

JEE Advanced

Sample Question Paper - 2023

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

Q2. A wire of resistance 19 ohm is bent into a circle. Effective resistance between diametrically opposite points is:

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

Q3. The de Broglie wavelength of an electron accelerated through 50 V is approximately:

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

Q4. The binding energy per nucleon of Fe-56 is approximately:

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

Q5. 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) 2.1
- (C) 2.1
- (D) 2.3

Q6. The focal length of a concave mirror is 12 cm. An object at 46 cm forms image at:

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

Q7. Two capacitors 9 μF and 9 μF are connected in series. The equivalent capacitance is:

- (A) 4.96 μF
- (B) 4.38 μF
- (C) 3.34 μF
- (D) 1.37 μF

Q8. A force of 64 N acts on a 17 kg body initially at rest. The velocity after 4 s is:

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

Q9. A spring with $k = 494 \text{ N/m}$ is compressed by 0.17 m. The stored PE is:

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

Q10. The focal length of a concave mirror is 21 cm. An object at 25 cm forms image at:

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

Q11. The escape velocity from a planet of mass $4 \times 10^{24} \text{ kg}$ and radius 7718 km is:

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

Q12. A solenoid of 145 turns and length 0.1 m carries current 4 A. The magnetic field inside is:

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

Q13. The focal length of a concave mirror is 17 cm. An object at 30 cm forms image at:

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

Q14. A radioactive substance has half-life 20 days. The fraction remaining after 14 days is:

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

Q15. A solenoid of 268 turns and length 0.2 m carries current 10 A. The magnetic field inside is:

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

Q16. A Carnot engine operates between 765 K and 266 K. Its efficiency is:

- (A) 35%
- (B) 25%
- (C) 56%
- (D) 52%

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. An electron moves with velocity 1×10^6 m/s perpendicular to a magnetic field of 0.3 T. The radius of its path is:

- (A) 2.09 cm
- (B) 0.95 cm
- (C) 0.80 cm
- (D) 1.71 cm

Section 2: Chemistry (18 Questions)

Q19. Lanthanide contraction is caused by:

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

Q20. The major product of SN1 reaction of tert-butyl chloride with ethanol is:

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

Q21. The ore of aluminium is:

- (A) Bauxite
- (B) Galena
- (C) Haematite
- (D) Chalcopyrite

Q22. The IUPAC name of neopentane is:

- (A) 2,2-Dimethylpropane
- (B) Cyclopentane
- (C) 2-Methylbutane
- (D) Pentane

Q23. Gibbs free energy change for a spontaneous process is:

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

Q24. Which metal is extracted by thermite process?

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

Q25. The reagent for converting aldehyde to carboxylic acid is:

- (A) $\text{KMnO}_4 / \text{K}_2\text{Cr}_2\text{O}_7$
- (B) LiAlH_4
- (C) NaBH_4
- (D) $\text{Zn-Hg} / \text{HCl}$

Q26. Which element has the highest electronegativity?

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

Q27. The pH of a 0.01 M HCl solution is:

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

Q28. The lightest noble gas is:

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

Q29. Which element has the highest electronegativity?

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

Q30. The osmotic pressure of a solution is given by:

- (A) $\pi = iMRT$
- (B) $\pi = nRT/V$
- (C) $\pi = mRT$
- (D) $\pi = PV$

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. Which test distinguishes aldehydes from ketones?

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

Q33. d-block elements show variable oxidation states because:

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

Q34. According to Raoult's law, the vapour pressure of a solvent in solution is:

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

Q35. Kolbe's electrolysis of sodium acetate gives:

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

Q36. Which reagent is used for Baeyer-Villiger oxidation?

- (A) LiAlH_4
- (B) mCPBA / peracid
- (C) NaBH_4
- (D) KMnO_4

Section 3: Mathematics (18 Questions)

Q37. Integral of $(x^3 + 1) dx$ from 0 to 1 equals:

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

Q38. The sum of first 40 terms of AP with $a = 5$, $d = 1$ is:

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

Q39. The area under $y = x^4$ from $x = 0$ to $x = 5$ is:

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

Q40. The area under $y = x^2$ from $x = 0$ to $x = 4$ is:

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

Q41. The distance between parallel lines $4x + 3y = 10$ and $2x + 4y = 12$ is:

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

Q42. The number of ways to arrange 5 distinct objects in a circle is:

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

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

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

Q44. The mean of a binomial distribution with $n = 43$ and $p = 0.5$ is:

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

Q45. The distance between parallel lines $4x + 3y = 2$ and $3x + 2y = 16$ is:

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

Q46. The eccentricity of the ellipse $x^2/19 + y^2/2 = 1$ is:

- (A) 0.34
- (B) 0.58
- (C) 0.84
- (D) 0.70

Q47. The mean of a binomial distribution with $n = 41$ and $p = 0.6$ is:

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

Q48. The derivative of $x^3 \sin(x)$ at $x = \pi$ is:

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

Q49. If $z = 5 + 4i$, then $|z| =$

- (A) 9.55
- (B) 1.87
- (C) 4.13
- (D) 1.85

Q50. The sum of first 22 terms of AP with $a = 3$, $d = 4$ is:

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

Q51. $\lim_{x \rightarrow 0} \sin(2x)/x =$

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

Q52. The area under $y = x^3$ from $x = 0$ to $x = 2$ is:

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

Q53. The equation of tangent to $y = x^4$ at $x = 3$ is:

(A) $y = 5x - 19$

(B) $y = 8x - 5$

(C) $y = 10x - 6$

(D) $y = 2x - 14$

Q54. The rank of the matrix $[[1,2,3],[4,5,6],[8,9,10]]$ is:

(A) 2

(B) 3

(C) 1

(D) 0

Answer Key

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

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