JEE Main

Sample Question Paper - 2024

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

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

Q2. 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) 65 N
(C) 176 N
(D) 146 N

Q3. An ideal gas at 292 K is heated at constant pressure to 489 K. The ratio of final to initial volume is:

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

Q4. An ideal gas at 295 K is heated at constant pressure to 678 K. The ratio of final to initial volume is:

(A) 1.5
(B) 1.5
(C) 2.3
(D) 2.4

Q5. 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) 6477 N
(C) 17916 N
(D) 6209 N

Q6. The escape velocity from a planet of mass 3 x 10^24 kg and radius 6004 km is:

(A) 14.0 km/s

(B) 9.6 km/s

(C) 12.6 km/s

(D) 9.1 km/s

Q7. The current through a 26 ohm resistor connected to a 15 V battery is:

(A) 2.36 A

(B) 0.50 A

(C) 1.89 A

(D) 2.83 A

Q8. The work function of a metal is 3.3 eV. The threshold frequency is:

(A) 6.65 x 10^14 Hz

(B) 7.25 x 10^14 Hz

(C) 9.88 x 10^14 Hz

(D) 10.83 x 10^14 Hz

Q9. 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) 7 m/s

(D) 26 m/s

Q10. A projectile is launched at 45 degrees with initial velocity 22 m/s. The time of flight is approximately:

(A) 3.9 s

(B) 4.6 s

(C) 2.9 s

(D) 3.3 s

Q11. A ball is dropped from height 90 m. Its velocity just before hitting the ground is:

(A) 32.6 m/s

(B) 28.3 m/s

(C) 35.8 m/s

(D) 35.0 m/s

Q12. Two capacitors 9 uF and 8 uF are connected in series. The equivalent capacitance is:

(A) 4.24 uF

(B) 2.11 uF

(C) 2.76 uF

(D) 3.56 uF

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

(A) 8.8 MeV

(B) 6.5 MeV

(C) 9.2 MeV

(D) 7.6 MeV

Q14. The current through a 11 ohm resistor connected to a 12 V battery is:

(A) 2.81 A

(B) 2.50 A

(C) 2.22 A

(D) 2.51 A

Q15. A block of mass 6 kg slides down a frictionless incline of angle 37 degrees. The acceleration is:

(A) 6.8 m/s^2

(B) 6.6 m/s^2

(C) 4.1 m/s^2

(D) 5.2 m/s^2

Q16. 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) 25 cm

(D) 15 cm

Q17. 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

Q18. A solenoid of 145 turns and length 0.1 m carries current 4 A. The magnetic field inside is:

(A) 9.69 mT

(B) 17.15 mT

(C) 1.19 mT

(D) 16.56 mT

Q19. The binding energy per nucleon of Fe-56 is approximately:

(A) 7.6 MeV

(B) 8.8 MeV

(C) 9.2 MeV

(D) 6.5 MeV

Q20. 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

Q21. A projectile is launched at 45 degrees with initial velocity 36 m/s. The time of flight is approximately:

(A) 2.5 s

(B) 2.4 s

(C) 1.6 s

(D) 4.3 s

Q22. A spring with k = 494 N/m is compressed by 0.17 m. The stored PE is:

(A) 18.25 J

(B) 22.76 J

(C) 16.40 J

(D) 20.63 J

Q23. 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

Q24. Two masses 8 kg and 7 kg are connected by a string over a frictionless pulley. The acceleration of the system is:

(A) 4.13 m/s^2

(B) 1.73 m/s^2

(C) 2.54 m/s^2

(D) 1.16 m/s^2

Q25. Two masses 7 kg and 11 kg are connected by a string over a frictionless pulley. The acceleration of the system is:

(A) 5.61 m/s^2

(B) 3.18 m/s^2

(C) 2.57 m/s^2

(D) 3.15 m/s^2

Section 2: Chemistry (25 Questions)

Q26. For an endothermic reaction, increasing temperature:

(A) Decreases rate

(B) Decreases equilibrium constant

(C) No effect

(D) Increases equilibrium constant

Q27. The osmotic pressure of a solution is given by:

(A) pi = mRT

(B) pi = iMRT

(C) pi = PV

(D) pi = nRT/V

Q28. The crystal field splitting energy in octahedral complex is:

(A) 10Dq_tet

(B) Delta_oct

(C) Delta_sq

(D) Delta_tet

Q29. Grignard reagents react with dry CO_2 to give:

(A) Esters

(B) Carboxylic acids

(C) Alcohols

(D) Ketones

Q30. The hybridization of Ni in $[Ni(CN)_4]^{2-}$ is:

(A) dsp2

(B) d2sp3

(C) sp3d

(D) sp3

Q31. The major product of SN1 reaction of tert-butyl chloride with ethanol is:

(A) tert-Butanol

(B) Isobutane

(C) tert-Butyl ethyl ether

(D) 2-Methylpropene

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

(A) Zero

(B) Negative

(C) Undefined

(D) Positive

Q33. The rate of reaction doubles when temperature increases by:

(A) 50 K

(B) 10 K

(C) 5 K

(D) 20 K

Q34. The product of dehydration of ethanol at 443 K is:

(A) Diethyl ether

(B) Acetic acid

(C) Acetaldehyde

(D) Ethylene (C_2H_4)

Q35. VSEPR theory predicts the shape of SF_6 as:

(A) Tetrahedral

(B) Octahedral

(C) Trigonal bipyramidal

(D) Square planar

Q36. Which element has the highest electronegativity?

(A) Fluorine

(B) Chlorine

(C) Nitrogen

(D) Oxygen

Q37. Hess's law states that:

(A) Volume is constant

(B) Entropy always increases

(C) Rate depends on concentration

(D) Enthalpy change is path independent

Q38. The pH of a 0.01 M HCl solution is:

(A) 3

(B) 4

(C) 1

(D) 2

Q39. The pH of a 0.01 M HCl solution is:

(A) 1

(B) 4

(C) 3

(D) 2

Q40. Kolbe's electrolysis of sodium acetate gives:

(A) Ethane

(B) Propane

(C) Butane

(D) Methane

Q41. Markovnikov's rule applies to the addition of HBr to:

(A) Propene

(B) Methane

(C) Ethene

(D) Benzene

Q42. Lanthanide contraction is caused by:

(A) Electron capture

(B) Nuclear fusion

(C) Poor shielding by 4f electrons

(D) High ionization energy

Q43. According to Raoult's law, the vapour pressure of a solvent in solution is:

(A) p = p0 / x_solvent

(B) p = RT/V

(C) p = p0 * x_solvent

(D) p = p0 * x_solute

Q44. The IUPAC name of CH3CH(OH)CH3 is:

(A) Propan-2-ol

(B) Isopropyl ether

(C) 2-Methylethanol

(D) Propan-1-ol

Q45. The magnetic moment of Fe2+ (d6) in weak field is:

(A) 4.9 BM (4 unpaired)

(B) 2.83 BM

(C) 5.9 BM

(D) 0 BM

Q46. Which reagent is used for Baeyer-Villiger oxidation?

(A) mCPBA / peracid

(B) KMnO4

(C) NaBH4

(D) LiAlH4

Q47. The van't Hoff factor for NaCl is approximately:

(A) 3

(B) 2

(C) 0.5

(D) 1

Q48. For an ideal gas, Cp - Cv equals:

(A) R/2

(B) R (8.314 J/mol K)

(C) 0

(D) 2R

Q49. The ore of aluminium is:

(A) Chalcopyrite

(B) Galena

(C) Haematite

(D) Bauxite

Q50. Which metal is extracted by thermite process?

(A) Aluminium

(B) Chromium

(C) Iron

(D) Sodium

Section 3: Mathematics (25 Questions)

Q51. The number of ways to arrange 5 distinct objects in a circle is:

(A) 297

(B) 2295

(C) 410

(D) 833

Q52. The number of ways to arrange 3 distinct objects in a circle is:

(A) 2236

(B) 1188

(C) 4624

(D) 621

Q53. The derivative of x^2 sin(x) at x = pi is:

(A) 11.37

(B) 5.37

(C) -10.70

(D) 16.30

Q54. If z = 1 + 5i, then |z| =

(A) 9.94

(B) 2.76

(C) 5.04

(D) 9.54

Q55. The area under y = x^4 from x = 0 to x = 5 is:

(A) 132.3

(B) 135.5

(C) 24.4

(D) 15.9

Q56. The rank of the matrix [[1,2,3],[4,5,6],[8,10,11]] is:

(A) 3

(B) 2

(C) 1

(D) 0

Q57. The number of ways to arrange 7 distinct objects in a circle is:

(A) 570

(B) 1166

(C) 3909

(D) 4480

Q58. The mean of a binomial distribution with n = 43 and p = 0.5 is:

(A) 39.2

(B) 26.4

(C) 37.9

(D) 20.5

Q59. 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

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

(A) 113.7

(B) 73.2

(C) 77.9

(D) 73.1

Q61. The distance between parallel lines 5x + 2y = 6 and 2x + 4y = 18 is:

(A) 2.76

(B) 4.16

(C) 2.11

(D) 0.57

Q62. If det(A) = 8 and A is 3x3, then det(2A) =

(A) 98

(B) 52

(C) 77

(D) 44

Q63. The sum of first 22 terms of AP with a = 1, d = 1 is:

(A) 4744

(B) 4913

(C) 218

(D) 1919

Q64. The distance between parallel lines 4x + 3y = 10 and 2x + 4y = 12 is:

(A) 4.15

(B) 4.25

(C) 4.75

(D) 3.08

Q65. Integral of (x^1 + 2) dx from 0 to 5 equals:

(A) 50

(B) 43

(C) 100

(D) 28

Q66. The area under y = x^2 from x = 0 to x = 4 is:

(A) 46.0

(B) 164.8

(C) 155.7

(D) 73.5

Q67. Integral of (x^4 + 8) dx from 0 to 2 equals:

(A) 18

(B) 97

(C) 59

(D) 48

Q68. The probability of getting exactly 3 heads in 5 tosses of a fair coin is:

(A) 6/128

(B) 23/32

(C) 7/64

(D) 48/256

Q69. 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

Q70. The rank of the matrix [[1,2,3],[4,5,6],[8,9,10]] is:

(A) 0

(B) 2

(C) 1

(D) 3

Q71. If det(A) = 10 and A is 3x3, then det(2A) =

(A) 36

(B) 89

(C) 58

(D) 36

Q72. If z = 5 + 4i, then |z| =

(A) 4.13

(B) 1.85

(C) 9.55

(D) 1.87

Q73. The equation of tangent to y = x^4 at x = 3 is:

(A) y = 10x - 6

(B) y = 2x - 14

(C) y = 8x - 5

(D) y = 5x - 19

Q74. Integral of (x^1 + 6) dx from 0 to 5 equals:

(A) 75

(B) 65

(C) 63

(D) 81

Q75. lim(x->0) sin(4x)/x =

(A) 4

(B) 1

(C) 6

(D) 1

Answer Key

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