

# JEE Advanced

## Sample Question Paper - 2024

Country: IN | Duration: 3 hours/paper | Max Marks: 180 | Language: English

Negative Marking: Yes (-1 or -2) | Total Questions: 54 | QuizVerse AI Tutor

### General Instructions:

1. This paper contains 54 questions across 3 section(s): Physics, Chemistry, Mathematics.
2. Duration: 3 hours/paper. Maximum marks: 180.
3. Negative marking: Yes (-1 or -2).
4. Read each question carefully before answering.

### Section 1: Physics (18 Questions)

**Q1. The focal length of a concave mirror is 21 cm. An object at 25 cm forms image at:**

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

**Q2. A wire of resistance 11 ohm is bent into a circle. Effective resistance between diametrically opposite points is:**

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

**Q3. The binding energy per nucleon of Fe-56 is approximately:**

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

**Q4. A radioactive substance has half-life 20 days. The fraction remaining after 14 days is:**

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

**Q5. A convex lens of focal length 16 cm forms a real image of an object placed 22 cm away. The image distance is:**

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

**Q6. A body of mass 4 kg is moving in a circle of radius 8 m at 19 m/s. The centripetal force is:**

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

**Q7. A radioactive substance has half-life 14 days. The fraction remaining after 54 days is:**

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

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

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

**Q9. Light passes from glass ( $n=1.6$ ) to air. The critical angle is:**

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

**Q10. A solenoid of 268 turns and length 0.2 m carries current 10 A. The magnetic field inside is:**

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

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

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

**Q12. An electron moves with velocity  $1 \times 10^6 \text{ m/s}$  perpendicular to a magnetic field of 0.2 T. The radius of its path is:**

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

**Q13. A Carnot engine operates between 765 K and 254 K. Its efficiency is:**

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

**Q14. A convex lens of focal length 18 cm forms a real image of an object placed 46 cm away. The image distance is:**

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

**Q15. In photoelectric effect, the stopping potential for light of wavelength 260 nm on a metal with work function 2.9 eV is:**

- (A) 0.69 V
- (B) 2.94 V
- (C) 2.43 V
- (D) 3.39 V

**Q16. The binding energy per nucleon of Fe-56 is approximately:**

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

**Q17. A block of mass 8 kg slides down a frictionless incline of angle 45 degrees. The acceleration is:**

- (A) 5.1 m/s<sup>2</sup>
- (B) 3.8 m/s<sup>2</sup>
- (C) 3.1 m/s<sup>2</sup>
- (D) 4.3 m/s<sup>2</sup>

**Q18. The current through a 26 ohm resistor connected to a 15 V battery is:**

- (A) 2.36 A
- (B) 1.89 A
- (C) 2.83 A
- (D) 0.50 A

## Section 2: Chemistry (18 Questions)

**Q19. The reagent for converting aldehyde to carboxylic acid is:**

- (A) NaBH<sub>4</sub>
- (B) Zn-Hg / HCl
- (C) LiAlH<sub>4</sub>
- (D) KMnO<sub>4</sub> / K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>

**Q20. For an endothermic reaction, increasing temperature:**

- (A) Decreases equilibrium constant
- (B) Decreases rate
- (C) No effect
- (D) Increases equilibrium constant

**Q21. Which reagent is used for Baeyer-Villiger oxidation?**

- (A)  $\text{LiAlH}_4$
- (B)  $\text{NaBH}_4$
- (C)  $\text{KMnO}_4$
- (D) mCPBA / peracid

**Q22. Friedel-Crafts acylation uses which catalyst?**

- (A)  $\text{FeCl}_3$
- (B)  $\text{ZnCl}_2$
- (C)  $\text{AlCl}_3$
- (D)  $\text{CuCl}_2$

**Q23. The IUPAC name of  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$  is:**

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

**Q24. Hess's law states that:**

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

**Q25. Kolbe's electrolysis of sodium acetate gives:**

- (A) Ethane
- (B) Methane
- (C) Propane
- (D) Butane

**Q26. The order of ionic radius:  $\text{Na}^+$  vs  $\text{Mg}^{2+}$  vs  $\text{Al}^{3+}$  is:**

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

**Q27. Which test distinguishes aldehydes from ketones?**

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

**Q28. The coordination number in BCC is:**

- (A) 4
- (B) 6
- (C) 12
- (D) 8

**Q29. The rate of reaction doubles when temperature increases by:**

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

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

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

**Q31. For an ideal gas,  $C_p - C_v$  equals:**

- (A) 0
- (B)  $R/2$
- (C)  $2R$
- (D)  $R$  (8.314 J/mol K)

**Q32. The molar conductivity at infinite dilution can be obtained by:**

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

**Q33. The pH of a 0.01 M HCl solution is:**

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

**Q34. d-block elements show variable oxidation states because:**

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

**Q35. Which element has the highest electronegativity?**

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

**Q36. The magnetic moment of  $Fe^{2+}$  ( $d^6$ ) in weak field is:**

- (A) 0 BM
- (B) 4.9 BM (4 unpaired)
- (C) 5.9 BM
- (D) 2.83 BM

### Section 3: Mathematics (18 Questions)

**Q37.**  $\lim_{x \rightarrow 0} \sin(2x)/x =$

- (A) 6
- (B) 5
- (C) 1
- (D) 5

**Q38.** The rank of the matrix  $\begin{bmatrix} 1,2,3 \\ 4,5,6 \\ 8,9,10 \end{bmatrix}$  is:

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

**Q39.** The sum of first 22 terms of AP with  $a = 1$ ,  $d = 1$  is:

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

**Q40.** The value of integral  $\sin^6(x) dx$  from 0 to  $\pi/2$  is:

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

**Q41.** If  $z = 1 + 5i$ , then  $|z| =$

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

**Q42.** The area under  $y = x^3$  from  $x = 0$  to  $x = 2$  is:

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

**Q43.** If  $z = 2 + 1i$ , then  $|z| =$

- (A) 4.05
- (B) 9.14
- (C) 7.42
- (D) 3.82

**Q44.** The derivative of  $x^5 \sin(x)$  at  $x = \pi$  is:

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

**Q45. The area under  $y = x^2$  from  $x = 0$  to  $x = 2$  is:**

- (A) 73.2
- (B) 73.1
- (C) 77.9
- (D) 113.7

**Q46. If  $\det(A) = 10$  and  $A$  is  $3 \times 3$ , then  $\det(2A) =$**

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

**Q47. The equation of tangent to  $y = x^3$  at  $x = 2$  is:**

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

**Q48. The number of ways to arrange 7 distinct objects in a circle is:**

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

**Q49. The distance between parallel lines  $5x + 2y = 6$  and  $2x + 4y = 18$  is:**

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

**Q50.  $\lim_{x \rightarrow 0} \sin(6x)/x =$**

- (A) 7
- (B) 2
- (C) 2
- (D) 5

**Q51. The probability of getting exactly 4 heads in 5 tosses of a fair coin is:**

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

**Q52. The equation of tangent to  $y = x^4$  at  $x = 3$  is:**

- (A)  $y = 10x - 6$
- (B)  $y = 5x - 19$
- (C)  $y = 2x - 14$
- (D)  $y = 8x - 5$

**Q53. The derivative of  $x^3 \sin(x)$  at  $x = \pi$  is:**

- (A) -10.50
- (B) -18.89
- (C) -6.35
- (D) 15.80

**Q54. Integral of  $(x^3 + 1) dx$  from 0 to 1 equals:**

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

# Answer Key

Q1: (C)	Q2: (B)	Q3: (A)	Q4: (C)	Q5: (A)
Q6: (C)	Q7: (B)	Q8: (A)	Q9: (B)	Q10: (A)
Q11: (B)	Q12: (B)	Q13: (A)	Q14: (C)	Q15: (D)
Q16: (A)	Q17: (B)	Q18: (A)	Q19: (D)	Q20: (D)
Q21: (D)	Q22: (C)	Q23: (C)	Q24: (D)	Q25: (A)
Q26: (B)	Q27: (B)	Q28: (D)	Q29: (A)	Q30: (C)
Q31: (D)	Q32: (D)	Q33: (A)	Q34: (B)	Q35: (D)
Q36: (B)	Q37: (A)	Q38: (D)	Q39: (B)	Q40: (A)
Q41: (D)	Q42: (A)	Q43: (D)	Q44: (D)	Q45: (A)
Q46: (B)	Q47: (D)	Q48: (B)	Q49: (C)	Q50: (B)
Q51: (A)	Q52: (C)	Q53: (A)	Q54: (B)	

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