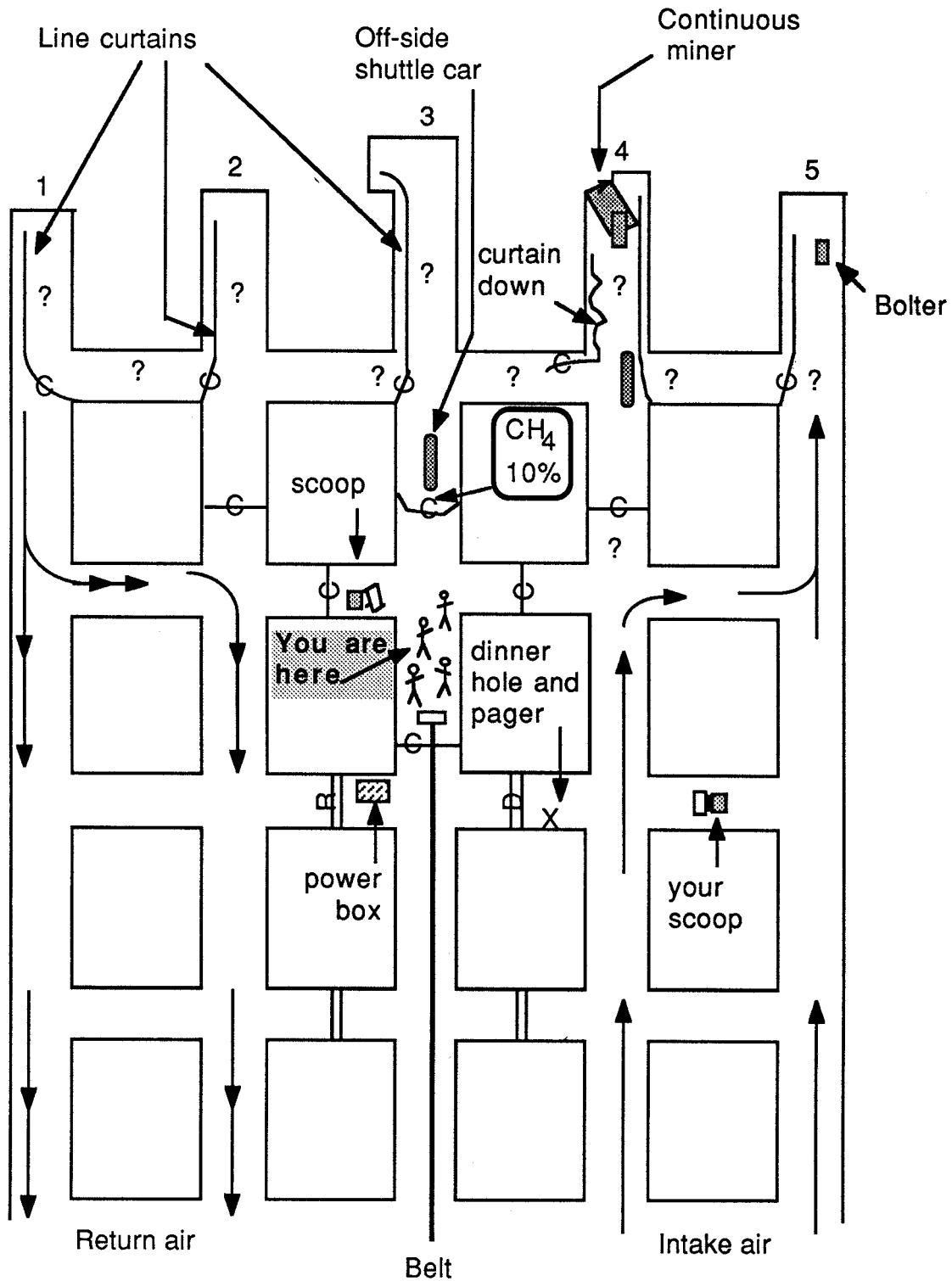


Figure 5: Your position and methane reading behind check curtain after sound of roof fall

Question L

When you arrive at the surface, you learn that the methane in the return air at the exhaust fan has reached 4.40% and the airflow in the returns is approximately 1800 cfm higher than the intake airflow. No carbon monoxide is present and the oxygen content is about 19.0%. At this point what do you suspect is the source of the methane? (Choose only ONE unless you are told to "Try again!")

82. There is a mine fire somewhere on section 001 or near it.
83. The methane is probably pressurized gas from old works that have been exposed by the continuous miner in #4 entry and by a subsequent roof fall in that entry.
84. There has been an explosion in the mine, perhaps in by the 001 section. The increased levels of methane and the increased flow of air in the returns are caused by the expansion of the air from the heat.

End Of Problem

Scoring your performance

1. Compare your completed answer sheet with the scoring key to learn which of your choices are correct, incorrect, or neutral.
2. Count the total number of correct answers you colored in. Write this number on the first blank on the answer sheet.
3. Count up the total number of incorrect answers you colored in. Subtract this number from 38. Write the difference on the second blank on the answer sheet. **Do not count answers 2, 31 and 32.**
4. Add the numbers in the first and second blanks on the answer sheet. This is your score.

The best possible score of 81 results from selecting all 43 of the correct answers, and none of the 38 wrong answers. The 3 neutral answers do not count for or against your score. The worst possible score of zero results from selecting all the wrong answers and no correct answers.