

MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF ASSISTANT CONTROLLER OF MINES UNDER COMMERCE & INDUSTRIES DEPARTMENT GOVERNMENT OF MIZORAM, SEPTEMBER, 2023

PAPER - III (TECHNICAL)

Time Allowed : 3 hours

Full Marks : 200

All questions carry equal marks of 2 each.

Attempt all questions.

- Which gas pollutants cause acid rain in mining and industrial complex areas?
(a) CO_2 and NO_x (b) NO_x and O_3
(c) CO_2 and H_2S (d) SO_x and NO_x
- Hair in human nose can remove air borne dust particulate of size greater than
(a) 10 micron (b) 100 micron
(c) 1000 micron (d) 10000 micron
- In a new coal mining project, the permissible concentration of respirable particulate matter (size less than 10 micron meter) measured on 24 hours average is
(a) $180 \mu\text{g}/\text{m}^3$ (b) $250 \mu\text{g}/\text{m}^3$
(c) $360 \mu\text{g}/\text{m}^3$ (d) $500 \mu\text{g}/\text{m}^3$
- Respirable coal mine dust presents the greatest danger to the _____ human organs.
(a) Windpipe (b) Nose
(c) Lungs (d) Hearts
- The most common instrument used for personal dust sampling is
(a) Personal dust sampler (b) Accelerator dust sampler
(c) Gravimetric dust sampler (d) Porosity dust sampler
- The human respiratory system can defend against respirable dust particle by
(a) Collecting dust in the nose and mouth (b) Collecting dust in the windpipe
(c) Attacking dust particle in the lung (d) All of the above
- CPCB initiated its own national Ambient Air Quality Monitoring (NAAQM) program in which year?
(a) 1982 (b) 1984
(c) 1986 (d) 1988
- Which of the following is responsible for the depletion of the ozone layer in the atmosphere to increase global warming?
(a) CFC emission (b) CH_4 and CO_2 emission
(c) NO_x emission and water vapour (d) All of the above
- What is the minimum level of illumination required to be provided (in Lux) at underground pit bottom in Indian coal mines?
(a) 20 (b) 25
(c) 10 (d) 15

10. The voltage limit shall not exceed _____ for general lighting in underground metal mines.
(a) 250 volts (b) 125 volts
(c) 330 volts (d) 440 volts
11. The manager of every opencast mine shall arrange to conduct illumination survey once at least in every _____ to ensure adequacy of illumination.
(a) Yearly (b) Biannually
(c) Quarterly (d) Monthly
12. The voltage limit shall not exceed _____ for general lighting in opencast coal mines.
(a) 125 volts (b) 250 volts
(c) 440 volts (d) 330 volts
13. Lux is the unit of which physical quantity?
(a) Luminous intensity (b) Illuminance
(c) Luminous flux (d) None of the above
14. Portable hand-lamps are used in underground working of mine and the voltage shall not exceed
(a) 10 Volts (b) 20 Volts
(c) 50 Volts (d) 30 Volts
15. The sound level of Audio Visual Alarm (AVA) should be at least _____ higher than ambient noise level as per the 10th National Safety Conference in Mines, 2007.
(a) 2.0 – 10.0% (b) 4.0 – 6.0%
(c) 5.0 – 20.0% (d) none of the above
16. Permanent loss of hearing occurs at continuous noise exposure of which sound level?
(a) 70 dB(A) (b) 100 dB(A)
(c) 80 dB(A) (d) 60 dB(A)
17. No worker shall be allowed to enter a mining area where the noise level exceeds
(a) 90 dB(A) (b) 115 dB(A)
(c) 140 dB(A) (d) 130 dB(A)
18. Noise standard (warning limit) prescribed for an opencast mine as per DGMS guideline is
(a) 80 dB (b) 85 dB
(c) 75 dB (d) 95 dB
19. Identify the health effects of noise pollution in a mining complex.
(a) Speech interference (b) Hearing loss
(c) Hypertensions (d) All of the above
20. Which of the following is not the post effects of toxic metals released during tailings?
(a) Nutrient absorption (b) Erosion
(c) Contamination (d) Sinkholes
21. Water pollution due to mining is generally caused by
(a) mine drainage (b) mine impoundment
(c) fouling of water sources (d) all of the above
22. Minamata disease is a pollution related disease resulted mainly from
(a) Chromite mining (b) Iron ore mining
(c) Bauxite mining (d) Zinc mining

23. What is the reason of fish dying in an ecological water park which was developed using old abandoned opencast coal mines having high sulphur?
- (a) Heavy oil spillage (b) Acid mine drainage
(c) CO₂ is mixed with large amounts (d) Harmful bacteria/insecticides/microorganisms
24. The biological oxygen demand (BOD) test is made for measuring
- (a) Air pollution (b) Water pollution
(c) Soil pollution (d) All of the above
25. The permissible value of Chemical Oxygen Demand (COD) in the effluent discharge of coal mine as per CPCB standard is
- (a) 120 mg/L (b) 240 mg/L
(c) 150 mg/L (d) 250 mg/L
26. If 'l' be the sloping distance and 'h' be the difference of level between two end points, then slope correction is expressed as
- (a) $h/2l$ (b) $2l/h$
(c) $h^2/2l$ (d) $2l/h^2$
27. Which of the following is the reducing scale
- (a) 1:1 (b) 3:1
(c) 1:3 (d) None of the above
28. Find correction for refraction for a distance of 1200 m
- (a) 0.0106 m (b) 0.0160 m
(c) 0.0016 m (d) 0.1600 m
29. Flying height in aerial photographic surveying refers to
- (a) Upper portion of the exposure station (b) Bottom of the exposure station
(c) Depression of the exposure station (d) Elevation of the exposure station
30. GPS user solution depends on
- (a) Absolute positioning (b) Satellite vehicle
(c) Space vehicle (d) Relative positioning
31. Which of the following type of levelling is necessary across a river ravine or any obstacle requiring a long site between two points?
- (a) Reciprocal levelling (b) Trigonometric levelling
(c) Spirit levelling (d) Barometric levelling
32. The laws of weight are established on the basis of
- (a) Observed equation (b) Normal equation
(c) Least square (d) Probability equation
33. What is the term generally applied to the operation of applying corrections to the latitudes and departures?
- (a) Adjustment (b) Closing error
(c) Traverse error (d) Balancing
34. Sag correction in survey is always
- (a) positive (b) negative
(c) zero (d) depends of ground inclination

35. Which line passes through true north and true south?
(a) True meridian (b) Magnetic meridian
(c) Magnetic north (d) Arbitrary meridian
36. The readings on staves A and B are 1.650 and 1.250 successively, then the level difference between stations is
(a) 1.650 m (b) 1.25 m
(c) 0.40 m (d) 2.90 m
37. The permissible error (E) for precise levelling type with distance (D) in kilometre is given as
(a) $E = 5 \ 0.025 \sqrt{D}$ (b) $E = 5 \ 0.100 \sqrt{D}$
(c) $E = 5 \ 0.005 \sqrt{D}$ (d) $E = 5 \ 0.006 \sqrt{D}$
38. The figure most commonly used in triangulation is a
(a) Quadrilateral with a centre point (b) Quadrilateral with one diagonal
(c) Braced quadrilateral (d) None of the above
39. Permissible error of correlation by wires is
(a) ± 1 minute of arc (b) ± 2 minute of arc
(c) ± 3 minute of Arc (d) ± 5 minute of Arc
40. Which of the following is not a method of levelling
(a) Barometric levelling (b) Trigonometric levelling
(c) Traverse levelling (d) Spirit levelling
41. Variation in scale of photograph can take place due to variation in
(a) Elevation (b) Azimuth
(c) Zenith (d) Datum
42. Weisbach method of correlation is also known as
(a) Direct alignment method (b) Approximate method
(c) Direct traversing method (d) Coplaning method
43. Hypsometry is a method of
(a) Surveying of water bodies
(b) Determining elevations based on atmospheric pressure
(c) Finding temperatures at different heights
(d) Determining elevations based on boiling point of liquids
44. A tachometer differs from an ordinary theodolite in one respect that its diaphragm is fitted with
(a) Two additional vertical hairs (b) Two additional horizontal hairs
(c) Three additional vertical hairs (d) Three additional horizontal hairs
45. The sum of interior angles of a closed traverse must be equal to
(a) $(2N + 4)$ right angles (b) $(2N - 4)$ right angles
(c) $(2N + 4) * 180$ (d) $(2N - 4) * 180$
46. If the track gauge of underground haulage is 0.12 m, radius of curve 4 m, velocity of train is 4 m/sec. What will be the amount of super elevation?
(a) 0.40 (b) 0.04
(c) 4.00 (d) 0.004

47. If the space factor in rope is high, then the strength of rope will be
(a) High (b) Low
(c) No change in the strength (d) None of above
48. Limiting gradient against load for locomotive transport is
(a) 1 in 15 (b) 1 in 16
(c) 1 in 25 (d) 1 in 20
49. The minimum gradient for endless rope haulage is
(a) 1 in 8 (b) 1 in 10
(c) 1 in 6 (d) 1 in 4
50. The minimum angle for gravity haulage is
(a) 14° (b) 15°
(c) 16° (d) 17°
51. Clifton pulley is used for
(a) Direct rope haulage (b) Main and Tail haulage
(c) Gravity haulage (d) Endless rope haulage
52. Method of making rope end suitable for attachment of load termed as
(a) Rope splicing (b) Rope capping
(c) Rope linking (d) Rope plugging
53. Safety device used to prevent the over winding of drums is
(a) Detaching hook (b) Safety catches
(c) Kips (d) None of above
54. The alternate name of koepe winder is:
(a) Drum winder (b) Multirope winder
(c) Friction winder (d) Bi-cylindro winder
55. Winder having different tensions in the ropes of two sides is
(a) Drum winder (b) Koepe winder
(c) Multi rope winder (d) None of the above
56. Width of the conveyor belt varies from
(a) 1 to 2 m (b) 0.6 to 1 m
(c) 2 to 2.5 m (d) Battery locomotive
57. High angle conveyors are designed for steep gradient up to
(a) 50° (b) 60°
(c) 65° (d) 70°
58. The term 'head' is used to measure which energy of the pump?
(a) Mechanical energy (b) Potential energy
(c) Kinetic energy (d) All of above
59. The approximate head generated by a single stage centrifugal pump of 350 mm diameter impeller running at 1540 r. p.m. with monomeric efficiency of 0.6 is
(a) 48.66 m (b) 48.44 m
(c) 48.33 m (d) 48.22 m
60. Affinity law of the pump defines change in
(a) Pump Capacity (b) Pump head
(c) Pump BHP (d) All of above

61. Axial thrust in the turbine pump acts
(a) from suction side to delivery side (b) from delivery side to suction side
(c) perpendicular to the pump shaft (d) in the delivery pipe
62. Squirrel cage motor is mainly used with
(a) endless haulage (b) tail rope haulage
(c) belt conveyor (d) shaker conveyor
63. A conveyor 400 m long moving with a speed of 1.358 m/sec with a gradient of 1 in 50. If the belt width is 0.75 m and cross sectional area of the material is 0.1 m^2 and the bulk density of coal is 0.8 t/m^3 . What is the carrying capacity of the belt speed?
(a) 0.06111 tonnes per sec (b) 0.61111 tonnes per sec
(c) 0.00611 tonnes per sec (d) 0.00061 tonnes per sec
64. If the r. m. s torque for a winder is 150 kNm, the cylindrical winding drum diameter is 6 m and the maximum power required of the motor is 450 Kw. What will be the maximum rope speed?
(a) 7 m/s (b) 8 m/s
(c) 9 m/s (d) 10 m/s
65. The angle between the vertical plane of the pulley and the rope is
(a) angle of draw (b) angle of fleet
(c) angle of repose (d) friction angle
66. Which of the following accessory is not provided in the centrifugal pump?
(a) impeller (b) volute casing
(c) balancing disc (d) foot valve
67. A spur gear system has two gears of 26 and 37 teeth of module 4. What is the centre distance in mm between the driving and driven shaft of the spur gear?
(a) 126 (b) 136
(c) 146 (d) 156
68. The maximum damage to the haulage rope caused by the gradient for direct rope haulage is
(a) fatigue (b) corrosion
(c) wear and tear (d) mine climate
69. Function of pull cord in a belt conveyor is
(a) Cleaning device (b) Safety stopping device
(c) Material discharging on the side of the belt (d) Increasing angle of wrap
70. The suitable gradient for main and tail rope haulage is
(a) 1 in 4 (b) 1 in 5
(c) 1 in 6 (d) 1 in 7
71. Gun powder is made of the following chemical compositions
(a) Sulphur, Charcoal and Ammonium Nitrate (b) Sulphur, Charcoal and Potassium Nitrate
(c) Sulphur, Charcoal and Calcium Nitrate (d) Sulphur, Charcoal and Sulphuric acid
72. P-5 explosives are used for
(a) solid blasting (b) open cast blasting
(c) overburden blasting (d) pre-split blasting
73. 'VOD' is the property of
(a) detonator (b) explosive
(c) electronic detonator (d) cord relay
74. The final density of Site Mixed Emulsion (SME) explosives after gassing generally varies from
(a) 0.85 to 0.95 g/cc (b) 0.95 to 1.10 g/cc
(c) 1.10 to 1.15 g/cc (d) 1.15 to 1.25 g/cc
75. The opening cut in open cast mining is known as
(a) bench cut (b) trench cut
(c) burn cut (d) box cut

76. Which of the blasting technique is used for controlling overbreak to achieve stable final slope?
- (a) Air-decking technique (b) Highwall blasting technique
(c) Buffer blasting technique (d) Deep hole blasting technique
77. The drilling pattern followed in underground coal mine is
- (a) Wedge cut (b) Ring cut
(c) Coromant cut (d) Drag cut
78. What is the full form of PETN?
- (a) Penta ethane tetra nitrate (b) Penta erythritol trinitrate
(c) Penta erythritol tetra nitrate (d) Penta ethane tolluine
79. A delay detonator has a delay element introduced between
- (a) Primer charge and base charge (b) Fuse head and primer charge
(c) Neoprene plug and neoprene sleeve (d) Detonator tube and fuse head
80. When stemming is insufficient, then there is chance of
- (a) over breakage of coal (b) excessive vibration
(c) blown out shot (d) high powder factor
81. Deck loading/charging is very useful when
- (a) strata consists of soft rocks
(b) Strata consists of friable rocks
(c) Strata consists of alternate band of hard and soft rocks
(d) hard and homogenous strata
82. Pop shooting or plaster shooting is a type of
- (a) primary blasting (b) secondary blasting
(c) controlled blasting (d) cushion blasting
83. In delay detonator, one millisecond is equal to
- (a) $1/10^3$ th part of second (b) $1/10^4$ th part of second
(c) $1/10^5$ th part of second (d) $1/10^6$ th part of second
84. In solid blasting practice which of the following type of initiation is preferred?
- (a) direct initiation (b) middle initiation
(c) multiple initiation (d) inverse initiation
85. Which of the following is the oxidizing agent in an explosive?
- (a) nitrolycerin (b) ammonium sulphate
(c) ammonium nitrate (d) magnesium carbonate
86. Which of the following has poor water-resistant property?
- (a) ANFO (b) Slurry explosive
(c) Emulsion Explosive (d) NG based explosives
87. The drilling pattern followed in small drifts is
- (a) Wedge cut (b) Fan cut
(c) Drag cut (d) Burn cut
88. Jack hammer drill machine works on the principle of
- (a) percussion (b) rotary
(c) hammering (d) none of the above
89. Which of the following is treated as base explosive?
- (a) Gun powder (b) Potassium nitrate
(c) NaCL (d) TNT

90. As per the DGMS technical circular 7 of 1997, what is the threshold level of vibration for domestic houses/structures when the frequency is more than 25 Hz?
- (a) mm/s (b) 5 mm/s
(c) 10 mm/s (d) 15 mm/s
91. If the hole diameter and hole depth are 110 mm and 6.0 m respectively. What should be the approximate burden for hard rock strata in bench blasting while maintaining optimum stiffness ratio?
- (a) 1.0 - 1.5 m (b) 2.0 - 2.5 m
(c) 3.0 - 4.0 m (d) 4.0 - 5.0 m
92. Which of the following apparatus is suitable for drilling while approaching water logged underground workings?
- (a) Jack hammer (b) Hand held electric drill
(c) Auger drill (d) Burm side boring
93. How scattering in NONEL delay detonators affects the blasting results?
- (a) Undesired fragmentation (b) Increase induced ground vibration level
(c) May cause flyrock (d) All of the above
94. What are the benefits of inclined drilling for bench blasting?
- (a) Better fragmentation, displacement and swelling of the muck pile
(b) Less probability of misfire caused by cutoff from burden movement
(c) Smoother and sounder slopes in the newly created benches
(d) All of the above
95. Sub-drilling is required for
- (a) to avoid flyrock (b) to avoid toe formation
(c) to avoid ground vibration (d) to avoid airblast
96. If the density of explosive is represented by r_e (kg/m^3) and its detonation velocity VOD (m/s). The detonation pressure (P_d) can be estimated by which formula?
- (a) $P_d = \frac{1}{2} \rho_e (VOD)^2 10^{-6}$ (b) $P_d = \frac{1}{2} \rho_e (VOD)^3 10^{-6}$
(c) $P_d = \frac{1}{2} \rho_e (VOD) 10^{-3}$ (d) $P_d = \frac{1}{3} \rho_e (VOD)^2 10^{-6}$
97. In rock blasting Kuz-Ram model is used for
- (a) ground vibration analysis (b) air overpressure analysis
(c) fragmentation analysis (d) none of the above
98. In USBM prediction model for ground vibration, the scaled distance is the ratio of
- (a) Distance/square root of maximum charge per delay
(b) Maximum charge per delay/distance
(c) Distance/cube root of maximum charge per delay
(d) None of the above
99. The factors which cause blasthole deviation can be
- (a) the structural properties of the rock (b) the chosen bit diameter
(c) the errors in collaring and alignment (d) all of the above
100. Which blasting accessories is used for designing surface firing patterns using detonating fuse?
- (a) short delay electric detonators (b) long delay electric detonators
(c) cord relays (d) Nonel