

# JEE Main

## Sample Question Paper - 2025

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

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

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### 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 binding energy per nucleon of Fe-56 is approximately:**

- (A) 6.5 MeV
- (B) 7.6 MeV
- (C) 9.2 MeV
- (D) 8.8 MeV

**Q2. The current through a 11 ohm resistor connected to a 12 V battery is:**

- (A) 2.22 A
- (B) 2.81 A
- (C) 2.51 A
- (D) 2.50 A

**Q3. Two masses 8 kg and 7 kg are connected by a string over a frictionless pulley. The acceleration of the system is:**

- (A)  $1.73 \text{ m/s}^2$
- (B)  $4.13 \text{ m/s}^2$
- (C)  $1.16 \text{ m/s}^2$
- (D)  $2.54 \text{ m/s}^2$

**Q4. The escape velocity from a planet of mass  $3 \times 10^{24} \text{ kg}$  and radius 6004 km is:**

- (A) 12.6 km/s
- (B) 9.6 km/s
- (C) 14.0 km/s
- (D) 9.1 km/s

**Q5. The work function of a metal is 1.6 eV. The threshold frequency is:**

- (A)  $9.14 \times 10^{14} \text{ Hz}$
- (B)  $10.62 \times 10^{14} \text{ Hz}$
- (C)  $3.11 \times 10^{14} \text{ Hz}$
- (D)  $11.96 \times 10^{14} \text{ Hz}$

**Q6. A convex lens of focal length 18 cm forms a real image of an object placed 46 cm away. The image distance is:**

- (A) 34 cm
- (B) 19 cm
- (C) 25 cm
- (D) 35 cm

**Q7. The work function of a metal is 3.3 eV. The threshold frequency is:**

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

**Q8. A wire of resistance 11 ohm is bent into a circle. Effective resistance between diametrically opposite points is:**

- (A) 2 ohm
- (B) 4 ohm
- (C) 3 ohm
- (D) 7 ohm

**Q9. A radioactive substance has half-life 14 days. The fraction remaining after 54 days is:**

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

**Q10. A convex lens of focal length 16 cm forms a real image of an object placed 22 cm away. The image distance is:**

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

**Q11. A body of mass 4 kg is moving in a circle of radius 8 m at 19 m/s. The centripetal force is:**

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

**Q12. Two capacitors 9  $\mu$ F and 8  $\mu$ F are connected in series. The equivalent capacitance is:**

- (A) 4.24  $\mu$ F
- (B) 2.76  $\mu$ F
- (C) 3.56  $\mu$ F
- (D) 2.11  $\mu$ F

**Q13. A Carnot engine operates between 781 K and 324 K. Its efficiency is:**

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

**Q14. The focal length of a concave mirror is 21 cm. An object at 25 cm forms image at:**

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

**Q15. A wire of resistance 19 ohm is bent into a circle. Effective resistance between diametrically opposite points is:**

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

**Q16. A ball is dropped from height 90 m. Its velocity just before hitting the ground is:**

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

**Q17. Two capacitors 9  $\mu$ F and 9  $\mu$ F are connected in series. The equivalent capacitance is:**

- (A) 1.37  $\mu$ F
- (B) 4.96  $\mu$ F
- (C) 3.34  $\mu$ F
- (D) 4.38  $\mu$ F

**Q18. 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) 17916 N
- (C) 6477 N
- (D) 6209 N

**Q19. A projectile is launched at 45 degrees with initial velocity 36 m/s. The time of flight is approximately:**

- (A) 2.5 s
- (B) 4.3 s
- (C) 2.4 s
- (D) 1.6 s

**Q20. 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) 4174 N
- (D) 15289 N

**Q21. The focal length of a concave mirror is 17 cm. An object at 30 cm forms image at:**

- (A) 17 cm, real inverted
- (B) 43 cm, real inverted
- (C) 32 cm, real inverted
- (D) 23 cm, real inverted

**Q22. The escape velocity from a planet of mass  $4 \times 10^{24}$  kg and radius 7718 km is:**

- (A) 13.2 km/s
- (B) 14.0 km/s
- (C) 8.9 km/s
- (D) 9.0 km/s

**Q23. An ideal gas at 292 K is heated at constant pressure to 489 K. The ratio of final to initial volume is:**

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

**Q24. A spring with  $k = 494$  N/m is compressed by 0.17 m. The stored PE is:**

- (A) 18.25 J
- (B) 20.63 J
- (C) 16.40 J
- (D) 22.76 J

**Q25. The focal length of a concave mirror is 12 cm. An object at 46 cm forms image at:**

- (A) 26 cm, real inverted
- (B) 35 cm, real inverted
- (C) 49 cm, real inverted
- (D) 32 cm, real inverted

## Section 2: Chemistry (25 Questions)

**Q26. The pH of a 0.01 M HCl solution is:**

- (A) 4
- (B) 2
- (C) 3
- (D) 1

**Q27. Colligative properties depend on:**

- (A) Molar mass of solute
- (B) Nature of solvent
- (C) Nature of solute
- (D) Number of solute particles

**Q28. Lanthanide contraction is caused by:**

- (A) High ionization energy
- (B) Electron capture
- (C) Nuclear fusion
- (D) Poor shielding by 4f electrons

**Q29. The order of ionic radius:  $\text{Na}^+$  vs  $\text{Mg}^{2+}$  vs  $\text{Al}^{3+}$  is:**

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

**Q30. Markovnikov's rule applies to the addition of HBr to:**

- (A) Benzene
- (B) Methane
- (C) Ethene
- (D) Propene

**Q31. The hybridization of Ni in  $[\text{Ni}(\text{CN})_4]^{2-}$  is:**

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

**Q32. The van't Hoff factor for NaCl is approximately:**

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

**Q33. Which of the following has the highest lattice energy?**

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

**Q34. Perkin reaction produces:**

- (A) Ethers
- (B) Amines
- (C) Alcohols
- (D) Alpha,beta-unsaturated acids

**Q35. Hess's law states that:**

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

**Q36. VSEPR theory predicts the shape of  $\text{SF}_6$  as:**

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

**Q37. Which metal is extracted by thermite process?**

- (A) Chromium
- (B) Iron
- (C) Aluminium
- (D) Sodium

**Q38. The equilibrium constant  $K_p$  and  $K_c$  are related by:**

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

**Q39. The crystal field splitting energy in octahedral complex is:**

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

**Q40. The shape of  $XeF_4$  is:**

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

**Q41. For a first-order reaction with  $k = 0.074 \text{ s}^{-1}$ , the half-life is:**

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

**Q42. The reagent for converting aldehyde to carboxylic acid is:**

- (A)  $LiAlH_4$
- (B)  $NaBH_4$
- (C) Zn-Hg / HCl
- (D)  $KMnO_4 / K_2Cr_2O_7$

**Q43. Which element has the highest electronegativity?**

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

**Q44. Which element has the highest electronegativity?**

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

**Q45. Gibbs free energy change for a spontaneous process is:**

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

**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 colour of  $\text{KMnO}_4$  is due to:**

- (A) f-f transition
- (B) d-d transition
- (C) s-p transition
- (D) Charge transfer transition

**Q48. The hybridization of C in acetylene is:**

- (A)  $\text{sp}^3$
- (B)  $\text{sp}^2$
- (C)  $\text{sp}^3\text{d}$
- (D)  $\text{sp}$

**Q49. Which test distinguishes aldehydes from ketones?**

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

**Q50. d-block elements show variable oxidation states because:**

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

### Section 3: Mathematics (25 Questions)

**Q51. Integral of  $(x^3 + 1) dx$  from 0 to 1 equals:**

- (A) 23
- (B) 99
- (C) 33
- (D) 8

**Q52. The mean of a binomial distribution with  $n = 43$  and  $p = 0.5$  is:**

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

**Q53. The rank of the matrix  $[[1,2,3],[4,5,6],[8,10,11]]$  is:**

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

**Q54. Integral of  $(x^1 + 6)$  dx from 0 to 5 equals:**

- (A) 65
- (B) 63
- (C) 81
- (D) 75

**Q55.  $\lim_{x \rightarrow 0} \sin(5x)/x =$**

- (A) 1
- (B) 6
- (C) 3
- (D) 3

**Q56. The value of integral  $\sin^6(x)$  dx from 0 to  $\pi/2$  is:**

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

**Q57. The number of ways to arrange 5 distinct objects in a circle is:**

- (A) 833
- (B) 2295
- (C) 410
- (D) 297

**Q58. The equation of tangent to  $y = x^3$  at  $x = 2$  is:**

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

**Q59. The distance between parallel lines  $5x + 2y = 6$  and  $2x + 4y = 18$  is:**

- (A) 4.16
- (B) 2.11
- (C) 0.57
- (D) 2.76

**Q60. The area under  $y = x^3$  from  $x = 0$  to  $x = 2$  is:**

- (A) 73.8
- (B) 27.6
- (C) 170.4
- (D) 76.4

**Q61. The mean of a binomial distribution with  $n = 41$  and  $p = 0.6$  is:**

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

**Q62. The sum of first 22 terms of AP with  $a = 3$ ,  $d = 4$  is:**

- (A) 3114
- (B) 3166
- (C) 2203
- (D) 2828

**Q63. The derivative of  $x^6 \sin(x)$  at  $x = \pi$  is:**

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

**Q64. The value of integral  $\sin^6(x) dx$  from 0 to  $\pi/2$  is:**

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

**Q65. The distance between parallel lines  $4x + 3y = 2$  and  $3x + 2y = 16$  is:**

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

**Q66. Integral of  $(x^4 + 8) dx$  from 0 to 2 equals:**

- (A) 48
- (B) 97
- (C) 18
- (D) 59

**Q67. The derivative of  $x^2 \sin(x)$  at  $x = \pi$  is:**

- (A) -10.70
- (B) 16.30
- (C) 5.37
- (D) 11.37

**Q68. The number of ways to arrange 3 distinct objects in a circle is:**

- (A) 2236
- (B) 1188
- (C) 4624
- (D) 621

**Q69.  $\lim_{x \rightarrow 0} \sin(4x)/x =$**

- (A) 1
- (B) 4
- (C) 1
- (D) 6

**Q70. If  $\det(A) = 10$  and  $A$  is  $3 \times 3$ , then  $\det(2A) =$**

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

**Q71. The area under  $y = x^2$  from  $x = 0$  to  $x = 4$  is:**

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

**Q72. The sum of first 40 terms of AP with  $a = 5$ ,  $d = 1$  is:**

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

**Q73. The probability of getting exactly 2 heads in 7 tosses of a fair coin is:**

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

**Q74. If  $\det(A) = 7$  and  $A$  is  $3 \times 3$ , then  $\det(2A) =$**

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

**Q75. The area under  $y = x^4$  from  $x = 0$  to  $x = 5$  is:**

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

# Answer Key

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

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