

MHT CET 2021 Mathematics Memory Based Question Paper PDF

1. Which of the following haloalkanes has the lowest boiling point?
 - (1) CH_3F
 - (2) CH_3Cl
 - (3) CH_3Br
 - (4) CH_3I
2. What is the product formed by the reaction of phenol with concentrated sulphuric acid at room temperature?
 - (1) o-phenol sulphonic acid
 - (2) p-phenol sulphonic acid
 - (3) Benzene sulphonic acid
 - (4) Picric acid
3. Which of the following statements is NOT correct for alkaline earth metals?
 - (1) They are less electropositive than alkali metals.
 - (2) Their carbonates are soluble in water.
 - (3) They form dipositive ions.
 - (4) Their oxides are basic in nature.
4. If $|\vec{a}| = 3$, $|\vec{b}| = 5$ and $|\vec{a} - \vec{b}| = 4$, then $|\vec{a} + \vec{b}|$ is equal to:
 - (1) $\sqrt{52}$
 - (2) $2\sqrt{13}$
 - (3) $\sqrt{82}$
 - (4) 8
5. If p and q have truth values T and r has F, then which of the following compound statements has the truth value F?
 - (1) $(p \vee q) \wedge r$
 - (2) $(p \wedge q) \vee r$
 - (3) $p \rightarrow (q \vee r)$

(4) $r \rightarrow (p \wedge q)$

6. Which of the following is a homopolymer?

- (1) Nylon 6,6
- (2) Buna-S
- (3) Polyethylene
- (4) Dacron

7. Benzoic acid + A $\rightarrow$ Acetophenone. In this reaction, 'A' is:

- (1) Methyl lithium
- (2) Ethanol
- (3) Sodium hydroxide
- (4) Phosphorus pentachloride

8. Which of the following compounds has the lowest ionic character?

- (1) $LiCl$
- (2) $BeCl_2$
- (3) $MgCl_2$
- (4) $CaCl_2$

9. Which of the following liquid pairs shows a positive deviation from Raoult's Law?

- (1) Water and Nitric acid
- (2) Benzene and Methanol
- (3) Acetone and Chloroform
- (4) Phenol and Aniline

10. The derivative of $(\log x)^2$ with respect to $\log x$ is:

- (1) $2\log x$
- (2) $\frac{2\log x}{x}$
- (3) $\frac{2}{x}$
- (4) $x\log x$

11. If $e^{-y} \cdot y = x$, then $\frac{dy}{dx}$ is:

- (1) $\frac{e^y}{1-y}$

(2) $\frac{1}{e^{-y}(1-y)}$

(3) $\frac{e^{-y}}{y-1}$

(4) $\frac{x}{y-1}$

12. Complete hydrolysis of starch yields:

- (1) Fructose
- (2) Glucose
- (3) Maltose
- (4) Sucrose

13. In an LC parallel resonant circuit, the impedance is:

- (1) Minimum
- (2) Maximum
- (3) Zero
- (4) Constant

14. The angular speed of the hour hand of a clock in degrees per second is:

- (1) $1/120$
- (2) $1/60$
- (3) $1/720$
- (4) $1/3600$

15. The value of the integral $\int [\sin(\log x) + \cos(\log x)] dx$ is:

- (1) $x \sin(\log x) + C$
- (2) $x \cos(\log x) + C$
- (3) $\log(\sin x) + C$
- (4) $e^x \sin(\log x) + C$

16. If the truth value of the expression $p \rightarrow (\sim p \vee q)$ is FALSE, then the truth values of p and q are:

- (1) T, T
- (2) T, F
- (3) F, T
- (4) F, F

17. When an electron in a hydrogen atom revolves in a stationary orbit, it is called as:

- (1) Excited state
- (2) Ground state
- (3) Transitions
- (4) Ionized state

18. The resolving power of a telescope increases when:

- (1) Aperture of the objective lens is increased
- (2) Focal length of the objective is decreased
- (3) Wavelength of light used is increased
- (4) Length of the telescope is decreased

19. If the truth value of the expression $p \rightarrow (\sim p \vee q)$ is FALSE, then the truth values of p and q are:

- (1) T, F
- (2) F, T
- (3) T, T
- (4) F, F

20. The area bounded by the curve $y^2 = x$, the line $y = 4$ and the Y-axis is:

- (1) $16/3$
- (2) $64/3$
- (3) 32
- (4) $8/3$

21. Which of the following quantities does NOT change due to damping of oscillations?

- (1) Amplitude
- (2) Time period
- (3) Energy
- (4) Angular frequency

22. Find the new maximum speed of SHM if the amplitude becomes thrice and the frequency is halved:

- (1) $1.5v_{max}$
- (2) $3v_{max}$

- (3) $0.5v_{max}$
(4) $6v_{max}$
- 23.** For a gas at pressure 2 atm, volume changes from 4.5 L to 2.5 L. If internal energy change is requested, what other data is needed?
- (1) Heat supplied (Q)
(2) Temperature
(3) Mass of gas
(4) Specific heat
- 24.** The angular speed of the hour hand of a clock in degrees per second is:
- (1) $1/720$
(2) $1/120$
(3) $1/60$
(4) 6
- 25.** In an LC parallel resonant circuit, the current is:
- (1) Maximum
(2) Minimum
(3) Infinite
(4) In phase with voltage
- 26.** If $x^2 - 4xy + y^2 = 0$ represents lines, and θ, α are angles, find the value of $\cot^2 \theta + \cot^2 \alpha$:
- (1) 2
(2) 4
(3) 1
(4) 6
- 27.** Newton's law of gravitation is applicable for:
- (1) Only point masses
(2) Only planets
(3) All bodies in the universe
(4) Only charged particles

28. Convert -197°C into Kelvin:

- (1) 76.15K
- (2) 470.15K
- (3) 197K
- (4) 0K

29. Which of the following is an amphoteric oxide?

- (1) Na_2O
- (2) SO_2
- (3) Al_2O_3
- (4) CaO

30. The expression involving $\tan A, \tan 2B, \tan 3C$ refers to:

- (1) Conditional identities
- (2) Sum of angles
- (3) Product of slopes
- (4) Area of triangle

31. In an LPP, $x \geq 0, y \geq 0, x + y \leq 5$. The maximum value of $Z = 10x + 25y$ occurs at:

- (1) $(0, 5)$
- (2) $(5, 0)$
- (3) $(2, 3)$
- (4) $(0, 0)$

32. The shortest distance between two lines is given by the formula involving:

- (1) Cross product of direction ratios
- (2) Dot product only
- (3) Scalar triple product
- (4) Modulus of intercepts

33. A plane $\frac{x}{2} + \frac{y}{3} + \frac{z}{4} = 1$ makes intercepts A, B, C on axes. The area of $\triangle ABC$ is:

- (1) $\sqrt{61}$
- (2) $\sqrt{31}$

(3) $\sqrt{15}$

(4) 12

34. Find the vector equation of the plane $2x + 3y - z = 5$:

(1) $\vec{r} \cdot (2\hat{i} + 3\hat{j} - \hat{k}) = 5$

(2) $\vec{r} \cdot (2\hat{i} + 3\hat{j} + \hat{k}) = 5$

(3) $\vec{r} \times (2\hat{i} + 3\hat{j} - \hat{k}) = 5$

(4) $\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 5$

35. If the slope of a line is 2 times the other in $ax^2 + 2hxy + by^2 = 0$, then $\frac{h^2}{ab}$ is:

(1) $9/8$

(2) $8/9$

(3) $1/2$

(4) 2

36. If a polygon has 44 diagonals, then the number of its sides is:

(1) 11

(2) 8

(3) 12

(4) 10

37. The integral $\int \tan^{-1} \left(\sqrt{\frac{1+\sin x}{1-\sin x}} \right) dx$ reduces to:

(1) $\frac{x^2}{4} + \frac{\pi x}{4} + C$

(2) $\frac{x^2}{2} + C$

(3) $\frac{x}{2} + C$

(4) $\log(\cos x) + C$

38. If $x = \frac{1-t^2}{1+t^2}$ and $y = \frac{2at}{1+t^2}$, then $\frac{dy}{dx}$ is:

(1) $-\frac{a(1-t^2)}{2t}$

(2) $\frac{x}{y}$

(3) $-\frac{a^2}{x}$

(4) $-\frac{a}{t}$

39. Find the general solution of $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$:

- (1) $\tan(x + y) = x + C$
- (2) $\log(x + y) = x + C$
- (3) $-\cot(x + y) = x + C$
- (4) $\sin(x + y) = x + C$

40. If the inverse of a matrix does not exist, then its determinant is:

- (1) 1
- (2) 0
- (3) -1
- (4) Infinite

41. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then $|A^{-1}|$ is:

- (1) -2
- (2) $-1/2$
- (3) 2
- (4) $1/2$

42. The value of $\int_0^1 \tan^{-1}\left(\frac{1-2x}{1-x+x^2}\right) dx$ is:

- (1) $\pi/4$
- (2) 0
- (3) 1
- (4) $\pi/2$

43. Given $K = 1/25$ in a probability table, find $P(2 \leq x \leq 5)$:

- (1) $3/25$
- (2) $10/25$
- (3) $4/25$
- (4) $14/25$

44. The standard deviation of a set of 6 numbers is 23.33. If each element is multiplied by 2, the new SD is:

- (1) 23.33
 - (2) 46.66
 - (3) 11.66
 - (4) 544.28
- 45.** 3 coins are tossed. Let X be the difference between heads and tails. Find $P(X = 1)$:
- (1) $1/8$
 - (2) $3/4$
 - (3) $1/2$
 - (4) $3/8$
- 46.** If $E(x) = 18$ and $V(x) = 12$ for a binomial distribution, find n :
- (1) 54
 - (2) 36
 - (3) 48
 - (4) 24
- 47.** A function is continuous at a point if:
- (1) $LHL = RHL$
 - (2) $LHL = f(a)$
 - (3) $RHL = f(a)$
 - (4) $LHL = RHL = f(a)$
- 48.** When using L'Hospital's rule for $\lim_{x \rightarrow 0} \frac{f(x)}{g(x)}$, we differentiate:
- (1) Once
 - (2) Until the indeterminacy is removed
 - (3) Twice always
 - (4) The entire fraction using quotient rule
- 49.** The maximum area of a rectangle that can be inscribed in an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is:
- (1) ab
 - (2) $2ab$
 - (3) $4ab$

(4) πab

50. If $x = 1 + i$, find the value of $x^3 + 7x^2 - x + 16$:

(1) $16 + 14i$

(2) $4 + 12i$

(3) $10 - 6i$

(4) 0

51. A solid sphere and a cylinder have equal Kinetic Energy. The relation between their angular momenta is:

(1) $L_s > L_c$

(2) $L_s < L_c$

(3) $L_s = L_c$

(4) Depends on radii

52. A bob is released 90 degrees from the mean position. The tension T at the mean position is:

(1) mg

(2) 2mg

(3) 3mg

(4) 0

53. Work done in blowing a bubble of radius r is W_1 . If the radius becomes $2r$, the work done W_2 is:

(1) $2W_1$

(2) $4W_1$

(3) $8W_1$

(4) $\sqrt{2}W_1$

54. Water rises to height h in a tube of radius r . The mass of water in a tube of radius $2r$ is:

(1) m

(2) 2m

(3) 4m

(4) m/2

55. If the temperature of the sun is increased 4 times, the radiated energy increases by a factor of:

- (1) 4
- (2) 16
- (3) 64
- (4) 256

56. The average Kinetic Energy of a gas molecule is:

- (1) Directly proportional to T
- (2) Directly proportional to $\sqrt{T}$
- (3) Inversely proportional to T
- (4) Independent of T

57. In an adiabatic process, which of the following is true?

- (1) $\Delta U = -W$
- (2) $\Delta U = Q$
- (3) $Q = W$
- (4) $\Delta U = 0$

58. If P , V , T are given for an ideal gas, the number of moles n is:

- (1) PV/RT
- (2) RT/PV
- (3) PR/VT
- (4) PT/RV

59. The velocity of a particle in SHM at the mean position is:

- (1) Zero
- (2) Minimum
- (3) Maximum
- (4) $\omega^2 A$

60. In a sonometer, 5 antinodes are formed with 9 kg. For 3 antinodes, the mass should be:

- (1) 25 kg
- (2) 15 kg
- (3) 20 kg

- (4) 4 kg
61. A charge Q is placed midway between two charges $+q$. For the system to be in equilibrium, Q must be:
- (1) $-q/4$
 - (2) $-q/2$
 - (3) $+q/4$
 - (4) $+q/2$
62. Kirchhoff's Voltage Law (KVL) is based on the conservation of:
- (1) Charge
 - (2) Energy
 - (3) Momentum
 - (4) Mass
63. In a Wheatstone bridge, if P, Q, R are in three gaps and S_1, S_2 are parallel in the 4th, the balance condition is:
- (1) $P/Q = R(S_1 + S_2)/S_1 S_2$
 - (2) $P/Q = R/S_{parallel}$
 - (3) $P/Q = (S_1 + S_2)/R$
 - (4) $PR = QS$
64. For two concentric circular conductors with radii r_1, r_2 , the ratio of currents i_1/i_2 to have zero magnetic field at center is:
- (1) r_1/r_2
 - (2) r_2/r_1
 - (3) $(r_1/r_2)^2$
 - (4) $\sqrt{r_1/r_2}$
65. If the phase angle $\phi = \pi/4$ and $R = 40\Omega$, the inductive reactance X_L is:
- (1) 40Ω
 - (2) 20Ω
 - (3) $40\sqrt{2}\Omega$
 - (4) 80Ω

66. The de-Broglie wavelength of a photon is:

- (1) h/p
- (2) p/h
- (3) $h\nu/c$
- (4) mc^2

67. The activity of a nuclei is 1000 at $t = 0$ and 600 at $t = 8$. Find activity at $t = 6$:

- (1) 700
- (2) 685
- (3) 750
- (4) 800

68. Which logic gate gives a HIGH output only when its two inputs are different?

- (1) AND
- (2) OR
- (3) XOR
- (4) NAND