

JEE Main

Sample Question Paper - 2022

Country: IN | Duration: 3 hours | Max Marks: 300 | Language: Hindi

Negative Marking: Yes (-1) | Total Questions: 75 | QuizVerse AI Tutor

General Instructions:

1. This paper contains 75 questions across 3 section(s): Physics, Chemistry, Mathematics.
2. Duration: 3 hours. Maximum marks: 300.
3. Negative marking: Yes (-1).
4. Read each question carefully before answering.

Section 1: Physics (25 Questions)

Q1. The electric field at 1 m from a point charge of 10 μC is:

- (A) 2935 N/C
- (B) 4338 N/C
- (C) 6300 N/C
- (D) 5784 N/C

Q2. A solenoid of 145 turns and length 0.1 m carries current 4 A. The magnetic field inside is:

- (A) 16.56 mT
- (B) 1.19 mT
- (C) 17.15 mT
- (D) 9.69 mT

Q3. A convex lens of focal length 16 cm forms a real image of an object placed 22 cm away. The image distance is:

- (A) 25 cm
- (B) 45 cm
- (C) 15 cm
- (D) 51 cm

Q4. A wire of resistance 19 ohm is bent into a circle. Effective resistance between diametrically opposite points is:

- (A) 8 ohm
- (B) 6 ohm
- (C) 8 ohm
- (D) 2 ohm

Q5. A ball is dropped from height 90 m. Its velocity just before hitting the ground is:

- (A) 35.8 m/s
- (B) 32.6 m/s
- (C) 28.3 m/s
- (D) 35.0 m/s

Q6. A radioactive substance has half-life 20 days. The fraction remaining after 14 days is:

- (A) $1/16$
- (B) $1/4$
- (C) $1/16$
- (D) $1/32$

Q7. Light passes from glass ($n=1.6$) to air. The critical angle is:

- (A) 42 degrees
- (B) 42 degrees
- (C) 48 degrees
- (D) 46 degrees

Q8. Two masses 8 kg and 7 kg are connected by a string over a frictionless pulley. The acceleration of the system is:

- (A) 1.16 m/s^2
- (B) 4.13 m/s^2
- (C) 2.54 m/s^2
- (D) 1.73 m/s^2

Q9. The electric field at 3 m from a point charge of 6 μC is:

- (A) 672 N/C
- (B) 8811 N/C
- (C) 7047 N/C
- (D) 1784 N/C

Q10. An ideal gas at 292 K is heated at constant pressure to 489 K. The ratio of final to initial volume is:

- (A) 2.7
- (B) 2.3
- (C) 2.1
- (D) 2.1

Q11. A force of 64 N acts on a 17 kg body initially at rest. The velocity after 4 s is:

- (A) 49 m/s
- (B) 37 m/s
- (C) 26 m/s
- (D) 7 m/s

Q12. The de Broglie wavelength of an electron accelerated through 50 V is approximately:

- (A) 1.17 Angstrom
- (B) 2.55 Angstrom
- (C) 1.32 Angstrom
- (D) 1.07 Angstrom

Q13. The de Broglie wavelength of an electron accelerated through 50 V is approximately:

- (A) 2.14 Angstrom
- (B) 1.53 Angstrom
- (C) 2.64 Angstrom
- (D) 1.20 Angstrom

Q14. In photoelectric effect, the stopping potential for light of wavelength 252 nm on a metal with work function 3.7 eV is:

- (A) 2.45 V
- (B) 3.59 V
- (C) 3.34 V
- (D) 1.49 V

Q15. The focal length of a concave mirror is 21 cm. An object at 25 cm forms image at:

- (A) 15 cm, real inverted
- (B) 34 cm, real inverted
- (C) 53 cm, real inverted
- (D) 47 cm, real inverted

Q16. A radioactive substance has half-life 14 days. The fraction remaining after 54 days is:

- (A) $1/8$
- (B) $1/4$
- (C) $1/4$
- (D) $1/16$

Q17. A car of mass 1593 kg moving at 44 m/s brakes to rest in 9 s. The braking force is:

- (A) 3916 N
- (B) 16867 N
- (C) 15289 N
- (D) 4174 N

Q18. A body of mass 4 kg is moving in a circle of radius 8 m at 19 m/s. The centripetal force is:

- (A) 146 N
- (B) 65 N
- (C) 176 N
- (D) 124 N

Q19. The work function of a metal is 3.3 eV. The threshold frequency is:

- (A) 10.83×10^{14} Hz
- (B) 9.88×10^{14} Hz
- (C) 7.25×10^{14} Hz
- (D) 6.65×10^{14} Hz

Q20. Two capacitors 9 μ F and 9 μ F are connected in series. The equivalent capacitance is:

- (A) 3.34 μ F
- (B) 4.96 μ F
- (C) 1.37 μ F
- (D) 4.38 μ F

Q21. A solenoid of 268 turns and length 0.2 m carries current 10 A. The magnetic field inside is:

- (A) 17.10 mT
- (B) 13.54 mT
- (C) 15.17 mT
- (D) 2.75 mT

Q22. A car of mass 1565 kg moving at 25 m/s brakes to rest in 7 s. The braking force is:

- (A) 15156 N
- (B) 6209 N
- (C) 6477 N
- (D) 17916 N

Q23. A Carnot engine operates between 765 K and 254 K. Its efficiency is:

- (A) 65%
- (B) 30%
- (C) 58%
- (D) 52%

Q24. A Carnot engine operates between 781 K and 324 K. Its efficiency is:

- (A) 28%
- (B) 54%
- (C) 51%
- (D) 60%

Q25. An electron moves with velocity 1×10^6 m/s perpendicular to a magnetic field of 0.2 T. The radius of its path is:

- (A) 3.91 cm
- (B) 1.26 cm
- (C) 1.43 cm
- (D) 1.26 cm

Section 2: Chemistry (25 Questions)

Q26. Which element has the highest electronegativity?

- (A) Fluorine
- (B) Oxygen
- (C) Chlorine
- (D) Nitrogen

Q27. According to Raoult's law, the vapour pressure of a solvent in solution is:

- (A) $p = p_0 / x_{\text{solvent}}$
- (B) $p = RT/V$
- (C) $p = p_0 * x_{\text{solute}}$
- (D) $p = p_0 * x_{\text{solvent}}$

Q28. The shape of XeF_4 is:

- (A) Tetrahedral
- (B) See-saw
- (C) Square planar
- (D) Octahedral

Q29. The hybridization of Ni in $[\text{Ni}(\text{CN})_4]^{2-}$ is:

- (A) d^2sp^3
- (B) dsp^2
- (C) sp^3d
- (D) sp^3

Q30. The van't Hoff factor for NaCl is approximately:

- (A) 2
- (B) 1
- (C) 0.5
- (D) 3

Q31. Hess's law states that:

- (A) Entropy always increases
- (B) Volume is constant
- (C) Rate depends on concentration
- (D) Enthalpy change is path independent

Q32. Gibbs free energy change for a spontaneous process is:

- (A) Positive
- (B) Zero
- (C) Negative
- (D) Undefined

Q33. The equilibrium constant K_p and K_c are related by:

- (A) $K_p = RT \cdot K_c$
- (B) $K_p = K_c$
- (C) $K_p = K_c(RT)^{\Delta n}$
- (D) $K_p = K_c/RT$

Q34. The hybridization of C in acetylene is:

- (A) sp^2
- (B) sp
- (C) sp^3
- (D) sp^3d

Q35. The molar conductivity at infinite dilution can be obtained by:

- (A) Kohlrausch's law
- (B) Faraday's law
- (C) Ohm's law
- (D) Hess's law

Q36. The crystal field splitting energy in octahedral complex is:

- (A) $10Dq_{\text{tet}}$
- (B) Δ_{tet}
- (C) Δ_{sq}
- (D) Δ_{oct}

Q37. VSEPR theory predicts the shape of SF₆ as:

- (A) Tetrahedral
- (B) Square planar
- (C) Octahedral
- (D) Trigonal bipyramidal

Q38. According to Raoult's law, the vapour pressure of a solvent in solution is:

- (A) $p = p_0 \cdot x_{\text{solvent}}$
- (B) $p = p_0 \cdot x_{\text{solute}}$
- (C) $p = p_0 / x_{\text{solvent}}$
- (D) $p = RT/V$

Q39. The lightest noble gas is:

- (A) Krypton
- (B) Argon
- (C) Neon
- (D) Helium

Q40. Which of the following has the highest lattice energy?

- (A) NaCl
- (B) NaI
- (C) NaBr
- (D) NaF

Q41. The reagent for converting aldehyde to carboxylic acid is:

- (A) Zn-Hg / HCl
- (B) KMnO₄ / K₂Cr₂O₇
- (C) LiAlH₄
- (D) NaBH₄

Q42. Which test distinguishes aldehydes from ketones?

- (A) Tollens' test (silver mirror)
- (B) Lassaigne test
- (C) Beilstein test
- (D) Lucas test

Q43. The product of dehydration of ethanol at 443 K is:

- (A) Acetic acid
- (B) Ethylene (C₂H₄)
- (C) Diethyl ether
- (D) Acetaldehyde

Q44. The major product of SN₁ reaction of tert-butyl chloride with ethanol is:

- (A) tert-Butyl ethyl ether
- (B) 2-Methylpropene
- (C) tert-Butanol
- (D) Isobutane

Q45. d-block elements show variable oxidation states because:

- (A) Filled d orbitals
- (B) Close energy of (n-1)d and ns orbitals
- (C) Large atomic size
- (D) Low ionization energy

Q46. The IUPAC name of $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ is:

- (A) Propan-2-ol
- (B) 2-Methylethanol
- (C) Isopropyl ether
- (D) Propan-1-ol

Q47. The rate of reaction doubles when temperature increases by:

- (A) 20 K
- (B) 10 K
- (C) 5 K
- (D) 50 K

Q48. Williamson's synthesis is used to prepare:

- (A) Esters
- (B) Ethers
- (C) Alcohols
- (D) Amines

Q49. The order of ionic radius: Na^+ vs Mg^{2+} vs Al^{3+} is:

- (A) $\text{Mg}^{2+} > \text{Na}^+ > \text{Al}^{3+}$
- (B) $\text{Al}^{3+} > \text{Mg}^{2+} > \text{Na}^+$
- (C) $\text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+}$
- (D) All equal

Q50. For a first-order reaction with $k = 0.074 \text{ s}^{-1}$, the half-life is:

- (A) 13.9 s
- (B) 15.0 s
- (C) 20.0 s
- (D) 10.0 s

Section 3: Mathematics (25 Questions)

Q51. The rank of the matrix $\begin{bmatrix} 1,2,3 \\ 4,5,6 \\ 7,9,13 \end{bmatrix}$ is:

- (A) 1
- (B) 2
- (C) 0
- (D) 3

Q52. If $\det(\mathbf{A}) = 8$ and \mathbf{A} is 3×3 , then $\det(2\mathbf{A}) =$

- (A) 98
- (B) 44
- (C) 77
- (D) 52

Q53. The value of integral $\sin^6(x)$ dx from 0 to $\pi/2$ is:

- (A) $14\pi/16$
- (B) $5\pi/8$
- (C) $9\pi/4$
- (D) $12\pi/8$

Q54. If $\det(A) = 7$ and A is 3×3 , then $\det(2A) =$

- (A) 92
- (B) 71
- (C) 8
- (D) 34

Q55. Integral of $(x^1 + 2)$ dx from 0 to 5 equals:

- (A) 100
- (B) 50
- (C) 28
- (D) 43

Q56. The probability of getting exactly 2 heads in 7 tosses of a fair coin is:

- (A) $23/64$
- (B) $29/128$
- (C) $37/128$
- (D) $7/64$

Q57. If $\det(A) = 10$ and A is 3×3 , then $\det(2A) =$

- (A) 36
- (B) 89
- (C) 36
- (D) 58

Q58. The distance between parallel lines $4x + 3y = 2$ and $3x + 2y = 16$ is:

- (A) 2.95
- (B) 4.33
- (C) 3.17
- (D) 4.36

Q59. The number of ways to arrange 7 distinct objects in a circle is:

- (A) 1166
- (B) 570
- (C) 3909
- (D) 4480

Q60. The mean of a binomial distribution with $n = 43$ and $p = 0.5$ is:

- (A) 39.2
- (B) 20.5
- (C) 37.9
- (D) 26.4

Q61. The sum of first 40 terms of AP with $a = 5$, $d = 1$ is:

- (A) 3958
- (B) 3093
- (C) 3946
- (D) 4410

Q62. The area under $y = x^4$ from $x = 0$ to $x = 5$ is:

- (A) 15.9
- (B) 24.4
- (C) 135.5
- (D) 132.3

Q63. The equation of tangent to $y = x^3$ at $x = 2$ is:

- (A) $y = 11x - 16$
- (B) $y = 9x - 12$
- (C) $y = 3x - 9$
- (D) $y = 2x - 2$

Q64. The mean of a binomial distribution with $n = 41$ and $p = 0.6$ is:

- (A) 25.0
- (B) 3.9
- (C) 25.1
- (D) 15.7

Q65. The probability of getting exactly 4 heads in 5 tosses of a fair coin is:

- (A) $14/32$
- (B) $36/64$
- (C) $43/32$
- (D) $20/256$

Q66. If $z = 1 + 5i$, then $|z| =$

- (A) 9.54
- (B) 5.04
- (C) 9.94
- (D) 2.76

Q67. The derivative of $x^6 \sin(x)$ at $x = \pi$ is:

- (A) -18.08
- (B) -1.45
- (C) -17.63
- (D) 18.32

Q68. The sum of first 22 terms of AP with $a = 1$, $d = 1$ is:

- (A) 1919
- (B) 218
- (C) 4913
- (D) 4744

Q69. The area under $y = x^2$ from $x = 0$ to $x = 4$ is:

- (A) 73.5
- (B) 155.7
- (C) 164.8
- (D) 46.0

Q70. The equation of tangent to $y = x^2$ at $x = 1$ is:

- (A) $y = 8x - 17$
- (B) $y = 8x - 2$
- (C) $y = 8x - 3$
- (D) $y = 3x - 7$

Q71. The derivative of $x^5 \sin(x)$ at $x = \pi$ is:

- (A) -0.65
- (B) -17.43
- (C) 17.80
- (D) 11.55

Q72. The value of integral $\sin^6(x) dx$ from 0 to $\pi/2$ is:

- (A) $6\pi/32$
- (B) $2\pi/16$
- (C) $5\pi/8$
- (D) $8\pi/8$

Q73. The rank of the matrix $[[1,2,3],[4,5,6],[8,10,11]]$ is:

- (A) 2
- (B) 1
- (C) 3
- (D) 0

Q74. The eccentricity of the ellipse $x^2/4 + y^2/6 = 1$ is:

- (A) 0.59
- (B) 0.38
- (C) 0.55
- (D) 0.69

Q75. The distance between parallel lines $4x + 3y = 10$ and $2x + 4y = 12$ is:

- (A) 4.75
- (B) 4.15
- (C) 4.25
- (D) 3.08

Answer Key

Q1: (A)	Q2: (C)	Q3: (C)	Q4: (A)	Q5: (D)
Q6: (D)	Q7: (A)	Q8: (D)	Q9: (A)	Q10: (A)
Q11: (C)	Q12: (D)	Q13: (B)	Q14: (D)	Q15: (D)
Q16: (A)	Q17: (D)	Q18: (A)	Q19: (B)	Q20: (D)
Q21: (D)	Q22: (D)	Q23: (D)	Q24: (A)	Q25: (B)
Q26: (A)	Q27: (D)	Q28: (C)	Q29: (B)	Q30: (A)
Q31: (D)	Q32: (C)	Q33: (C)	Q34: (B)	Q35: (A)
Q36: (D)	Q37: (C)	Q38: (A)	Q39: (D)	Q40: (D)
Q41: (B)	Q42: (A)	Q43: (B)	Q44: (A)	Q45: (B)
Q46: (A)	Q47: (B)	Q48: (B)	Q49: (C)	Q50: (A)
Q51: (B)	Q52: (D)	Q53: (B)	Q54: (C)	Q55: (C)
Q56: (A)	Q57: (A)	Q58: (D)	Q59: (A)	Q60: (C)
Q61: (C)	Q62: (A)	Q63: (B)	Q64: (C)	Q65: (D)
Q66: (A)	Q67: (D)	Q68: (C)	Q69: (C)	Q70: (B)
Q71: (A)	Q72: (A)	Q73: (A)	Q74: (C)	Q75: (C)

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