



AMIE STUDY CIRCLE  
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# **STUDY MATERIAL FOR DGMS, GATE AND PSU EXAMS**

## **MINE VENTILATION, FIRES, EXPLOSION & INUNDATION**

- Warm Up Questions
- Questions from DGMS Exams
- Questions from PSU Exams
- Questions from GATE Exams



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# MINE VENTILATION, FIRES, EXPLOSION & INUNDATION

## WARM UP QUESTIONS

1. The oxygen percentage in intake air is

- (a) 20.28 %
- (b) 78.04 %
- (c) 20.93 %\*
- (d) 25 %

Hint: Inhaled air is by volume 79% nitrogen, 20.95% oxygen and small amounts of other gases including argon, carbon dioxide, neon, helium, and hydrogen. The gas exhaled is 4% to 5% by volume of carbon dioxide, about a 100 fold increase over the inhaled amount.

2. The oxygen percentage in return air is

- (a) 20.28 %\*
- (b) 78.04 %
- (c) 20.93 %
- (d) 25 %

3. Decay of timber by fungus growth is caused by

- (a) CH<sub>4</sub>
- (b) O<sub>2</sub> absorption\*
- (c) N<sub>2</sub> depletion
- (d) CO<sub>2</sub>

Hint: Fungal decay is caused by a biological attack within the wood by a certain species of fungi. The fungus can lie dormant in the timber for years until the right conditions present themselves. The conditions needed are oxygen, moisture and nutrients, with moisture being the critical component.

4. Each 1 % reduction in the O<sub>2</sub> % results in about the depletion from the light is

- (a) 10 %,
- (b) 20 %,
- (c) 30 %\*
- (d) 40 %

5. The light of oil lamps is extinguished when O<sub>2</sub> % is falls to

- (a) 19 %,
- (b) 17.5 %\*

(c) 21 %,

(d) 20 %

Hint: Blackdamp affects flame of an oil flame safety lamp. For every 5% blackdamp (corresponding to 1% reduction in O<sub>2</sub> percentage) light diminishes by 30% and extinguishes when O<sub>2</sub> percentage falls below 17.5%.

6. Mining laws in India require that mine air should contain minimum % of O<sub>2</sub> is

- (a) 25 %
- (b) 21 %
- (c) 19 %\*
- (d) 17 %

7. CO<sub>2</sub> is mostly found at

- (a) roof
- (b) middle of the roadway
- (c) dip areas of depillaring areas\*
- (d) anywhere in the mine

8. The permissible limit of CO<sub>2</sub> is

- (a) 0.5 %\*
- (b) 1.25 %
- (c) 0.75 %
- (d) 1 %

Hint: OSHA has established a Permissible Exposure Limit (PEL) for CO<sub>2</sub> of 5,000 parts per million (ppm) (0.5% CO<sub>2</sub> in air) averaged over an 8-hour work day (time-weighted average or TWA.)

9. Flame safety lamp is extinguished at CO<sub>2</sub> %

- (a) 1 - 2
- (b) 2 - 3
- (c) 3 - 4\*
- (d) 4 - 5

10. Black damp is mixture of

- (a) CO<sub>2</sub> + N<sub>2</sub>\*
- (b) CO<sub>2</sub> + H<sub>2</sub>
- (c) CO<sub>2</sub> + O<sub>2</sub>
- (d) CO<sub>2</sub> + CO

Hint: Blackdamp (also known choke damp) is an asphyxiant, reducing the available

oxygen content of air to a level incapable of sustaining human or animal life. It is not a single gas but a mixture of unbreathable gases left after oxygen is removed from the air and typically consists of nitrogen, carbon dioxide and water vapour. The term is etymologically and practically related to terms for other underground mine gases such as fire damp, white damp, and stink damp, and afterdamp.

11. Black damp is also called

- (a) stink damp
- (b) Marsh gas
- (c) stythe or choke dam\*
- (d) white damp

12. For every 5% of black damp the light is diminished by

- (a) 20 %
- (b) 30 % \*
- (c) 40 %
- (d) 50 %

Hint: Blackdamp affects flame of an oil flame safety lamp. For every 5% blackdamp (corresponding to 1% reduction in O<sub>2</sub> percentage) light diminishes by 30% and extinguishes when O<sub>2</sub> percentage falls below 17.5%.

13. The light is extinguished when black damp % is

- (a) 17 % \*
- (b) 17.5 %
- (c) 21 %
- (d) 20 %

14. CO is also called as

- (a) Black damp
- (b) Marsh gas
- (c) Stink damp
- (d) White damp\*

Hint: White damp is a mixture of poisonous gases found in coal mines and is predominantly made up of carbon monoxide (CO). It is colourless, odourless, and tasteless making it very hard for a human to detect. It is commonly referred to as a “silent killer”. Carbon monoxide is a product of the incomplete combustion of carbon.

15. CO forms an explosive mixture with air when present within the range of nearly (by volume)

- (a) 5 - 15
- (b) 4.5 - 45
- (c) 12 - 75\*
- (d) 4.5 - 75

Hint: CO is a colourless, odourless, tasteless and combustible gas with a lower explosive limit (LEL) of 12.5% or 125,000 parts per million

16. Incomplete oxidation of coal result

- (a) CO<sub>2</sub>
- (b) CO\*
- (c) CH<sub>4</sub>
- (d) None

Hint: Carbon monoxide (CO) forms when there is not enough excess air to burn the fuel or the available air is not mixed properly with the fuel. CO is not undesirable in itself, but its presence indicates inadequate excess air or incomplete combustion. Carbon monoxide is also a harmful gas and can be fatal.

17. The permissible limit of the CO is

- (a) 10 ppm
- (b) 50 ppm\*
- (c) 7 ppm
- (d) 5 ppm

Hint: The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for carbon monoxide is 50 parts per million (ppm) parts of air.

18. Hopcalite is used to detect

- (a) CO\*
- (b) CO<sub>2</sub>
- (c) CH<sub>4</sub>
- (d) SO<sub>2</sub>

Hint: Hopcalite is the trade name for a number of mixtures that mainly consist of oxides of copper and manganese, which are used as catalysts for the conversion of carbon monoxide to carbon dioxide when exposed to the oxygen in the air at room temperature.

19. Hopcalite is a mixture of

- (a) Manganese dioxide + copper oxide\*

- (b) Potassium superoxide + copper oxide
- (c) silica gel +potassium palladium sulphate
- (d) Iodine pentoxide + sulphuric acid

20. Hoolamite is a mixture of

- (a) Manganese dioxide + copper oxide
- (b) Potassium superoxide + copper oxide
- (c) silica gel +potassium palladium sulphate
- (d) Iodine pentoxide + sulphuric acid\*

21. The minimum ppm of CO detected by CO detectors is

- (a) 3
- (b) 5\*
- (c) 10
- (d) 50

22. In M.S.A. CO detector which tubes are used

- (a) P.S detector tubes\*
- (b) Hopcalite
- (c) Hoolamite
- (d) None

23. Which is formed in stagnant water in old workings in the areas of gob

- (a) CH<sub>4</sub>
- (b) SO<sub>2</sub>
- (c) H<sub>2</sub>S\*
- (d) CO<sub>2</sub>

Hint: Hydrogen sulphide may be found in old pipelines, stagnant water, fire areas and occasionally in active workings, usually associated with broken bottom.

24. H<sub>2</sub>S is also called as

- (a) stink damp\*
- (b) Marsh gas
- (c) choke damp
- (d) white damp

25. When mixed with air H<sub>2</sub>S forms on explosive mixture the limits of inflammability is

- (a) 5 - 15
- (b) 4.3 - 45\*
- (c) 12 - 75
- (d) 4.5 - 75

Hint: The H<sub>2</sub>S gas can explode when its concentration in the air ranges from about 4% (40,000 ppm) to 46% (460,000 ppm).

26. Which can be found by blotting paper soaked in lead acetate changes its colour to black

- (a) SO<sub>2</sub>
- (b) H<sub>2</sub>
- (c) H<sub>2</sub>S\*
- (d) CH<sub>4</sub>

Hint: Sulphur dioxide gas turns lead acetate paper black.

27. The permissible limit of the H<sub>2</sub>S is

- (a) 10 ppm
- (b) 50 ppm
- (c) 7 ppm\*
- (d) 5 ppm

28. The permissible limit of the SO<sub>2</sub> is

- (a) 10 ppm\*
- (b) 50 ppm
- (c) 7 ppm
- (d) 5 ppm

29. When mixed with air H<sub>2</sub> forms on explosive mixture the limits of explosiveness is

- (a) 5 - 15
- (b) 4.3 - 45
- (c) 12 - 75
- (d) 4 - 75\*

30. The permissible limit for the nitrous fumes is

- (a) 10 ppm
- (b) 50 ppm
- (c) 7 ppm
- (d) 5 ppm\*

Hint: OSHA NO<sub>2</sub> exposure limits:

Occupational Safety and Health Administration (OSHA) defines the Permissible Exposure Limit to be 1 ppm (8 hour time weighted average) and Short Term Exposure Limit to be 5 ppm (15 minute average).

31. Methane gas is also called as

- (a) stink damp
- (b) Marsh gas\*
- (c) choke damp
- (d) white damp



Hint: Methane is also known as firedamp or marsh gas.

32. Methane can be found at

- (a) roof\*
- (b) floor
- (c) Any place in the roadway
- (d) Exhaust gases of the locomotive

33. M.S.A. methanometer is worked on the principle of

- (a) Formation of gas cap
- (b) Wheatstone bridge\*
- (c) Infra radiation
- (d) Optical properties

Hint: A catalytic-type methanometer uses an array of four heated wire filament elements, two active filaments are coated with a catalyst, arranged in a Wheatstone bridge with two inactive elements that have no coating. When exposed to methane-contaminated air, the coated filaments heat up due to oxidation of the methane, and the resulting imbalance in the resistance of active and inactive elements can be displayed on a calibrated meter. Such instruments require oxygen to work and can be inaccurate if methane concentration is very high.

34. Spiral arm is worked on the principle of

- (a) Formation of gas cap\*
- (b) Wheatstone bridge
- (c) Infra radiation
- (d) Optical properties

35. Ring rose detector works on the principle of

- (a) Formation of gas cap
- (b) Wheatstone bridge
- (c) Diffusion-combustion-contraction\*
- (d) Optical properties

36. Interferometers works on the principle of

- (a) Formation of gas cap
- (b) Wheatstone bridge
- (c) Infra radiation
- (d) Optical properties\*

37. One kg of methane in burning evolves — kcal of heat.

- (a) 10000
- (b) 12000
- (c) 13600\*
- (d) 15000

Hint: When methane gas is combusted, heat is released, making the reaction exothermic. Specifically, the combustion of 1 mol of methane releases 890.4 kilojoules of heat energy.

38. The minimum voltage at which the methanometer works with accuracy is

- (a) 1 v
- (b) 1.5 v
- (c) 2.2 v\*
- (d) 3 v

39. The wet bulb temperature in development faces should not exceed

- (a) 30 deg C
- (b) 33.5 deg C\*
- (c) 35 deg C
- (d) 38 deg C

40. The minimum quantity of air per person in deg III mine is

- (a) 6 cu.m/min
- (b) 8 cu.m/min\*
- (c) 10 cu.m/min
- (d) 12 cu.m/min

41. If the wet bulb temperature exceeds 30.5 deg c at any place air current should be faster than

- (a) 1 m/s\*
- (b) 2 m/s
- (c) 3 m/s
- (d) 0.5 m/s

42. Whirling hygrometer is rotated with a speed of

- (a) 100 rpm
- (b) 200 rpm\*
- (c) 300 rpm
- (d) 400 rpm

43. The value of the kata factor is

- (a) 250
- (b) 300
- (c) 380
- (d) 480\*

Hint: Kata factor, A conversion factor, constant for a given kata thermometer, used to convert the measured time for a standardised drop in temperature into the environmental cooling rate. The Kata cooling factor which gives the amount of heat loss per  $\text{cm}^2$  from the surface of the bulb in cooling from  $38^\circ$  to  $35^\circ$  is usually written on the Kata thermometer. This factor divided by the time taken for the cooling gives the estimate of Kata cooling power of air.

44. The unit for the kata factor is

- (a) Milli calories/sq.cm/sec
- (b) kcal/sec/sq.cm
- (c) milli calories/sq.cm\*
- (d) millicolories/sec/sq.cm

45. The difference between the atmosphere pressure and the total pressure on the fan drift is called

- (a) Velocity pressure of surface fan
- (b) Static pressure
- (c) Total pressure of surface fan\*
- (d) none

46. Static pressure is measured by

- (a) Barometer
- (b) Pitot tube
- (c) Venturi meter
- (d) U-tube\*

47. Velocity pressure is measured by

- (a) Barometer
- (b) Inclined manometer
- (c) U-tube
- (d) Pitot tube\*

48. Cooling power is a combination of temperature of air ; relative humidity and \_\_\_\_\_

- (a) Moisture content of air
- (b) density of air
- (c) velocity of air\*
- (d) Pressure

49. For light manual workers the wet kata is

- (a) 18
- (b) 25\*
- (c) 30

(d) 8

50. Ordinary U-tube manometers are not useful for measurement of gas velocities below

- (a) 12 m/s\*
- (b) 13 to 20 m/s
- (c) 20 to 30 m/s
- (d) above 30 m/s

51. Geothermic gradient in Indian coal seam is \_\_\_\_\_

- (a) 1 deg c per 15 m
- (b) 1 deg c per 38m\*
- (c) 1 deg c per 50 m
- (d) none

Hint: Geothermal gradient is the rate of increasing temperature with respect to increasing depth in the Earth's interior.

Away from tectonic plate boundaries, it is about  $25^\circ\text{C}$  per km of depth.

52. Up to what depth from the surface the temperature is constant

- (a) 10m
- (b) 15m\*
- (c) 20m
- (d) 25m

Hint: AT a small depth (from 12 to 40 feet) below the surface of the earth the temperature is constant throughout the year, and this constant temperature of the soil differs little from the mean annual temperature of the air.

53. The speed of the centrifugal fan is

- (a) 1 to 100 rpm
- (b) 100 to 300 rpm\*
- (c) 300 to 1000 rpm
- (d) above 1000 rpm

54. The mostly used blade type in centrifugal fan is

- (a) backward\*
- (b) radial
- (c) forward
- (d) none

Hint: Centrifugal fans with backward curved blades are used primarily for intake suction and do not require a scroll housing. They have high hydraulic efficiency.

55. The presence of Nitrous fumes are detected by

- (a) The rotten eggs smell
- (b) sweet smell
- (c) metallic taste on tongue
- (d) head ache\*

56. The noxious and inflammable gasses of old workings of a coal mine expands when there is

- (a) sudden rise of temperature
- (b) sudden heavy roof fall
- (c) sudden rise in barometric pressure
- (d) sudden drop in barometric pressure\*

57. The instrument that is used to measure the relative humidity is

- (a) pitot tube
- (b) aneroid barometer
- (c) hygrometer\*
- (d) anemometer

58. For comfortable working conditions the reasonable velocity of air at the working face is

- (a) 0.5 to 2 m/s\*
- (b) 3 to 4 m/s
- (c) 5 m/s
- (d) 6 m/s

59. Cooling power by conduction convection and radiation is given by using the

- (a) dry bulb temperature
- (b) wet bulb temperature\*
- (c) Average time of wet and dry bulbs
- (d) wet and dry bulb time and velocity of air

60. Inclined water gauge is used for the measurement of water gauge for smaller than

- (a) 200 mm
- (b) greater than 200 mm
- (c) smaller than 50 mm\*
- (d) greater than 50 mm

61. The inclined water gauge can read up to

- (a) 2 mm
- (b) 1.5 mm
- (c) 1 mm

(d) 0.2 mm\*

62. The velocity of air flowing in a drift where the velocity pressure is 36 mm is

- (a) 36 m/s
- (b) 24 m/s\*
- (c) 42 m/s
- (d) 48 m/s

63. In the centrifugal fan smooth flow air and conversion of velocity energy into pressure energy takes place

- (a) In spiral casing
- (b) In the blades
- (c) At the tip of the blades
- (d) In the evasee\*

64. In the centrifugal fan re-entry of of the discharged air is prevented by

- (a) spiral casing\*
- (b) blades
- (c) evasee
- (d) eye

65. With a centrifugal fan for a given quantity of air increase of efficiency of the and reduction in cost of power can be obtained with

- (a) well-designed blades of the fan
- (b) well-designed spiral casing
- (c) well-designed evasee\*
- (d) well-designed eye of the impeller

66. The maximum permissible speed of the axial flow fan is

- (a) 8000 m/min
- (b) 6000 m/min
- (c) 5200 m/min
- (d) 4200 m/min\*

67. The maximum water gauge developed in axial flow fan is

- (a) 10 cm
- (b) 12.5 cm\*
- (c) 13.5 cm
- (d) 15 cm

68. The water gauge developed and quantity circulated with an axial flow fan depend on

- (a) Size of the fan
- (b) Shape of the blades

- |  |  |
|--|--|
| <p>(c) Design of the evasee<br/>(d) Speed of the blade tips*</p> <p>69. With a axial fan direction of travel of air current to the mine is changed by<br/>(a) changing direction flow of air into fan by means of doors<br/>(b) changing the blades on the rotor<br/>(c) changing the direction of rotation of the motor*<br/>(d) not possible with this type of fan</p> <p>70. The pitch of the blades of axial flow fans is<br/>(a) 1 to 5 deg<br/>(b) 5 to 10 deg<br/>(c) 10 to 15 deg*<br/>(d) 15 to 20 deg</p> <p>71. By varying the pitch of the blades the pressure generated by axial flow fan is<br/>(a) remains same*<br/>(b) decreases<br/>(c) increases<br/>(d) increases 8 times</p> <p>72. The water gauge of a axial flow fan can be increased by<br/>(a) increasing speed of rotation<br/>(b) changing the pitch of blades<br/>(c) installing 2 or more stages*<br/>(d) enlarging the evasee of the fan</p> <p>73. The manometric efficiency of axial flow fan is<br/>(a) 10 to 20 %<br/>(b) 70 to 85 %<br/>(c) 20 to 30 %*<br/>(d) 40 to 50 %</p> <p>74. The overall efficiency of axial flow fan is<br/>(a) 10 to 20 %<br/>(b) 70 to 85 %*<br/>(c) 20 to 30 %<br/>(d) 40 to 50 %</p> <p>75. Modern flame safety lamps can withstand an air velocity of<br/>(a) 5 m/s<br/>(b) 10 m/s*</p> | <p>(c) 15 m/s<br/>(d) 20 m/s</p> <p>76. The maximum air velocity at the face is<br/>(a) 1.7 m/s*<br/>(b) 3 m/s<br/>(c) 5 m/s<br/>(d) 7.5 m/s</p> <p>77. The maximum air velocity at the main haulage roads is<br/>(a) 1.7 m/s<br/>(b) 3 m/s<br/>(c) 5 m/s*<br/>(d) 7.5 m/s</p> <p>78. Air velocities in diesel locomotive sheds should not be less than<br/>(a) 4 m/s<br/>(b) 2 m/s<br/>(c) 1 m/s<br/>(d) 0.75 m/s*</p> <p>79. If the quantity of air passing through airway has to be increased from 1200 cu.m/min to 2400 cu.m/min the effect of HP of fan is<br/>(a) 8 times*<br/>(b) 4 times<br/>(c) 2 times<br/>(d) 1/2 times</p> <p>80. If the velocity of the air is doubled then the water gauge increased will be<br/>(a) 2 times<br/>(b) 4 times*<br/>(c) 8 times<br/>(d) 1/2 times</p> <p>81. The area of the regulator required for flow of a certain quantity of air can be calculated from the formula is<br/>(a) <math>PQ/75</math><br/>(b) <math>KxSxQ^2/A^3</math><br/>(c) <math>0.385Q/\sqrt{P}</math>*<br/>(d) none</p> <p>82. In a mine of high resistance the series arrangement of fans gives a considerable increase in the quantity of air flowing is<br/>(a) 10 %</p> |
|--|--|



- (b) 20 %
- (c) 30 %\*
- (d) 40 %

83. In a mine of high resistance the parallel arrangement fans a considerable increase in the quantity of air flowing is

- (a) 10 %
- (b) 20 %
- (c) 30 %
- (d) negligible\*

84. In a mine of medium resistance both series and parallel arrangement of fans give the same result that the increase in the air quantity is

- (a) 20 %\*
- (b) 30 %
- (c) 40 %
- (d) 50 %

85. In a mine of low resistance the parallel arrangement of the fans gives the increase in the air quantity by

- (a) 20 %
- (b) 30 %
- (c) 40 %
- (d) 50 %\*

86. When the wet bulb temperature exceeds 33.5 deg then the rise in the body temperature is

- (a) 3 deg
- (b) 2 deg
- (c) 1 deg\*
- (d) 0.5 deg

87. Man dies when the body temperature is rise maximum up to

- (a) 38 deg
- (b) 41 deg
- (c) 43 deg\*
- (d) 48 deg

88. For breaking up the methane layer formed in the roof the minimum layering number required is

- (a) 4
- (b) 3
- (c) 2\*
- (d) 1

89. While testing with safety lamp for CH<sub>4</sub> if the minimum length of the blue flame is 11.5 mm then the % of methane is

- (a) 1.5
- (b) 2.0
- (c) 2.5
- (d) 3.0\*

90. The rise in the pressure due to auto compression is ——per 100 m

- (a) 1.1 kpa\*
- (b) 2 kpa
- (c) 3 kpa
- (d) 3.5 kpa

91. The rise in the dry bulb temperature of air due to auto compression is——per 100 m depth

- (a) 2 K
- (b) 1.96 K
- (c) 1.012 K
- (d) 0.976 K\*

92. At 300 K the working efficiency of a worker is

- (a) 100 %\*
- (b) 80 %
- (c) 60 %
- (d) 50 %

93. The angle of the evasee is

- (a) 4 deg
- (b) 6 deg\*
- (c) 8 deg
- (d) 10 deg

94. The ratio between H.P of ventilation and H.P of Fan shaft is called

- (a) Mechanical efficiency
- (b) Manometric efficiency
- (c) Overall efficiency
- (d) Fan efficiency\*

95. The ratio between H.P of ventilation and H.P input to engine is called

- (a) Mechanical efficiency\*
- (b) Manometric efficiency
- (c) Overall efficiency
- (d) Fan efficiency

96. The sensitivity of the vertical U-tube manometer is

- (a) 1 pa
- (b) 5 pa
- (c) 10 pa\*
- (d) 15 pa

97. The sensitivity of Inclined gauge manometer is

- (a) 0.2 pa
- (b) 0.4 pa\*
- (c) 1 pa
- (d) 2 pa

98. Heat stroke is caused when the wet bulb temperature is

- (a) 294 K
- (b) 300 K
- (c) 312 K\*
- (d) 320 K

99. The efficiency of the workman if the wet bulb temperature in the mine is 310 K

- (a) 100
- (b) 75
- (c) 50
- (d) 25\*

100. For hard workers the dry kata is

- (a) 8
- (b) 18
- (c) 10\*
- (d) 30

101. The minimum thickness of the ventilation stopping is

- (a) 25 cm
- (b) 30 cm
- (c) 38 cm\*
- (d) 45 cm

102. The ventilation system which takes intake ventilating air to the lowest point of the district or face and allow it to travel to higher levels to ventilate the district before it goes to the return

- (a) ascensional ventilation\*
- (b) descensional ventilation
- (c) Homotropical
- (d) Antitropical

103. Natural ventilation pressure assists the fan ventilation pressure in case of

- (a) ascensional ventilation\*
- (b) descensional ventilation
- (c) Homotropical
- (d) Antitropical

104. When the air and mineral flow in the same direction the ventilation is called

- (a) ascensional ventilation
- (b) descensional ventilation
- (c) Homotropical\*
- (d) Antitropical

105. The effect of splitting the air in parallel is

- (a) Overall resistance of mine increases
- (b) Overall resistance of mine decreases\*
- (c) Pressure produced by fan increases
- (d) pressure produced by fan decreases

106. The ventilating door should open against the intake air so that

- (a) Air leakage takes from intake to return
- (b) The air pressure normally keeps the door closed\*
- (c) Recirculation of foul air avoided
- (d) Regulations are complied with

107. Splits reduce the doors on haulage roads but

- (a) Increase pressure
- (b) Decrease quantity
- (c) Increase Number of air crossings\*
- (d) none

108. The quantity of air to be circulated by an auxiliary fan depends upon

- (a) Length of the heading
- (b) Number of persons in the drift
- (c) Size of the drift
- (d) Rate of emission in the roadway\*

109. The quantity of air drawn by an auxiliary fan from the air way should not exceed

- (a) equal to quantity
- (b) 1/3 of quantity\*
- (c) 3/4 of quantity
- (d) 1/1.5 of quantity

110. The minimum distance between the fan and the corner of the drift to be ventilated should be

- (a) 3 m
- (b) 4 m
- (c) 5 m\*
- (d) 6 m

111. The quantity of the air per minute should be—— per sq. m of working area

- (a) 2.5 cu.m
- (b) 6 cu.m
- (c) 7 cu.m\*
- (d) 8 cu.m

112. On reversal of air current by axial flow fan the quantity of air reduces to——

- (a) 20 %
- (b) 30 %
- (c) 40 %\*
- (d) 60 %

113. If the booster is placed in bye of the neutral line

- (a) Leakage is maximum
- (b) Zone of recirculation takes place\*
- (c) Fan will damage
- (d) none

114. Compressed air jets increased the air flow by

- (a) 10 %
- (b) 20 %\*
- (c) 30 %
- (d) 40 %

115. Venturi tubes increased the air flow by

- (a) 10 %
- (b) 20 %
- (c) 30 %\*
- (d) 40 %

116. The increase in the quantity of air due to expansion in the up cast shaft can be roughly taken as

- (a) 1 % for every 15 m
- (b) 1 % for every 50 m
- (c) 1 % for every 100 m\*
- (d) 5 % for every 100 m

117. Anemometers are used to measure air velocities between

- (a) 60 - 1000 m/min\*
- (b) 0 - 10 m/min
- (c) 10 -50 m/min
- (d) 50 - 60 m/min

118. The vanes of the anemometers are \_\_\_\_\_ deg to the direction of airflow

- (a) 10-20
- (b) 20-30
- (c) 30-40
- (d) 40-50\*

119. For obtaining good results measurement of quantity flowing through an airway on either side of velocity measuring point the roadway should be uniform in cross section for a length of

- (a) 2 m
- (b) 5 m
- (c) 10 m
- (d) 15 m\*

120. The minimum reading with a velometer can be taken as

- (a) 0.5 m/sec
- (b) 0.05 m/sec\*
- (c) 1 m/sec
- (d) 2 m/sec

121. For measuring air velocities less than 1 m/se(c)——is used

- (a) Anemometer
- (b) Velometer
- (c) Smoke generator\*
- (d) Pitot static tube

122. In smoke generator for measuring air velocity the time taken by the smoke to travel——m is recorded

- (a) 4 - 6 m
- (b) 6 - 8 m
- (c) 8 - 10 m\*
- (d) 10 - 12 m

123. In anemometer the angle of yaw should be

- (a) less than 30 deg
- (b) less than 20 deg
- (c) less than 15 deg

(d) less than 10 deg\*

124. The accuracy obtained in precise traversing is more than

- (a) 5 %
- (b) 5 %
- (c) 3 %
- (d) 2 %\*

125. Air lock doors are required to be arranged where pressure on the door is more than

- (a) 250 pa\*
- (b) less than 250 pa
- (c) more than 500 pa
- (d) less than 500 pa

126. In refrigerant circulation system the refrigerant used is

- (a) Ammonia\*
- (b) Calcium chloride
- (c) Freon-12
- (d) Carbon dioxide

127. Good and harmless refrigerant in the following refrigerants is

- (a) Carbon dioxide
- (b) Methyl chloride
- (c) Freon -12\*
- (d) Ammonia gas

128. Profilometer is used for measuring

- (a) Air velocity
- (b) cross section of irregular shape\*
- (c) Pressure of the air
- (d) % of CH<sub>4</sub>

129. Ammonia should not be used in U/g mines as it forms an explosive mixture with air if present — by volume

- (a) 30 %\*
- (b) 40 %
- (c) 50 %
- (d) 20 %

130. The best extinguisher for fires involved live electrical equipment is

- (a) CO<sub>2</sub> type\*
- (b) Foam type
- (c) Water-CO<sub>2</sub> type
- (d) Soda acid type

131. The best extinguisher for fires due to oil is

- (a) CO<sub>2</sub> type
- (b) Foam type\*
- (c) Water - CO<sub>2</sub> type
- (d) Soda acid type

132. The best extinguisher for gaseous fires is

- (a) Dry powder\*
- (b) CO<sub>2</sub> type
- (c) Foam type
- (d) Water - CO<sub>2</sub> type

133. If a quarry is abandoned the coal and the OB dump should be separated by digging a trench —m wide

- (a) 1 - 2 m
- (b) 3 - 5 m
- (c) 6 - 10 m\*
- (d) 11 - 15 m

134. The coal stock should not exceed at least

- (a) 200 te\*
- (b) 100 te
- (c) 50 te
- (d) 400 te

135. The height of the coal stock should not exceed at least

- (a) 1 to 1.5 m
- (b) 1.5 to 3 m\*
- (c) 3 to 4 m
- (d) 4 to 5 m

136. The ignition temperature of the bituminous coal is

- (a) 500 deg
- (b) 450 deg
- (c) 398 deg
- (d) 200 deg\*

137. The coals are more prone to spontaneous heating if the coal having at least

- (a) 25 % V.M\*
- (b) 15 % V.M
- (c) 40 % V.M
- (d) 50 % V.M

- (c) 10 micron\*
- (d) 100 micron

523. The sound pressure level is measured as  $5 \times 10^{-4} \text{ N/m}^2$ . What is the noise level in dB?

- (a) 27.9\*
- (b) 30.7
- (c) 28.7
- (d) 25.0

524. The noise levels measured during the operation of three machines are 80 dBA, 75 dBA and 85 dBA respectively. Determine the equivalent noise level for the above three machines.

- (a) 86.5\*
- (b) 87.73
- (c) 80.00
- (d) 240.0

525. It is required to find out the day-night equivalent noise levels at a location. The three-hourly day average values in dB are 48, 54, 56, 52, 61 and three-hourly night average values in dB are 36, 42, and 48. What is value of  $L_{dn}$ ?

- (a) 43.9
- (b) 56.9
- (c) 55.7\*
- (d) 45.8

526. What is the center frequency of the band number whose lower and upper bands are 1414 and 2828 Hz respectively?

- (a) 3000 Hz
- (b) 1814 Hz
- (c) 2000 Hz\*
- (d) 1500 Hz

527. What is the center frequency for the one-third ( $1/3$ ) octave band whose lower and upper frequency limits are 7079 and 8913 Hz, respectively?

- (a) 7000 Hz
- (b) 7928 Hz\*
- (c) 8000 Hz
- (d) 7852 Hz

528. What is the sound power level of a sound source radiating energy at a rate of 0.2 W?

- (a) 110 dB
- (b) 112 dB
- (c) 113 dB\*
- (d) 120 dB

529. What is the acoustical power of a 100 HP air compressor whose rated sound power level is 130 dB

- (a) 13 W
- (b) 9 W
- (c) 10 W\*
- (d) 12 W

530. The sound intensity level of a particular mine machine at a radial distance of 10 m is  $2.4 \times 10^{-7} \text{ W/m}^2$ . Determine the sound power level of the noise source in dB. Assume that the sound waves are radiating uniformly in all the directions.

- (a) 84.4 dB\*
- (b) 95.4 dB
- (c) 80.0 dB
- (d) 75.4 dB

531. A small source whose sound power level  $L_w$  is 110 dB is hanging freely outdoors. What is the sound pressure level at 20 m from the source?

- (a) 73 dB\*
- (b) 75 dB
- (c) 77 dB
- (d) 76 dB

532. The noise level at 10 m from a long conveyor belt is 95 dBA. What is the noise level at 100 m?

- (a) 85 dBA\*
- (b) 90 dBA
- (c) 95 dBA
- (d) 80 dBA

533. As per the DGMS norm warning level of noise for the worksite area is

- (a) 85 dBA\*
- (b) 90 dBA
- (c) 95 dBA
- (d) 100 dBA



534. A sample of sewage from a coal mines is found to have a BOD after 5 d ( $BOD_5$ ) of 180 mg/L. Estimate the ultimate BOD ( $BOD_L$ ) of the sewage. Assume that  $k = 0.1$  /d for this waste water.

- (a) 240 mg/ L
- (b) 350 mg/ L
- (c) 400 mg/ L\*
- (d) 450 mg/ L

535. A 6 ml sample of mine water is diluted to 300 mL with distilled water in a standard BOD bottle. The initial DO in the bottle is determined to be 8.5 mg/ L, and the dissolved

- after 5 d at 20 °C is found to be 0.5 mg/ L. Determine the  $BOD_5$  of the mine water.
- (a) 240 mg/ L
- (b) 350 mg/ L
- (c) 400 mg/ L
- (d) 450 mg/ L\*

536. The  $BOD_5$  of an effluent from a coke oven plant is 25 mg/ L, and the effluent discharge is 4 ML/d. The receiving stream has a  $BOD_5$  of 2 mg/L and the stream flow is 40 ML/d. What will be the  $BOD_5$  in the stream just below the mixing zone?

- (a) 4.5
- (b) 5.2
- (c) 4.1\*
- (d) 4.8

537. The value of COD is related to BOD as

- (a)  $COD > BOD^*$
- (b)  $COD = BOD$
- (c)  $COD < BOD$
- (d) There is no relation

538. The permissible value of oil and grease discharge from the mine workshop is

- (a) 10 mg/ L\*
- (b) 20 mg/L
- (c) 25 mg/L
- (d) 15 mg/L

539. The permissible value of BOD in the effluent discharge from a coal mines is

- (a) 120 mg/L
- (b) 240 mg/L
- (c) 150 mg/L

(d) 250 mg/L\*

540. The ultimate BOD value of a waste

- (a) Increases with temperature
- (b) Decreases with temperature
- (c) Remains the same at all temperatures\*
- (d) Doubles with every 10°C rise in temperature

541. When a mine water is disposed off in a river, the rate of depletion of dissolved oxygen of the river mainly depends on

- (a) BOD of the mine water\*
- (b) COD of the mine water
- (c) Total organic carbon present in the mine water
- (d) Dissolved oxygen present in the mine water

542. Which of the following pairs is correctly matched?

- (a)  $BOD/COD = 0$  : Mine water is toxic
- (b)  $BOD/COD \leq 0.2$  : Acclimatization of seed is necessary
- (c)  $BOD/COD \geq 0.6$  : Mine water is non—biodegradable
- (d)  $BOD = COD = 0$  : Mine water is devoid of organic matter\*

543. The correct statement of comparison of ultimate BOD, COD, Theoretical Oxygen Demand and 5-day BOD ( $BOD_5$ ) is

- (a)  $BOD_U > COD > ThOD > BOD_5$
- (b)  $COD > ThOD > BOD_U > BOD_5$
- (c)  $ThOD > COD > BOD_U > BOD_5^*$
- (d)  $COD > BOD_U > BOD_5 > ThOD$

544. Floor illumination at a point directly below a light source in an underground garage of height 4 m is 40 lux. What is the floor illumination in lux at a point 8 m away source from the light?

- (a) 2
- (b) 5\*
- (c) 10
- (d) 20

## QUESTIONS FROM DGMS EXAMS

545. 1 Bar pressure is equivalent to

- (a) 1 kPa
- (b) 10 kPa
- (c) 100 kPa\*
- (d) 1000 kPa (DGMS FCMC/COAL 2015)

546. Choose the correct statement

- (a) Rate of diffusion of gases into air is directly proportional to their densities.
  - (b) Rate of diffusion of gases into air is directly proportional to the square root of their densities.
  - (c) Rate of diffusion of gases into air is inversely proportional to their densities.
  - (d) Rate of diffusion of gases into air is inversely proportional to the square root of their densities\*
- (DGMS FCMC/COAL 2015)

547. Jones - Trickett ration of 0.4 indicates

- (a) No fire\*
- (b) Wood fire
- (c) Coal fire
- (d) Oil fire (DGMS FCMC/COAL 2015)

548. The average concentration of respirable dust in mine atmosphere during each shift, to which person is exposed at any working is shall not exceed \_\_\_\_\_. Where the free silica in air borne dust is \_\_\_\_\_ or less.

- (a) 2 mg/m<sup>3</sup> and 3%
  - (b) 3 mg/m<sup>3</sup> and 5%\*
  - (c) 5 mg/m<sup>3</sup> and 5%
  - (d) 3 mg/m<sup>3</sup> and 3%
- (DGMS FCMC/COAL 2015)

549. Ratio of CO<sub>2</sub> given off to O<sub>2</sub> consumed by the human being is called

- (a) Life quotient
  - (b) Life survival ration
  - (c) Oxidation ration
  - (d) Respiratory quotient\*
- (DGMS FCMC/COAL 2015)

550. When coal is burnt with insufficient supply of oxygen, \_\_\_\_\_ Is formed?

- (a) carbon dioxide
  - (b) carbon peroxide
  - (c) carbon monoxide\*
  - (d) carbon tetroxide
- (DGMS FCMC/COAL 2015)

551. In a ventilating district, wet bulb temperature is found to 32° C, the air velocity should not be less than

- (a) 0.5 m/sec
- (b) 1 m/sec\*
- (c) 45 m/ min
- (d) 75 m/ min (DGMS FCMC/COAL 2015)

552. What is the physiological effect of 0.2% CO inhalation by human?

- (a) Death in 5 min.
  - (b) Palpitation and giddiness
  - (c) Headache and collapse
  - (d) Death in 10 min\*
- (DGMS FCMC/COAL 2015)

553. The period of time that elapses between the application of an ignition source and appearance of the flame is called

- (a) Ignition time
- (b) Incubation period
- (c) Lag on ignition\*
- (d) Fire time (DGMS FCMC/COAL 2015)

554. Gas chromatography separates and analyse components of gas mixture by

- (a) adsorbent
- (b) Molecular species\*
- (c) Boiling water
- (d) Catalyst (DGMS FCMC/COAL 2015)

555. Why nitrogen flushing is done in mines?

- (a) To increase the % of nitrogen
  - (b) Remove CO from sealed off area
  - (c) To reduce the % of oxygen in the area\*
  - (d) To improve ventilation of mine
- (DGMS FCMC/COAL 2015)

556. What is full form of FLP?

- (a) Fast Leakage Process
  - (b) Flameproof\*
  - (c) Fire Leakage Process
  - (d) First Lighting Process
- (DGMS FCMC/COAL 2015)

557. Gravimetric dust sampler is used for

- (a) Measuring gravitational force
- (b) Air sampling
- (c) Removing dust from air

(d) Respirable air borne dust sample\*  
(DGMS FCMC/COAL 2015)

558. Why auxiliary fan is used in underground mine ?

- (a) To increase overall quantity of air in district
  - (b) To improve working condition of the working face\*
  - (c) To decrease resistance in airway
  - (d) To increase overall quantity of air in district and to improve working condition of the working face
- (DGMS FCMC/COAL 2015)

559. Which of the following is not a type of mechanical ventilator?

- (a) Axial-Flow fan
  - (b) Uniaxial fan\*
  - (c) Turbo- axial fan
  - (d) Radial -flow fan
- (DGMS FCMC/COAL 2015)

560. At what scale the Dust Plan is prepared and maintained, at every mine having working belowground ?

- (a) Not less than 1-2500
  - (b) Not less than 1-4000
  - (c) Not less than 1-2400\*
  - (d) Not less than 1-5000
- (DGMS FCMC/COAL 2015)

561. A man while doing hard work, breathes  $60 \times 10^{-3} \text{ m}^3$  of air per minute. Amount of oxygen consumed by him will be:

- (a)  $12.57 \times 10^{-3} \text{ m}^3$ \*
  - (b)  $11.56 \times 10^{-3} \text{ m}^3$
  - (c)  $13.75 \times 10^{-3} \text{ m}^3$
  - (d)  $11.65 \times 10^{-3} \text{ m}^3$
- (DGMS FCMC/COAL 2015)

562. Distance of main mechanical ventilator of the mine from the opening of the shaft or incline at any point, shall be

- (a) less than 10 m
- (b) Not less than 10 m\*
- (c) At the opening of the shaft or incline
- (d) 15 m (DGMS FCMC/COAL 2015)

563. To reopen a mine or part thereof, which has been isolated, sealed off or flooded with water to deal with a fire:

- (a) A prior permission in writing from Chief Inspector is required
- (b) A notice is required to be given, not less than 14 days before the commencement of work\*
- (c) A prior permission in writing from Regional Inspector is required.
- (d) A notice is required to be given, not less than 07 days before the commencement of work (DGMS FCMC/COAL 2015)

564. At what interval examination of rate of emission of inflammable gas in cubic meters per tonne of coal raised shall be done?

- (a) 15 days
- (b) 7 days
- (c) 30 days\*
- (d) 45 days (DGMS FCMC/COAL 2015)

565. If a volume of  $20 \text{ cm}^3$  air sample is analysed with Haldane apparatus, and the volume remained after absorption of  $\text{CO}_2$  is  $18.65 \text{ cm}^3$ . What is the percentage of  $\text{CO}_2$  present in the air sample?

- (a) 5.65%
- (b) 6.55%
- (c) 7.65%
- (d) 6.75%\* (DGMS FCMC/COAL 2015)

566. Which of the following fan testing method is more accurate?

- (a) Field test
  - (b) Rating test\*
  - (c) Air quantity test
  - (d) Efficiency test
- (DGMS FCMC/COAL 2015)

567. For what purpose the Smoke-cloud Generator is used?

- (a) For air quantity survey\*
  - (b) For pressure survey
  - (c) For sending emergency warning
  - (d) To generate electricity
- (DGMS FCMC/COAL 2015)

568. Which is not the advantage of axial flow fan

- (a) Requires less space for installation

1314. If the length of an airway is increased from 100 m to 180 m, how much must the water gauge be increased or decreased to maintain the same velocity. Take the original water gauge to be 60 mm.

- (a) 150 mm
- (b) 125 mm
- (c) 120 mm
- (d) 108 mm\*
- (e) 90 mm

(DGMS FCMC/METAL/UR/DEC-2021)

1315. Respirable dust approximates to that fraction which penetrates to the gas exchange region of the ——— .

- (a) Nose
- (b) Chest
- (c) Throat
- (d) Mouth
- (e) None of the above\*

(DGMS FCMC/METAL/UR/DEC-2021)

Hint: Lungs

1316. Fill in the blanks. : In case of use of diesel equipment's in belowground mines, at least once in every ——— during the diesel equipment's are in normal operation, the atmosphere of the roadways, in which the equipment's are operated, shall be tested for the presence of the noxious and inflammable gases. The tests for noxious gases shall be carried out in the roadways approximately at ——— m above the floor level and ——— m from the diesel equipment exhaust on the return side.

- (a) hour, 1, 2
- (b) four hours, 1, 1.5
- (c) shift, 1.5, 1\*
- (d) day, 1.5, 2
- (e) week, 1.5, 2.5

(DGMS FCMC/METAL/UR/DEC-2021)

1317. If actual vapour density is  $10 \text{ g/m}^3$  at 20 degree centigrade compared to the saturation vapour density at that temperature of  $18 \text{ g/m}^3$ , then the Relative humidity is ——— .

- (a) 50%
- (b) 55.55%\*
- (c) 61.15%

(d) 72.25%

(e) 66.66%

(DGMS FCMC/METAL/UR/DEC-2021)

Hint:  $(10/18) \times 100$

1318. If the quantity of air produced by mine fan has to be increased from 1000  $\text{m}^3/\text{min}$  with power requirement in HP as 'H1' to 2000  $\text{m}^3/\text{min}$  with power requirement in HP as 'H2', then  $H2/H1$  is equal to ——— .

- (a) 4
- (b) 5
- (c) 6
- (d) 7
- (e) 8\*

(DGMS FCMC/METAL/UR/DEC-2021)

1319. Calculate the w.g. produced by 3 m dia fan running at 250 rpm and delivering 6000  $\text{m}^3/\text{min}$  of air, if the blades are radial. Air density =  $1.2 \text{ kg/m}^3$ .

- (a) 172 mm
- (b) 175 mm
- (c) 180 mm
- (d) 189 mm\*
- (e) 198 mm

(DGMS FCMC/METAL/UR/DEC-2021)

Hint: Blade speed =  $\pi DN/60$

$WG = V^2/g$

1320. Determine the useful cooling effect or evaporator duty; if water mass flow rate = 50 kg/s, sp. Heat of water =  $4187 \text{ J/Kg } ^\circ\text{C}$  & temperature drop of water = 10 degree centigrade.

- (a) 2093.5 KW\*
- (b) 3124.5 KW
- (c) 3212.21 kW
- (d) 3244.54 KW
- (e) 3286.95 KW

(DGMS FCMC/METAL/UR/DEC-2021)

1321. Calculate the w.g. , a fan has to develop for ventilating a roadway under the following conditions. (i) cross section= 2.4 m x 3 m. (ii) Length = 100 m (iii) Quantity of air passing = 6  $\text{m}^3/\text{s}$  (iv) coefficient of resistance = 0.00161 mm of wg per  $\text{m}^2$  of rubbing surface per 1 m/s velocity of air.

- (a) 0.677 mm
- (b) 0.477 mm

- (c) 0.377 mm  
(d) 0.277 mm  
(e) 0.167 mm\*  
(DGMS FCMC/METAL/UR/DEC-2021)

1322. At what percentages of Oxygen in mine air a person becomes unconscious within half an hour?

- (a) 19  
(b) 17  
(c) 15  
(d) 13  
(e) None of the above\*  
(DGMS FCMC/METAL/UR/DEC-2021)  
Hint: 10%

1323. A fan is running at 850 rpm and passing air of inlet density of 1.2 kg/m<sup>3</sup> with the shaft power of 440 kW. Assuming that the efficiency remains unchanged, calculate the corresponding new power, if the fan is run at 1275 rpm in air of density 1.1 kg/m<sup>3</sup>.

- (a) 1312.2 Kw  
(b) 1321.2kw  
(c) 1342.3 kw  
(d) 1361.2 kW\*  
(e) 1375.2 kW  
(DGMS FCMC/METAL/UR/DEC-2021)

1324. A mine requires 10 MW of cooling. Calculate the mass flow rate of water involved, if the water is supplied at 3 degree centigrade and returns at 20 degree centigrade. (Sp. Heat of water = 4187 J/Kg °C)

- (a) 132.5 kg/s  
(b) 140.5 kg/s\*  
(c) 144.5 kg/s  
(d) 148 kg/s  
(e) 152.2 kg/s  
(DGMS FCMC/METAL/UR/DEC-2021)

1325. Find the percentage of Blackdamp in a mine air sample having the following analysis (percent by volume). O<sub>2</sub> = 19, N<sub>2</sub> = 79.04, CO<sub>2</sub> = 0.25, CO = 0.02, CH<sub>4</sub> = 1.69. (Atmospheric air entering the mine has O<sub>2</sub> = 20.93, N<sub>2</sub> = 79.04, CO<sub>2</sub> = 0.03).

- (a) 7.13%  
(b) 7.23%  
(c) 7.31%

- (d) 7.51%\*  
(e) 7.79%  
(DGMS FCMC/METAL/UR/DEC-2021)  
 $N_2 = (19/20.93) \times 79.04 = 71.75\%$   
Excess N<sub>2</sub> = 79.04 – 71.75 = 7.29  
 $CO_2 = (19/20.93) \times 0.03 = 0.02$   
Excess CO<sub>2</sub> = 0.25 – 0.02 = 0.23  
Blackdamp = Excess N<sub>2</sub> + excess CO<sub>2</sub>  
= 7.29 + 0.23 = 7.52

1326. In a belowground mine, the temperature increases on an average one degree centigrade for every 70m in depth. If the temperature at a depth of 50 m below earth's surface is 25 degree centigrade, then the probable temperature at a depth of 2000 m, will be ———.

- (a) 78.57 deg centigrade  
(b) 62.85 deg centigrade  
(c) 52.85 deg centigrade\*  
(d) 48.75 deg. Centigrade  
(e) 45.57 deg. Centigrade  
(DGMS FCMC/METAL/UR/DEC-2021)

1327. Consider an airway before it is affected by a fire. Air flows along it at a mass flowrate of M (kg/s) and doing work against friction at a rate of F (J/kg). The airpower dissipated against friction, Pow, is equal to ——— (Watts).

- (a) F<sup>2</sup>M  
(b) F/M  
(c) FM\*  
(d) FM<sup>2</sup>  
(e) 2F/M  
(DGMS FCMC/METAL/UR/DEC-2021)

1328. A cloud of dust of a ——— material behaves similarly to a flammable gas mixed with air in its ability to propagate a flame if in sufficient concentration; in a confined space it can produce an ———

- (a) combustible, explosion\*  
(b) incombustible material, explosion  
(c) toxic, ignition  
(d) flammable, oxidation  
(e) None of the above  
(DGMS FCMC/METAL/UR/DEC-2021)

1329. Calculate the quantity of air flowing down the mine shaft of circular section and



7 m diameter, if the velocity is 600 m/minute.

- (a) 100 m<sup>3</sup>/sec
- (b) 200 m<sup>3</sup>/sec
- (c) 350 m<sup>3</sup>/sec
- (d) 385 m<sup>3</sup>/sec\*
- (e) 415 m<sup>3</sup>/sec

(DGMS FCMC/METAL/UR/DEC-2021)

1330. The dry bulb temperature and wet bulb temperature recorded in a mine D.C. shaft pit bottom is 33 degree centigrade and 30 degree centigrade respectively. Calculate water content of intake air, if the water content of saturated air at normal atmosphere pressure is 35 g/m<sup>3</sup> at 33 degree centigrade.

- (a) 30.5 g/m<sup>3</sup>
- (b) 27.65 g/m<sup>3</sup>\*
- (c) 33.75 g/m<sup>3</sup>
- (d) 26.60 g/m<sup>3</sup>
- (e) 25.55 g/m<sup>3</sup>

(DGMS FCMC/METAL/UR/DEC-2021)

Hint: RH for a diff of 3° = 79% (from RH table)

Water content = 35 x 0.79

1331. If the equivalent resistance of three identical parallel roadways is R. By adding one additional identical roadway in parallel i.e. total four parallel roadways, the resistance becomes \_\_\_\_.

- (a) 1.77R
- (b) 0.177R
- (c) 0.0562R
- (d) 0.5652R
- (e) None of the above\*

(DGMS FCMC/METAL/UR/DEC-2021)

1332. Every auxiliary fan shall be installed, located and worked in such a manner that an air-duct for conducting the air to or from the face or blind end; and such air-duct shall be so maintained as to minimise any leakage of air and to ensure an adequate supply of air to within \_\_\_\_ metres of the \_\_\_\_ or blind end.

- (a) 5, face
- (b) 4.5, face\*
- (c) 5, rest station
- (d) 5, refuge chamber

(e) None of these

(DGMS FCMC/METAL/UR/DEC-2021)

1333. An air sample taken from a return airway yields the following analysis N<sub>2</sub> = 79.22%, O<sub>2</sub> = 20.05%, CO = 18 ppm, Find out Graham's Ratio. (Assumption - Air is supplied with 20.93% O<sub>2</sub> & 79.04 % N<sub>2</sub>.)

- (a) 0.31%
- (b) 0.29%
- (c) 0.25%
- (d) 0.23%
- (e) 0.19%\*

(DGMS FCMC/METAL/UR/DEC-2021)

1334. Dusts are solid particles, ranging in size from below \_\_\_\_ µm up to at least \_\_\_\_ µm, which may be or become airborne, depending on their origin, physical characteristics and ambient conditions.

- (a) 0.1, 10\*
- (b) 1, 100
- (c) 2, 100
- (d) 5, 100
- (e) 10, 100

(DGMS FCMC/METAL/UR/DEC-2021)

1335. A circular shaft which absorbs 150 mm of w.g. is being widened from 4 m to 6 m. What pressure will it take when completed, if the coefficient of friction is constant?

- (a) 15 mm
- (b) 17.5 mm
- (c) 19.75 mm\*
- (d) 21.50 mm
- (e) 100 mm

(DGMS FCMC/METAL/UR/DEC-2021)

1336. The evaporator and condenser of a refrigeration unit have temperature of 5 and 45 degrees centigrade respectively. Determine the Carnot or ideal coefficient of performance of this unit.

- (a) 5.678
- (b) 5.875
- (c) 6.954\*
- (d) 7.225
- (e) 8.224

(DGMS FCMC/METAL/UR/DEC-2021)

1337. Resistance of mine roadway A is  $0.8 \text{ N s}^2/\text{m}^8$ . Resistance of roadway B is  $0.3 \text{ N s}^2/\text{m}^8$ . Find the equivalent resistance, if the roadways A & B are in parallel.

- (a)  $1.1 \text{ N s}^2/\text{m}^8$
- (b)  $0.55 \text{ N s}^2/\text{m}^8$
- (c)  $0.1854 \text{ N s}^2/\text{m}^8$
- (d)  $0.1154 \text{ N s}^2/\text{m}^8$ \*
- (e)  $0.2154 \text{ N s}^2/\text{m}^8$

(DGMS FCMC/METAL/UR/DEC-2021)

1338. The amount of water carried by ventilating air is  $7.62 \text{ g/m}^3$ . If the quantity of air circulating in a mine is  $6000 \text{ m}^3/\text{min}$ , calculate the amount of water carried by ventilating air per day.

- (a) 60.6875 tonnes
- (b) 62.6754 tonnes
- (c) 70.7658 tonnes
- (d) 68.8876 tonnes
- (e) 65.8368 tonnes\*

(DGMS FCMC/METAL/UR/DEC-2021)

1339. A 500m long airway passes  $10 \text{ m}^3$  of air per second. A new airway of the same cross section and similar surface but 250 m long is added in parallel to it. Calculate the total quantity of air passing after addition of new airway? (Consider that the pressure across the airway remain unchanged after addition of the new airway).

- (a)  $24.14 \text{ m}^3/\text{s}$ \*
- (b)  $28.34 \text{ m}^3/\text{min}$
- (c)  $30.12 \text{ m}^3/\text{min}$
- (d)  $32.42 \text{ m}^3/\text{min}$
- (e)  $34.2 \text{ m}^3/\text{min}$

(DGMS FCMC/METAL/UR/DEC-2021)

1340. The density of hydrogen is 1, and of oxygen 16. Thus the relative rates of diffusion of hydrogen and oxygen are that the-

- (a) oxygen will diffuse into hydrogen at 4 times the rate that hydrogen will diffuse into oxygen.
- (b) oxygen will diffuse into hydrogen at 8 times the rate that hydrogen will diffuse into oxygen.
- (c) Hydrogen will diffuse into oxygen at 8 times the rate that oxygen will diffuse into Hydrogen.

(d) Hydrogen will diffuse into oxygen at 4 times the rate that oxygen will diffuse into Hydrogen\*

(e) Hydrogen will diffuse into oxygen at 2 times the rate that oxygen will diffuse into Hydrogen

(DGMS FCMC/METAL/UR/DEC-2021)

## QUESTIONS FROM PSU EXAMS

1341. Calculate the natural ventilating pressure in a mine if, Depth of the mine is 400m, Pitbottom barometer reading is 101 kPa, Pit-top barometer reading is 99.5 kPa, Average temperature in DC shaft is 305 K and Average temperature in UC shaft is 308 K.

- (a) 23.7 Pa
- (b) 55 Pa
- (c) 43.7 Pa\*
- (d) 13.7 Pa (CIL MT 2020)

1342. How can you reduce the resistance developed in a ventilation duct?

- (a) By using a duct having corrugated internal surface
- (b) Using a large diameter duct\*
- (c) By using the duct of very high length
- (d) Increasing the flow of air through the duct (CIL MT 2020)

1343. Which of the Fire Extinguisher can be used for Electrical fires?

- (a) Water type
- (b)  $\text{CO}_2$  type\*
- (c) Foam type
- (d) Automatic (CIL MT 2020)

1344. Burning of methane with a blue flame producing C & D gas. C and D are given by:

- (a)  $\text{CO}_2 + \text{H}_2\text{O}$ \*
- (b)  $\text{CO}_2 + \text{CH}_4$
- (c)  $\text{CO}_2 + \text{CO}$
- (d)  $\text{CO}_2 + \text{N}_2$  (CIL MT 2020)

1345. A district of an underground mine is ventilated by  $40 \text{ m}^3/\text{s}$ . Water gauge across the district is 30 mm. If the quantity has to be reduced to  $25 \text{ m}^3/\text{s}$  by installing a

regulator in the return of the district, calculate the size of the regulator.

- (a) 4.44 m<sup>2</sup>
- (b) 5.1 m<sup>2</sup>
- (c) 3.33 m<sup>2</sup>
- (d) 2.22 m<sup>2</sup>\* (CIL MT 2020)

1346. Black damp contains varying portion of:

- (a) CO<sub>2</sub> + CH<sub>4</sub>
- (b) CO<sub>2</sub> + CO
- (c) CO<sub>2</sub> + H<sub>2</sub>
- (d) CO<sub>2</sub> + N<sub>2</sub>\* (CIL MT 2020)

1347. What type of ventilation is recommended for SDL / LHD?

- (a) 1 m<sup>3</sup>/minute/kW of motor power
- (b) 10 m<sup>3</sup>/minute/kW of motor power
- (c) 15 m<sup>3</sup>/minute/kW of motor power
- (d) 5 m<sup>3</sup>/minute/kW of motor power\* (CIL MT 2020)

1348. As per the Indian law the methane concentration should not exceed "X%" in the return of a ventilation district. X is given by:

- (a) 0.75%\*
- (b) 0.25%
- (c) 1.25%
- (d) 0.45% (CIL MT 2020)

1349. What should be the range of methane air mixture to make it an explosive?

- (a) 10 – 18
- (b) 4.2 – 8.4
- (c) 5.4 – 14.8\*
- (d) 7.4 – 16.6 (CIL MT 2020)

1350. The exhaust of Diesel loco is mixed with fresh air before being discharged into open atmosphere of mine. The minimum quantity of fresh air mixed with the exhaust is "X" times of volume of exhaust. "X" is given by:

- (a) 40\*
- (b) 5
- (c) 20
- (d) 10 (CIL MT 2020)

1351. The quantity of air going down the DC district is 850 m<sup>3</sup>/min. The surface ventilator

develops water gauge of 45 mm when the ventilator is stopped the air going down the shaft is 280 m<sup>3</sup>/min. What is the NVP?

- (a) 5.5 mm of w.g.\*
- (b) 7.5 mm of w.g
- (c) 10 mm of w.g
- (d) 6.5 mm of w.g (CIL MT 2020)

Hint:  $P = RQ^2$

$R = P/Q^2$

$R = [N + 45]/(850/60)^2$   
 $= (N + 45)/200$  (eq. 1)

Also,

$R = [N]/(280/60)^2$   
 $= N/21.8$  (eq. 2)

Solve these equations for N.

1352. Which of the following component is more dangerous to ozone layer?

- (a) Halons\*
- (b) Sulphur
- (c) CFCs
- (d) Nitrogen (CIL MT 2020)

1353. Maximum exposure limit of dust prescribed for 8 hrs. weighted average in Mine.

- (a) 5 mg/m<sup>3</sup>
- (b) 3 mg/m<sup>3</sup>\*
- (c) 7 mg/m<sup>3</sup>
- (d) 10 mg/m<sup>3</sup> (NCL JOM 2018)

1354. Which of the following features should be Shown in water danger plan?

- (a) River, Stream, Water course, Reservoir
- (b) Surface contour lines, dykes, faults
- (c) Highest flood level of the area
- (d) All of above\* (NCL JOM 2018)

1355. The Cap lamp used by the miner is —

- (a) Intrinsically safe
- (b) Flame proof
- (c) None of a & b\*
- (d) Capable to produce spark (NCL JOM 2018)

1356. The earliest indication of spontaneous heating of Coal can be given by

- (a) Make of CO<sub>2</sub>
- (b) Sweating\*
- (c) Temperature rise
- (d) Name of the above (NCL JOM 2018)

1357. The most important parameter of a dust that governs its physiological effect is

- (a) Colour of dust
- (b) Speed of dust
- (c) Size of dust\*
- (d) Smell of dust (NCL JOM 2018)

1358. The Oxygen concentration in underground Mine should not be less than

- (a) 25%
- (b) 21%
- (c) 19%\*
- (d) 15% (NCL JOM 2018)

1359. Geothermal gradient in Indian Coalfields is about

- (a) 1°C/38 m\*
- (b) 10°C/38 m
- (c) 100°C/38 m
- (d) – 1°C/38 m (NCL JOM 2018)

1360. Dust Generation may be reduced by drilling

- (a) With Blunt Bit
- (b) With high speed
- (c) With low speed
- (d) With sharp bit\* (NCL JOM 2018)

1361. Spontaneous combustion of coal is

- (a) Burning of Coal
- (b) Self-heating of Coal\*
- (c) Not related to Coal
- (d) Domestic (NCL JOM 2018)

1362. Installation of booster fan in one district

- (a) Increases the flow of air in other district
- (b) Reduces the flow of air in other district\*
- (c) Reduces the resistance of other district
- (d) None of the above (BCCL JOM 2017)

1363. As per provision of CMR 2017, who shall be responsible for determining the VEQ

- (a) Safety officer
- (b) Overman
- (c) Ventilation officer\*
- (d) Colliery Manager (BCCL JOM 2017)

1364. Permissible limit of respirable concentration of coal dust should not be more than

- (a) 6 mg/m<sup>3</sup>
- (b) 10 mg/m<sup>3</sup>
- (c) 15 mg/m<sup>3</sup>
- (d) 3 mg/m<sup>3</sup>\*

1365. Geothermal gradient in Indian coal fields is about

- (a) 1°C/20 m
- (b) 1°C/92 m
- (c) 1°C/38 m\*
- (d) 1°C/72 m (BCCL JOM 2017)

1366. Which one of the following composition of methane in air is most explosive in nature?

- (a) 8.5% by volume
- (b) 9.5% by volume\*
- (c) 10.5% by volume
- (d) 11.5% by volume (BCCL JOM 2017)

1367. In a mine a big roof fall has taken place in main intake airway. The fan drifts water gauge

- (a) Will remain unaffected
- (b) Will decrease
- (c) Will register an increase\*
- (d) Will increase temporarily only when fall takes place (BCCL JOM 2017)

1368. The camp lamp used by the miners is

- (a) Intrinsically safe
- (b) Flameproof\*
- (c) Neither intrinsically safe nor flame proof
- (d) Capable to produce spark (BCCL JOM 2017)

1369. The purpose of wire gauge in flame safety lamp is

- (a) To disperse the combustion gases uniformly
- (b) To prevent the passage of CH<sub>4</sub> from outside to the inside of the lamp

- (c) To prevent the passage of flame from inside to the outside of the lamp\*  
(d) For proper circulation of air current (BCCL JOM 2017)

1370. Kata thermometer is used to know

- (a) Dry bulb temperature  
(b) Wet bulb temperature  
(c) Heat convection  
(d) Cooling time\* (BCCL JOM 2017)

1371. Fire damp is largely made up of

- (a) CO<sub>2</sub>  
(c) N<sub>2</sub>  
(b) CH<sub>4</sub>\*  
(d) CO (BCCL JOM 2017)

1372. The earliest indication of the spontaneous heating of coal can be given by

- (a) Make of CO<sub>2</sub>  
(b) Sweating of strata\*  
(c) Temperature rise  
(d) None of the above (BCCL JOM 2017)

1373. Under the provisions of CMR 2017, inflammable gas shall be deemed to have been found or detected when it is indicated by methane detector to be — or more in case of a mine having degree two seams.

- (a) 0.5%\*  
(b) 1 %  
(c) 0.75%  
(d) 0.1% (CCL MS 2023)

1374. Which of the following is NOT shown in a water-danger plan and section?

- (a) The highest flood level of the area  
(b) The position of the working belowground and every borehole and shaft  
(c) The position of every dyke, fault and other geological disturbance  
(d) Every point where the quantity of air is measured\* (CCL MS 2023)

1375. To order to detect spontaneous heating in early stages, the air in the return airway of every depillaring district and, of every goaf which has not been isolated, shall be tested for percentage of carbon monoxide once at least in every — with an automatic

detector.

- (a) 14 days  
(b) 3 months  
(c) 21 days  
(d) 7 days\* (CCL MS 2023)

1376. Which of the following precautions is NOT to be adopted in safety lamp-rooms as per the provisions of the CMR 2017?

- (a) Internal relighters shall not be taken out of lamps and cleaned, repaired.  
(b) Adequate number of suitable fire extinguishers shall be provided  
(c) No person shall enter the safety lamp room\*  
(d) No person shall smoke in the room (CCL MS 2023)

1377. AMM stands for:

- (a) Arrested Mine Methane  
(b) Alluvial Micro Methane  
(c) Aerobic Mine Methane  
(d) Abandoned Mine Methane\* (CCL MS 2023)

1378. During the extraction of methane in progress from old boreholes, how much thickness of a coal barrier shall be maintained from the present working in the same seam?

- (a) Not less than 75 m  
(b) Not less than 150 m\*  
(c) Not less than 100 m  
(d) Not less than 50 m (CCL MS 2023)

1379. In every mine in which a mechanical ventilator is used, the quantity of air shall be measured once at least every —.

- (a) 1 month  
(b) 3 months  
(c) 7 days  
(d) 14 days\* (CCL MS 2023)

1380. The number of persons in any rescue team using breathing apparatus in a mine shall

NOT be less than — and not more than — , including the leader.

- (a) 5; 10  
(b) 5; 6\*



- (a) Ear Muff
- (b) Goggle
- (c) Mask\*
- (d) All of the above (NCL MS 2018)

1407. What is permissible limit of CO gas?

- (a) 20 ppm
- (b) 30 ppm
- (c) 40 ppm
- (d) 50 ppm\* (WCL MS 2018)

1408. Humidity measured by which instruments?

- (a) Velometer
- (b) Anemometer
- (c) Hygrometer\*
- (d) Humid meter (WCL MS 2018)

1409. Velocity of air is measured in mines by

- (a) Anemometer
- (b) Velometer
- (c) Hygrometer
- (d) Both A & B\* (WCL MS 2018)

1410. BG 174 is a

- (a) Self-contained breathing apparatus\*
- (b) Open Circuit breathing apparatus
- (c) Gas Mask
- (d) Gas contained breathing apparatus (WCL MS 2018)

1411. By flame safety lamp we test ——

- (a) Percentage Test
- (b) Accumulation Test
- (c) Both A & B\*
- (d) None A & B (WCL MS 2018)

1412. Inflammable gas percentage should not more than in district return\_

- (a) 0.5%
- (b) 0.75%\*
- (c) 1%
- (d) 1.25% (WCL MS 2018)

1413. What is minimum percentage of O<sub>2</sub> should to be present in mines ?

- (a) 17%
- (b) 18%
- (c) 19%\*
- (d) 20.5% (WCL MS 2018)

1414. III<sub>rd</sub> degree mines when the rate of emission of CH<sub>4</sub> is more than per tonne of coal production

- (a) More than 1 M<sup>3</sup>
- (b) More than 1 M<sup>3</sup> but less than 10 M<sup>3</sup>
- (c) More than 10 M<sup>3</sup>\*
- (d) None of the above (WCL MS 2018)

1415. How much air quantity supply to mines is calculated by

- (a) Person employed in mine
- (b) Production of mines
- (c) Both a & b\*
- (d) None of the above (WCL MS 2018)

1416. Spontaneous heating occurs due to

- (a) Fast oxidation of coal
- (b) Slow oxidation of coal\*
- (c) Fire in seam
- (d) Incubation period (WCL MS 2018)

1417. Which type of extinguisher used in electric fire?

- (a) Water CO<sub>2</sub>
- (b) CO<sub>2</sub>\*
- (c) Foam
- (d) Dry powder (WCL MS 2018)

1418. Wet bulb temperature is measured by which instrument

- (a) Whirling Hygrometer\*
- (b) Kata Thermometer
- (c) Planimeter
- (d) Both A & B (WCL MS 2018)

1419. At what temperature wet bulb temperature should not exceed in mine

- (a) 30.5° C
- (b) 33.5° C\*
- (c) 33.0° C
- (d) 32.5° C (WCL MS 2018)

1420. What is the % of inflammable gas in return in a mine

- (a) 0.5%
- (b) 0.75%\*
- (c) 1.25%
- (d) 1.75% (WCL MS 2018)

1421. Cap Lamp is

- (a) Intrinsically safe
- (b) Flame Proof
- (c) Both a & b
- (d) None of these\* (SECL MS 2017)

1422. "Gassy seams of the degree-III" means a coal seam in which the rate of emission of inflammable gas per tonne of coal produced is more than -

- (a) 1 cu.m
- (b) 10 cu.m\*
- (c) 5 cu.m
- (d) None of these (SECL MS 2017)

1423. Which type of stopping is used to block off ventilation between main intake and return?

- (a) Fire Stoppings
- (b) Isolation Stoppings
- (c) Explosion proof stoppings
- (d) Ventilation stoppings\* (SECL MS 2017)

1424. Pneumoconiosis disease is caused due to following:

- (a) Water
- (b) Noise
- (c) Dust\*
- (d) Temperature (SECL MS 2017)

1425. The velocity of air current may be measured by

- (a) Vibrometer
- (b) Methanometer
- (c) Anemometer\*
- (d) Toximeter (SECL MS 2017)

1426. Purpose of wire gauge in Safety Lamp is

- (a) To prevent the passage of flame from the inside to the outside\*
- (b) To have good gas detecting qualities
- (c) To increase mechanical strength and robustness
- (d) To give high illumination (SECL MS 2017)

1427. Gas, not being tested by flame safety lamp

- (a) Methane
- (b) Carbon Dioxide
- (c) Oxygen

(d) Carbon Monoxide\* (SECL MS 2017)

1428. Minimum quantity of air in cubic meter per minute per person in every ventilating district shall be

- (a) 4
- (b) 2.5
- (c) 6\*
- (d) None of these (SECL MS 2017)

1429. In mine plan the intake airway is shown — colour and return airway is shown in — colour

- (a) Red, Green
- (b) Yellow, Blue
- (c) Blue, Red\*
- (d) Blue, Green (SECL MS 2017)

1430. Maximum permissible limit of Carbon monoxide is — ppm in any underground workings

- (a) 10
- (b) 50\*
- (c) 15
- (d) 100 (SECL MS 2017)

1431. The minimum thickness of ventilation stopping between main intake and main return airway is —

- (a) 15 cm
- (b) 25 cm
- (c) 38 cm\*
- (d) 55 cm (SECL MS 2017)

1432. The gases found in a coal seam are Carbon di oxide - 04%, Methane - 0% & Carbon Mono oxide 0.1% then the seam comes to the following category

- (a) Non-gassy
- (b) First degree of gassy\*
- (c) Second degree of gassy
- (d) Third degree of gassy (SECL MS 2017)

1433. Coal Dust explosion occurs if

- (a) Concentration of coal dust is within explosive limit
- (b) There is a proper source of ignition
- (c) Both of the above\*
- (d) None of them (SECL MS 2017)

1434. Spontaneous heating means

- (a) Heating of coal by itself\*
- (b) Heating of coal without oxygen
- (c) Heating of coal at low temperature
- (d) All of the above (SECL MS 2017)

1435. A mine worker inhales normal air whereas the exhaled air contains 16.65% O<sub>2</sub> and 3.83% CO<sub>2</sub>. The respiratory quotient of breathing for the worker is \_\_\_\_.

- (a) 0.56
- (b) 0.66
- (c) 0.89\*
- (d) none of these (GATE 2013)

Hint:  $RQ = \text{CO}_2 \text{ exhaled} / \text{O}_2 \text{ consumed}$

## QUESTIONS FROM GATE EXAMS

1436. In a coal mine district, air flows at a rate of 30 m<sup>3</sup>/s at a pressure of 1200 Pa. The density of air is 1.2 kg/m<sup>3</sup>. The mine management decided to reduce the flow rate of air to 20 m<sup>3</sup>/s using a regulator without changing the ventilation pressure. The area of regulator expressed in m<sup>2</sup> will be

- (a) 0.99\*
- (b) 0.77
- (c) 0.71
- (d) 0.60 (GATE)

1437. A mine fan produces 30 m<sup>3</sup>/s of air at 240 Pa pressure running at 1400 rpm. If the fan speed is increased to 2100 rpm, the pressure in Pa and the quantity in m<sup>3</sup>/s generated by the fan will be

- (a) 540 and 67.5
- (b) 540 and 45.0\*
- (c) 360 and 45.0
- (d) 540 and 30.0 (GATE 2004)

Hint:  $P_1/P_2 = (N_1/N_2)^2$   
and  $P_1/P_2 = (Q_1/Q_2)^2$

1438. The fan drift pressure readings and fan quantities are measured to be 500 Pa and 65 m<sup>3</sup>/s respectively at the time when NVP aids fan pressure. On reversal, the fan delivers a quantity of 50 m<sup>3</sup>/s while acting against NVP with fan drift pressure of 600 Pa. Assuming that the NVP remains constant in both cases the total resistance of the mine in Ns<sup>2</sup>/m<sup>8</sup> will be

- (a) 0.9487
- (b) 0.2750
- (c) 0.4105
- (d) 0.1635\* (GATE 2004)

Hint:  $P = RQ^2$

$$500 + N = R \times 65^2 \quad (1)$$

and

$$600 - N = R \times 50^2 \quad (2)$$

Solve these equations for R.

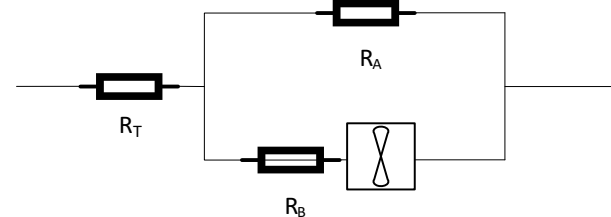
1439. The blade tip speed of a backward bladed centrifugal fan running at 300 rpm delivers 120 m<sup>3</sup>/s of air. If the tip speed of the blade is 47.12 m/s and width of the fan is 1.3 m then the radial velocity of air at the periphery of the impeller in m/s is

- (a) 9.79\*
- (b) 12.73
- (c) 30.79
- (d) 40.22 (GATE 2004)

1440. A main fan of a mine circulates 40 m<sup>3</sup>/s of air at a pressure of 500 Pa. The mine has two splits of equal resistance. The trunk airways have a total resistance of 0.2 Ns<sup>2</sup>/m<sup>8</sup>. When a booster fan is installed in one split, the flow of air in the other splits stops. Assuming that the pressure remains unchanged, the new air quantity flowing through the mine in m<sup>3</sup>/s is

- (a) 20
- (b) 30
- (c) 40\*
- (d) 50 (GATE 2006)

Hint: See the following figure.



Given data  
 $Q = 40 \text{ m}^3/\text{s}$   
 $P_T = 500 \text{ Pa}$   
 $R_{Tr} = 0.2 \text{ Ns}^2/\text{m}^8$   
 $R_A = R_B = R$   
 $Q_T = ?$

When the air quantity through gallery A is zero, the pressure difference between both its ends is also zero. This fact implies that

*total pressure supplied by the main fan is used in overcoming the resistances of the shafts.*

$$P_T = R_T Q_T^2$$

$$500 = 0.2 Q_T^2$$

From this

$$Q_T = 50 \text{ m}^3/\text{s}$$

1441. In ambient air of industrial area, the permissible concentration of suspended particulate matter (PM<sub>10</sub>) measured on 24 hours average in µg/m<sup>3</sup> is

- (a) 200
- (b) 300
- (c) 100\*
- (d) 400 (GATE 2005)

1442. During 24 hours sampling of mass concentration of suspended particulate matter (SPM) by the High Volume Sampler, the following data are obtained:

Air flowing through the filter: 1.7 m<sup>3</sup>/ min

Air flowing through filter at the end of the test: 1.5 m<sup>3</sup>/ min

Mass of the clean filter: 5.0 g

Mass of the filter after 24 hours of exposure: 5.4 g

Assuming the flow rate through the sampler decreases linearly, the average concentration of suspended particulates in µg/m<sup>3</sup> is

- (a) 163.40
- (b) 173.61\*
- (c) 185.18
- (d) 190.20 (GATE 2006)

1443. The noise level measured during the operation of a jackhammer arc given below:

Noise Level, Duration

70 dBA, 30 min

80 dBA, 15 min

85 dBA, 10 min

The equivalent noise level (L<sub>eq</sub>) in dBA calculated from these data is

- (a) 88.50
- (b) 79.55\*
- (c) 71.45
- (d) 69.55 (GATE 2005)

1444. If the measured sound pressure level at a distance of 10 m from a source is 120 dB, the sound pressure level in dB at a

distance of 60 m from the source is (GATE 2006)

- (a) 104.44\*
- (b) 121.55
- (c) 127.78
- (d) 135.56

1445. On a flat terrain noise received from a source 100 m away is 82 dBA. If the receiver is 160 m away from source, what is the noise level in dBA?

- (a) 72
- (b) 65
- (c) 81
- (d) 78\* (GATE)

1446. A jackhammer operates at a corner of a square field of side 50 m. At the diagonally opposite corner, the SPL sensed is 82.3 dB. The SPL at any of the other two corners of the field in dB is

- (a) 86.3
- (b) 85.3\*
- (c) 83.6
- (d) 81.2 (GATE 2007)

1447. An effluent sample is diluted with fresh water to make up a solution of 300 ml. The DO of the solution initially is 8 mg/l and the value falls to 3 mg/l after 5 days. If the 5 day BOD of the original effluent is known to be 50 mg/l, the amount of fresh water added in ml to the solution is

- (a) 270
- (b) 160
- (c) 54
- (d) 30\* (GATE 2007)

1448. The minimum illumination standard at the coal mine pit bottom is

- (a) 1.5 lux\*
- (b) 1.5 lm/ ft<sup>2</sup>
- (c) 0.4 lm/ ft<sup>2</sup>
- (d) 2.4 lux (GATE, 1997)

1449. The concentration of OH<sup>-</sup> ion in a mine water sample is 10<sup>-11</sup> mol/L. The pH of the sample is

- (a) 2
- (b) 3\*
- (c) 4

(d) 11 (GATE 2009)

1450. In an area within a surface mine, under static condition the following gases are found:  $\text{NO}_2$ ,  $\text{CO}_2$ ,  $\text{O}_3$ , and  $\text{SO}_2$ . Assuming no diffusion, reaction and bonding of the gases, the concentration of the gases from bottom upwards will be in the order of

- (a)  $\text{NO}_2$ ,  $\text{CO}_2$ ,  $\text{O}_3$ , and  $\text{SO}_2$
- (b)  $\text{SO}_2$ ,  $\text{NO}_2$ ,  $\text{CO}_2$ , and  $\text{O}_3$
- (c)  $\text{SO}_2$ ,  $\text{O}_3$ ,  $\text{NO}_2$ , and  $\text{CO}_2^*$
- (d)  $\text{NO}_2$ ,  $\text{CO}_2$ ,  $\text{SO}_2$  and  $\text{O}_3$  (GATE 2009)

1451. Electrostatic precipitator works on the principle of

- (a) Capacitance change
- (b) Ionisation of the particles\*
- (c) Electro heating of gases
- (d) Centrifuging the gaseous molecules (GATE 2008)

1452. Precipitation of metallic ions in mine, water drainage is carried out by

- (a)  $\text{CaSO}_4$  and  $\text{MgSO}_4$
- (b)  $\text{CaCO}_3$  and  $\text{MgCO}_3$
- (c)  $\text{Ca}(\text{OH})_2$  and  $\text{NaOH}$
- (d)  $\text{CaCO}_3$  and  $\text{MgSO}_4^*$  (GATE 2008)

1453. For a person working in an atmosphere containing 21 %  $\text{O}_2$ , the exhaled air contains 4.5%  $\text{CO}_2$  and 16%  $\text{O}_2$ . The respiratory quotient of breathing is

- (a) 0.21
- (b) 0.9\*
- (c) 0.28
- (d) 1.11 (GATE 2008)

1454. Mine water flowing at  $1.5 \text{ m}^3/\text{s}$  with 2 mg/l dissolved oxygen, joins river water flowing at  $7 \text{ m}^3/\text{s}$  containing 6 mg/l dissolved oxygen. The dissolved oxygen concentration of the mixture In mg/l is

- (a) 5.3\*
- (b) 4.8
- (c) 4.2.
- (d) 3.9 (GATE 2008)

1455. Mine water flowing at  $1.5 \text{ m}^3/\text{s}$  with 2 mg/l dissolved oxygen, joins river water flowing at  $7 \text{ m}^3/\text{s}$  containing 6 mg/l

dissolved oxygen. The saturated value of the dissolved oxygen in the mixture is given to be 9.3 mg/l. On the basis, the initial oxygen deficit of the mixture in mg/l is

- (a) 2.4
- (b) 4.0\*
- (c) 6.8
- (d) 14.6 (GATE 2008)

1456. A phreatic surface experiences a pressure

- (a) Less than atmospheric pressure
- (b) Equal to atmospheric pressure\*
- (c) More than barometric pressure
- (d) Less than barometric pressure

1457. A gas mask does not include

- (a) Check valve
- (b) Warning device
- (c) Face piece assembly
- (d) Coolant canister\* (GATE 2009)

1458. Air flows at  $2 \text{ m}^3/\text{s}$  through a forcing fan duct of  $0.3 \text{ m}^2$  having uniform cross-section. The duct  $40 \text{ N s}^2/\text{m}^8$  and air density is  $1.2 \text{ kg/m}^3$ . The resistance is total pressure generated by the fan in Pa is

- (a) 186.7\*
- (b) 160.0
- (c) 133.3
- (d) 26.7 (GATE 2009)

1459. A fan running at a speed of 280 rpm circulates  $105 \text{ m}^3/\text{s}$  of air in a mine. If the power input to the motor for driving the fan is recorded to be 75 kW, with the combined efficiency of fan and motor at 70%. the fan pressure in Pa is

- (a) 50
- (b) 350
- (c) 500\*
- (d) 650 (GATE 2009)

Hint: Power = PQ

where P is pressure in Pa, Q is air quantity in  $\text{m}^3/\text{s}$  and power is in Watt.

Given that

Power output =  $0.7 \times 75 = 52.5 \text{ kW} = 52500 \text{ Watt}$

$Q = 105 \text{ m}^3/\text{s}$

Pressure = ?

Now using above formula



52500 = P x 105  
Giving P = 500 Pa

1460. A fan running at a speed of 280 rpm circulates 105 m<sup>3</sup>/s of air in a mine. If the power input to the motor for driving the fan is recorded to be 75 kW, with the combined efficiency of fan and motor at 70%. If the fan pressure is to be increased by 200 Pa by changing the fan speed, the fan speed in rpm will become

- (a) 768
- (b) 549
- (c) 392
- (d) 332\* (GATE 2009)

Hint: Now when pressure is increased by 200 Pa, new pressure is 500 + 200 = 700 Pa. Let us use the following formula

$$P_1/P_2 = (N_1/N_2)^2$$

Putting values

Solving, we get

$$N_2 = 332 \text{ rpm}$$

1461. Moody diagram represents resistance coefficient in terms of

- (a) Reynolds number and asperity ratio\*
- (b) Viscosity and aspect ratio
- (c) Surface tension and viscosity
- (d) Reynolds number and surface tension (GATE 2009)

1462. Effective temperature is estimated from

- (a) Wet-bulb temperature, relative humidity, and air velocity
- (b) Dry-bulb temperature, relative humidity, and air velocity
- (c) Dry-bulb temperature, Wet-bulb temperature, and air velocity\*
- (d) Dry bulb temperature, Wet-bulb temperature, and relative humidity (GATE 2008)

1463. In a mine ventilation system, the resistances of two splits A and B are 0.5 Ns<sup>2</sup>/m<sup>8</sup> and 2 Ns<sup>2</sup>/m<sup>8</sup> respectively. Combined resistance of two shafts and trunk airways is 0.7 Ns<sup>2</sup>/m<sup>8</sup>. A quantity of 20 m<sup>3</sup>/s of air passes through split A. The total air quantity passing the mine in m<sup>3</sup>/s is  
(a) 30\*

- (b) 27
- (c) 25
- (d) 17 (GATE 2008)

1464. In a mine ventilation system, the resistances of two splits A and B are 0.5 Ns<sup>2</sup>/m<sup>8</sup> and 2 Ns<sup>2</sup>/m<sup>8</sup> respectively. Combined resistance of two shafts and trunk airways is 0.7 Ns<sup>2</sup>/m<sup>8</sup>. A quantity of 20 m<sup>3</sup>/s of air passes through split A. The total air power of the ventilation system in kW are

- (a) 82.9
- (b) 48.9
- (c) 24.9\*
- (d) 27.9 (GATE 2008)

Hint: For resistances in parallel, pressure losses will be same but discharge different.

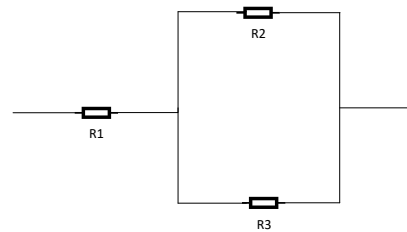
$$R_2 = 0.5 \text{ Ns}^2/\text{m}^8$$

$$R_3 = 2 \text{ Ns}^2/\text{m}^8$$

These two are in parallel.

$$R_1 = 0.7 \text{ Ns}^2/\text{m}^8$$

This one is in series with equivalent of rest of two.



$$\therefore P = R_2 Q_1^2 = R_3 Q_2^2$$

$$0.5 \times 20^2 = 2 \times Q_2^2$$

$$Q_2 = 10 \text{ m}^3/\text{s}$$

$$\text{Total discharge} = Q_1 + Q_2 = 20 + 10 = 30 \text{ m}^3/\text{s}$$

Now,  $R_{eq}$  from parallel resistances

$$1/\sqrt{R_{eq}} = 1/\sqrt{0.5} + 1/\sqrt{2}$$

$$\therefore R_{eq} = 0.22 \text{ Ns}^2/\text{m}^8$$

$$\text{Total resistance} = R_1 + R_{eq} = 0.7 + 0.22 = 0.92 \text{ Ns}^2/\text{m}^8$$

$$\text{Now, Power} = PQ = RQ^3$$

$$= 0.92 \times 30^3$$

$$= 24840 \text{ Watt}$$

$$= 24.84 \text{ k}$$

1465. Intake air containing 0.2% methane enters a section of an underground mine where emission of methane is 0.05 m<sup>3</sup>/s. Assuming that the threshold limit value of