JEE Main

Sample Question Paper - 2023

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. 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) 146 N

(C) 176 N

(D) 65 N

Q2. A Carnot engine operates between 781 K and 324 K. Its efficiency is:

(A) 60%

(B) 51%

(C) 28%

(D) 54%

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

(A) 1.07 Angstrom

(B) 2.55 Angstrom

(C) 1.17 Angstrom

(D) 1.32 Angstrom

Q4. A block of mass 8 kg slides down a frictionless incline of angle 45 degrees. The acceleration is:

(A) 3.1 m/s^2

(B) 3.8 m/s^2

(C) 4.3 m/s^2

(D) 5.1 m/s^2

Q5. The current through a 11 ohm resistor connected to a 12 V battery is:

(A) 2.22 A

(B) 2.51 A

(C) 2.81 A

(D) 2.50 A

Q6. The current through a 26 ohm resistor connected to a 15 V battery is:

(A) 1.89 A

(B) 0.50 A

(C) 2.83 A

(D) 2.36 A

Q7. 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

Q8. Two capacitors 9 uF and 9 uF are connected in series. The equivalent capacitance is:

(A) 4.96 uF

(B) 3.34 uF

(C) 1.37 uF

(D) 4.38 uF

Q9. An electron moves with velocity 1x10^6 m/s perpendicular to a magnetic field of 0.2 T. The radius of its path is:

(A) 1.26 cm

(B) 3.91 cm

(C) 1.26 cm

(D) 1.43 cm

Q10. The focal length of a concave mirror is 12 cm. An object at 46 cm forms image at:

(A) 32 cm, real inverted

(B) 26 cm, real inverted

(C) 49 cm, real inverted

(D) 35 cm, real inverted

Q11. The escape velocity from a planet of mass 3 x 10^24 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

Q12. A Carnot engine operates between 765 K and 266 K. Its efficiency is:

(A) 56%

(B) 25%

(C) 52%

(D) 35%

Q13. The binding energy per nucleon of Fe-56 is approximately:

(A) 6.5 MeV

(B) 9.2 MeV

(C) 7.6 MeV

(D) 8.8 MeV

Q14. A wire of resistance 19 ohm is bent into a circle. Effective resistance between diametrically opposite points is:

(A) 8 ohm

(B) 8 ohm

(C) 6 ohm

(D) 2 ohm

Q15. An ideal gas at 295 K is heated at constant pressure to 678 K. The ratio of final to initial volume is:

(A) 2.4

(B) 2.3

(C) 1.5

(D) 1.5

Q16. 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

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

(A) 15289 N

(B) 4174 N

(C) 16867 N

(D) 3916 N

Q18. The focal length of a concave mirror is 17 cm. An object at 30 cm forms image at:

(A) 32 cm, real inverted

(B) 17 cm, real inverted

(C) 23 cm, real inverted

(D) 43 cm, real inverted

Q19. A projectile is launched at 45 degrees with initial velocity 22 m/s. The time of flight is approximately:

(A) 3.9 s

(B) 2.9 s

(C) 4.6 s

(D) 3.3 s

Q20. The electric field at 3 m from a point charge of 6 uC is:

(A) 672 N/C

(B) 1784 N/C

(C) 7047 N/C

(D) 8811 N/C

Q21. Two masses 7 kg and 11 kg are connected by a string over a frictionless pulley. The acceleration of the system is:

(A) 3.15 m/s^2

(B) 5.61 m/s^2

(C) 2.57 m/s^2

(D) 3.18 m/s^2

Q22. A radioactive substance has half-life 14 days. The fraction remaining after 54 days is:

(A) 1/4

(B) 1/16

(C) 1/8

(D) 1/4

Q23. The binding energy per nucleon of Fe-56 is approximately:

(A) 7.6 MeV

(B) 6.5 MeV

(C) 9.2 MeV

(D) 8.8 MeV

Q24. A convex lens of focal length 18 cm forms a real image of an object placed 46 cm away. The image distance is:

(A) 19 cm

(B) 35 cm

(C) 25 cm

(D) 34 cm

Q25. A spring with k = 494 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

Section 2: Chemistry (25 Questions)

Q26. The IUPAC name of CH3CH(OH)CH3 is:

(A) Propan-2-ol

(B) Isopropyl ether

(C) 2-Methylethanol

(D) Propan-1-ol

Q27. For an endothermic reaction, increasing temperature:

(A) Decreases equilibrium constant

(B) No effect

(C) Increases equilibrium constant

(D) Decreases rate

Q28. The van't Hoff factor for NaCl is approximately:

(A) 3

(B) 2

(C) 0.5

(D) 1

Q29. Which of the following has the highest lattice energy?

(A) NaBr

(B) NaI

(C) NaF

(D) NaCl

Q30. Gibbs free energy change for a spontaneous process is:

(A) Negative

(B) Undefined

(C) Zero

(D) Positive

Q31. The hybridization of Ni in [Ni(CN)4]2- is:

(A) sp3

(B) d2sp3

(C) dsp2

(D) sp3d

Q32. The order of ionic radius: Na+ vs Mg2+ vs Al3+ is:

(A) Mg2+ > Na+ > Al3+

(B) Na+ > Mg2+ > Al3+

(C) Al3+ > Mg2+ > Na+

(D) All equal

Q33. For a first-order reaction with k = 0.074 s^-1, the half-life is:

(A) 15.0 s

(B) 20.0 s

(C) 10.0 s

(D) 13.9 s

Q34. Lanthanide contraction is caused by:

(A) High ionization energy

(B) Nuclear fusion

(C) Poor shielding by 4f electrons

(D) Electron capture

Q35. The rate of reaction doubles when temperature increases by:

(A) 50 K

(B) 10 K

(C) 5 K

(D) 20 K

Q36. The colour of KMnO4 is due to:

(A) d-d transition

(B) f-f transition

(C) Charge transfer transition

(D) s-p transition

Q37. Hess's law states that:

(A) Enthalpy change is path independent

(B) Entropy always increases

(C) Rate depends on concentration

(D) Volume is constant

Q38. Markovnikov's rule applies to the addition of HBr to:

(A) Benzene

(B) Propene

(C) Ethene

(D) Methane

Q39. According to Raoult's law, the vapour pressure of a solvent in solution is:

(A) p = RT/V

(B) p = p0 * x_solute

(C) p = p0 * x_solvent

(D) p = p0 / x_solvent

Q40. The reagent for converting aldehyde to carboxylic acid is:

(A) Zn-Hg / HCl

(B) LiAlH4

(C) KMnO4 / K2Cr2O7

(D) NaBH4

Q41. The lightest noble gas is:

(A) Helium

(B) Argon

(C) Krypton

(D) Neon

Q42. Colligative properties depend on:

(A) Number of solute particles

(B) Nature of solute

(C) Molar mass of solute

(D) Nature of solvent

Q43. The IUPAC name of CH3CH(OH)CH3 is:

(A) Isopropyl ether

(B) 2-Methylethanol

(C) Propan-1-ol

(D) Propan-2-ol

Q44. Williamson's synthesis is used to prepare:

(A) Amines

(B) Esters

(C) Ethers

(D) Alcohols

Q45. The pH of a 0.01 M HCl solution is:

(A) 4

(B) 2

(C) 1

(D) 3

Q46. The ore of aluminium is:

(A) Galena

(B) Chalcopyrite

(C) Bauxite

(D) Haematite

Q47. d-block elements show variable oxidation states because:

(A) Filled d orbitals

(B) Large atomic size

(C) Close energy of (n-1)d and ns orbitals

(D) Low ionization energy

Q48. Which metal is extracted by thermite process?

(A) Sodium

(B) Chromium

(C) Iron

(D) Aluminium

Q49. The coordination number in BCC is:

(A) 6

(B) 4

(C) 8

(D) 12

Q50. Grignard reagents react with dry CO2 to give:

(A) Ketones

(B) Alcohols

(C) Esters

(D) Carboxylic acids

Section 3: Mathematics (25 Questions)

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

(A) 33

(B) 8

(C) 23

(D) 99

Q52. The distance between parallel lines 5x + 2y = 6 and 2x + 4y = 18 is:

(A) 2.76

(B) 2.11

(C) 0.57

(D) 4.16

Q53. If z = 5 + 4i, then |z| =

(A) 1.85

(B) 1.87

(C) 9.55

(D) 4.13

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

(A) 2

(B) 3

(C) 1

(D) 0

Q55. The derivative of x^3 sin(x) at x = pi is:

(A) -18.89

(B) -6.35

(C) -10.50

(D) 15.80

Q56. The distance between parallel lines 4x + 3y = 2 and 3x + 2y = 16 is:

(A) 4.33

(B) 3.17

(C) 2.95

(D) 4.36

Q57. The sum of first 22 terms of AP with a = 1, d = 1 is:

(A) 1919

(B) 4744

(C) 218

(D) 4913

Q58. The number of ways to arrange 5 distinct objects in a circle is:

(A) 410

(B) 833

(C) 297

(D) 2295

Q59. The area under y = x^2 from x = 0 to x = 4 is:

(A) 73.5

(B) 155.7

(C) 46.0

(D) 164.8

Q60. Integral of (x^1 + 2) dx from 0 to 5 equals:

(A) 50

(B) 43

(C) 100

(D) 28

Q61. 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

Q62. The eccentricity of the ellipse x^2/4 + y^2/6 = 1 is:

(A) 0.69

(B) 0.55

(C) 0.38

(D) 0.59

Q63. The mean of a binomial distribution with n = 43 and p = 0.5 is:

(A) 39.2

(B) 37.9

(C) 26.4

(D) 20.5

Q64. Integral of (x^4 + 8) dx from 0 to 2 equals:

(A) 97

(B) 59

(C) 48

(D) 18

Q65. The probability of getting exactly 2 heads in 7 tosses of a fair coin is:

(A) 37/128

(B) 7/64

(C) 23/64

(D) 29/128

Q66. The equation of tangent to y = x^4 at x = 3 is:

(A) y = 8x - 5

(B) y = 2x - 14

(C) y = 5x - 19

(D) y = 10x - 6

Q67. The equation of tangent to y = x^3 at x = 2 is:

(A) y = 11x - 16

(B) y = 2x - 2

(C) y = 9x - 12

(D) y = 3x - 9

Q68. The probability of getting exactly 4 heads in 5 tosses of a fair coin is:

(A) 20/256

(B) 14/32

(C) 43/32

(D) 36/64

Q69. The sum of first 22 terms of AP with a = 3, d = 4 is:

(A) 3114

(B) 2828

(C) 3166

(D) 2203

Q70. lim(x->0) sin(2x)/x =

(A) 6

(B) 5

(C) 1

(D) 5

Q71. The value of integral sin^6(x) dx from 0 to pi/2 is:

(A) 2pi/16

(B) 8pi/8

(C) 5pi/8

(D) 6pi/32

Q72. 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

Q73. The eccentricity of the ellipse x^2/19 + y^2/2 = 1 is:

(A) 0.70

(B) 0.58

(C) 0.34

(D) 0.84

Q74. If det(A) = 7 and A is 3x3, then det(2A) =

(A) 31

(B) 51

(C) 58

(D) 81

Q75. The rank of the matrix [[1,2,3],[4,5,6],[8,10,11]] is:

(A) 3

(B) 0

(C) 2

(D) 1

Answer Key

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