JEE MAIN 2027

20 Full-Length Mock Tests

Physics•Chemistry • Mathematics

Complete Answer Key with Detailed Solutions

Tests	20 (Full syllabus, latest pattern)
Questions	75 per test — 1500 unique questions in total
Sections	Section A: Physics (Q1–25) • Section B: Chemistry (Q26–50) • Section C: Mathematics (Q51–75)
Difficulty	Mixed (Easy → Hard), progressively challenging series
Marking	+4 for correct, −1 for incorrect (single correct MCQ)
Includes	Answer key for every test + brief worked solution for every question

Mock Test 19

Time Allowed: 3 Hours |Maximum Marks: 300 | 75 Questions

Instructions: This paper contains three sections — A (Physics, Q1–25), B (Chemistry, Q26–50) and C (Mathematics, Q51–75). Each question carries +4 for a correct response and −1 for an incorrect response. Choose the single best option.

Section A — PHYSICS

1. A particle starts at 5 m/s with constant acceleration 4 m/s². Its speed after 4 s is:
   (a) 21 m/s
   (b) 9 m/s
   (c) 16 m/s
   (d) 29 m/s

2. A wave of frequency 500 Hz has wavelength 10 m. Its speed is:
   (a) 50 m/s
   (b) 2500 m/s
   (c) 510 m/s
   (d) 5000 m/s

3. A particle starts at 15 m/s with constant acceleration 3 m/s². Its speed after 2 s is:
   (a) 27 m/s
   (b) 6 m/s
   (c) 18 m/s
   (d) 21 m/s

4. The moment of inertia of a disc about a perpendicular axis through its centre is:
   (a) $2MR^2/3$
   (b) $2MR^2/5$
   (c) $MR^2/2$
   (d) MR^2

5. A particle starts at 15 m/s with constant acceleration 3 m/s². Its speed after 4 s is:
   (a) 18 m/s
   (b) 33 m/s
   (c) 27 m/s
   (d) 12 m/s

6. A body floats with 1/5 of its volume above water. Its density is:
   (a) 1000 kg/m³
   (b) 800 kg/m³
   (c) 200 kg/m³
   (d) 1250 kg/m³

7. A Carnot engine works between 500 K and 300 K. Its efficiency is:
   (a) 50%
   (b) 20%
   (c) 60%
   (d) 40%

8. For a projectile, the horizontal component of velocity during flight:
   (a) Decreases
   (b) Increases
   (c) Becomes zero at top
   (d) Remains constant

9. The rms value of an alternating current with peak value 5 A is about:
   (a) 2.5 A
   (b) 7.07 A
   (c) 5 A
   (d) 3.54 A

10. If current through a 4 Ω resistor is 3 A, the power dissipated is:
   (a) 12 W
   (b) 36 W
   (c) 7 W
   (d) 48 W

11. In Young's double-slit experiment the fringe width is:
   (a) λD/d
   (b) λd/D
   (c) λ/Dd
   (d) Dd/λ

12. In a lift falling freely the apparent weight of a body becomes:
   (a) Twice the weight
   (b) Zero
   (c) Equal to weight
   (d) Half the weight

13. A body with initial speed 10 m/s accelerates at 4 m/s². Distance in 3 s is:
   (a) 18 m
   (b) 58 m
   (c) 30 m
   (d) 48 m

14. The rotational analogue of force is:
   (a) Moment ofinertia
   (b) Angular momentum
   (c) Angular velocity
   (d) Torque

15. The drift velocity of electrons in a conductor is:
   (a) Zero
   (b) Equal to light speed
   (c) Comparable to c
   (d) Very small (mm/s order)

16. A convex lens forms a real image when the object is:
   (a) Atthe focal point
   (b) Beyond the focal point
   (c) Behind the lens
   (d) Inside the focal point

17. A Carnot engine takes 1000 J from the source and rejects 600 J. Its efficiency is:
   (a) 20%
   (b) 60%
   (c) 40%
   (d) 100%

18. The photoelectric effect shows that light behaves as:
   (a) Sound
   (b) Particles (photons)
   (c) Continuous waves
   (d) Longitudinal waves

19. A coil of 100 turns experiences a flux change of 0.02 Wb in 0.1 s. The induced emf is:
    (a) 200 V
    (b) 2 V
    (c) 20 V
    (d) 0.2 V

20. If g at the surface is 10 m/s², the value at a height 3× Earth's radius is:
    (a) 3.33 m/s²
    (b) 0.62 m/s²
    (c) 10 m/s²
    (d) 2.5 m/s²

21. The equivalent capacitance of three 3 μF capacitors in series is:
    (a) 3 μF
    (b) 1 μF
    (c) 6 μF
    (d) 9 μF

22. Two soap bubbles of radii 2 cm and 4 cm coalesce into a single bubble. Its radius is:
    (a) ≈4.16cm
    (b) 2 cm
    (c) 6 cm
    (d) 8 cm

23. A 220 V, 50 Hz supply has peak voltage:
    (a) 440 V
    (b) 220 V
    (c) 110 V
    (d) ≈311 V

24. In an experiment the values 2.63, 2.56, 2.42, 2.71, 2.68 are obtained. The mean absolute error is about:
    (a) 0.0088
    (b) 0.88
    (c) 0.088
    (d) 0.44

25. A photon of energy 3 eV has wavelength (hc = 1240 eV·nm):
    (a) 206.67 nm
    (b) 413.33 nm
    (c) 3720 nm
    (d) 826.67 nm

Section B — CHEMISTRY

26. A solution contains 10 g of solute in 100 g of solution. The mass percent is:
    (a) 10%
    (b) 5%
    (c) 20%
    (d) 100%

27. Benzene undergoes which type of reaction most readily?
    (a) Electrophilicsubstitution
    (b) Addition
    (c) Elimination
    (d) Nucleophilic substitution

28. Markovnikov's rule predicts addition of HBr to propene gives mainly:
    (a) Propane
    (b) Propanol
    (c) 2-bromopropane
    (d) 1-bromopropane

29. Which is used as a catalyst in the Haber process?
    (a) Copper
    (b) Nickel
    (c) Iron
    (d) Platinum

30. The standard enthalpy of formation of an element in its standard state is:
    (a) Negative
    (b) Zero
    (c) Positive
    (d) 100 kJ/mol

31. Alkali metals react with water to give:
    (a) Hydroxideandhydrogen
    (b) Only hydrogen
    (c) Hydride and oxygen
    (d) Oxide and oxygen

32. A mixture has 0.5 mol of A and 1.5 mol of B. The mole fraction of A is:
    (a) 0.5
    (b) 0.25
    (c) 1.5
    (d) 0.75

33. The magnetic quantum number m can have values:
    (a) −l to +lincluding0
    (b) ±1/2
    (c) 1 to n
    (d) 0 to n−1

34. The electronic configuration of Cu (Z = 29) is:
    (a) $[Ar]4s^{1}3d^{9}$
    (b) $[Ar]3d^{10}4s^{2}$
    (c) $[Ar]3d^{9}4s^{2}$
    (d) $[Ar]3d^{10}4s^{1}$

35. Which is the strongest acid among the following?
    (a) Butyric acid
    (b) Acetic acid
    (c) Formic acid
    (d) Propanoic acid

36. The sugar present in RNA is:
    (a) Deoxyribose
    (b) Fructose
    (c) Glucose
    (d) Ribose

37. The number of millimoles in 0.5 L of a 0.02 M solution is:
    (a) 1
    (b) 100
    (c) 0.01
    (d) 10

38. The colour of $[Cu(H_2O)_4]^{2+}$ is:
    (a) Blue
    (b) Green
    (c) Red
    (d) Colourless

39. The equivalent mass of H_2SO_4 (M = 98) is:
    (a) 196
    (b) 98
    (c) 24.5
    (d) 49

40. For a first-order reaction with k = 0.3465 min^{-1}, the half-life is:
    (a) 2 min
    (b) 1 min
    (c) 4 min
    (d) 0.3465 min

41. The rate constant of a first-order reaction with half-life 100 min is about:
    (a) 0.01 min^{-1}
    (b) 0.0069 min^{-1}
    (c) 100 min^{-1}
    (d) 0.0139 min^{-1}

42. The process of heating ore in the absence of air is:
    (a) Roasting
    (b) Smelting
    (c) Leaching
    (d) Calcination

43. The rate constant of a first-order reaction with half-life 20 min is about:
    (a) 20min^{-1}
    (b) 0.0693 min^{-1}
    (c) 0.0347 min^{-1}
    (d) 0.05 min^{-1}

44. The number of peptide bonds in a tripeptide is:
    (a) 3
    (b) 1
    (c) 4
    (d) 2

45. Zone refining is used to purify metals used in:
    (a) Construction
    (b) Cooking
    (c) Fuel
    (d) Semiconductors

46. $BaCl_2$ solution gives a white precipitate with:
    (a) Chloride
    (b) Nitrate
    (c) Iodide
    (d) Sulphate ion

47. According to MO theory, which is paramagnetic?
    (a) O_2
    (b) F_2
    (c) He_2
    (d) N_2

48. 10 mL of 2 M solution is diluted to 100 mL. The new molarity is:
    (a) 0.2 M
    (b) 20 M
    (c) 2 M
    (d) 0.4 M

49. Ionisation enthalpy of nitrogen is higher than oxygen because:
    (a) Nitrogen has ahalf-filledstable$2p^3$configuration
    (b) Nitrogen is a metal
    (c) Nitrogen is larger
    (d) Oxygen is smaller

50. The electronic configuration of Cr (Z = 24) is:
    (a) $[Ar]3d^6$
    (b) $[Ar]3d^44s^2$
    (c) $[Ar]4s^23d^4$
    (d) $[Ar]3d^54s^1$

Section C — MATHEMATICS

51. The value of $\sin^2\theta + \cos^2\theta$ is:
    (a) 2
    (b) 1
    (c) 0
    (d) $\tan^2\theta$

52. The number of subsets of a set with 10 elements is:
    (a) 100
    (b) 20 (c)
    10 (d)
    1024

53. The distance between (2,2) and (5,6) is:
    (a) 7
    (b) 5
    (c) 10
    (d) 12

54. The midpoint of the segment joining (2,2) and (5,6) is:
    (a) (7, 8)
    (b) (3, 4)
    (c) (3.5, 4)
    (d) (7, 4)

55. The nature of the roots of $1x^2 + -6x + 9 = 0$ is:
    (a) Cannot be determined
    (b) Real and distinct
    (c) Real and equal
    (d) Complex (imaginary)

56. The nature of the roots of $1x^2 + 4x + 4 = 0$ is:
    (a) Real and distinct
    (b) Real and equal
    (c) Cannot be determined
    (d) Complex (imaginary)

57. The value of 5P2 is:
    (a) 60
    (b) 40
    (c) 20
    (d) 10

58. The value of 5C4 is:
(a) 5
(b) 10
(c) 120
(d) 20

59. The slope of the line through (2,3) and (5,7) is:
(a) 2.67
(b) 1.33
(c) -1.33
(d) 0.75

60. The unit vector along 5î + 12ĵ is:
(a) (5î + 12ĵ)/13
(b) (î + ĵ)/2
(c) (5î + 12ĵ)/17
(d) 5î + 12ĵ

61. The value of 7P2 is:
(a) 14
(b) 84
(c) 21
(d) 42

62. $\lim_{x\to 0} (1-\cos x)/x^2$ equals:
(a) 2
(b) 1
(c) 0
(d) 1/2

63. The number of diagonals in an octagon is:
(a) 28
(b) 20
(c) 16
(d) 8

64. The transpose of a row matrix is a:
(a) Columnmatrix
(b) Row matrix
(c) Zero matrix
(d) Square matrix

65. The sum of an infinite GP with $|r| < 1$ is:
(a) $a/(1+r)$
(b) $a/(r-1)$
(c) $a/(1-r)$
(d) $a \cdot r$

66. The eccentricity of $x^2/9 + y^2/4 = 1$ is:
(a) 2/3
(b) 3/2
(c) √5/2
(d) √5/3

67. The focus of the parabola $y^2 = 4ax$ is:
(a) (2a, 0)
(b) (−a, 0)
(c) (a, 0)
(d) (0, a)

68. The inverse of the matrix [[5,2],[3,1]] is (1/-1) times:
(a) [[1,-2],[-3,5]]
(b) [[-1,2],[3,-5]]
(c) [[5,2],[3,1]]
(d) [[1,2],[3,5]]

69. If a set has 7 elements, the number of proper subsets is:
(a) 7
(b) 64
(c) 127
(d) 128

70. The area of the triangle with vertices (1,1), (5,1), (1,4) is:
(a) 3
(b) 7
(c) 6
(d) 12

71. The coefficient of x^3 in $(1 + x)^6$ is:
(a) 6
(b) 15
(c) 30
(d) 20

72. The sum of squares of first n natural numbers is:
(a) $n(n+1)/2$
(b) n^3
(c) $n(n+1)(2n+1)/6$
(d) $n^2(n+1)/4$

73. If A is a square matrix with $|A| = 5$, then $|A^T|$ is:
(a) 25
(b) 5
(c) 1/5
(d) −5

74. For independent events A and B, $P(A \cap B)$ equals:
(a) $P(A)/P(B)$
(b) $P(A) - P(B)$
(c) $P(A) \cdot P(B)$
(d) $P(A) + P(B)$

75. The inverse of the matrix [[2,1],[1,1]] is (1/1) times:
(a) [[2,1],[1,1]]
(b) [[1,-1],[-1,2]]
(c) [[1,1],[1,2]]
(d) [[-1,1],[1,-2]]

Mock Test 19 — Answer Key

1-a	2-d	3-d	4-c	5-c	6-b	7-d	8-d	9-d	10-b	11-a	12-b	13-d	14-d	15-d
16-b	17-c	18-b	19-c	20-b	21-b	22-a	23-d	24-c	25-b	26-a	27-a	28-c	29-c	30-b
31-a	32-b	33-a	34-d	35-c	36-d	37-d	38-a	39-d	40-a	41-b	42-d	43-c	44-d	45-d
46-d	47-a	48-a	49-a	50-d	51-b	52-d	53-b	54-c	55-c	56-b	57-c	58-a	59-b	60-a
61-d	62-d	63-b	64-a	65-c	66-d	67-c	68-a	69-c	70-c	71-d	72-c	73-b	74-c	75-b

Mock Test 20 — Answer Key

1-c	2-a	3-b	4-c	5-c	6-c	7-b	8-d	9-a	10-d	11-c	12-d	13-c	14-c	15-b
16-b	17-c	18-d	19-a	20-c	21-c	22-d	23-b	24-a	25-a	26-a	27-d	28-b	29-a	30-d
31-a	32-b	33-c	34-a	35-b	36-c	37-c	38-c	39-c	40-c	41-b	42-d	43-b	44-c	45-a
46-d	47-c	48-c	49-d	50-a	51-b	52-b	53-c	54-a	55-b	56-d	57-c	58-a	59-a	60-d
61-d	62-c	63-d	64-a	65-c	66-a	67-a	68-d	69-c	70-c	71-b	72-d	73-c	74-a	75-c

Mock Test 19 — Solutions

1. (a) 21 m/s — v = u + at = 5 + 4×4 = 21 m/s.
2. (d) 5000 m/s — v = fλ = 5000 m/s.
3. (d) 21 m/s — v = u + at = 15 + 3×2 = 21 m/s.
4. (c) MR²/2 — Standard result: I = MR²/2.
5. (c) 27 m/s — v = u + at = 15 + 3×4 = 27 m/s.
6. (b) 800 kg/m³ — Submerged fraction = 4/5 → ρ_body = (4/5)ρ_w = 800 kg/m³.
7. (d) 40% — η = 1 − Tc/Th = 40%.
8. (d) Remains constant — No horizontal acceleration, so ucosθ stays constant.
9. (d) 3.54 A — I_rms = $I_0/\sqrt{2} \approx 3.54$ A.
10. (b) 36 W — P = I²R = 9×4 = 36 W.
11. (a) λD/d — β = λD/d.
12. (b) Zero — In free fall a = g, so N = m(g−g) = 0.
13. (d) 48 m — s = ut + ½at² = 48 m.
14. (d) Torque — τ = Iα is analogous to F = ma.
15. (d) Very small (mm/s order) — Typical drift speed ~10^{-4} m/s.
16. (b) Beyond the focal point — Object beyond f → real inverted image.
17. (c) 40% — η = 1 − Q_2/Q_1 = 1 − 600/1000 = 0.4.
18. (b) Particles (photons) — Explained only by photon (quantum) nature.
19. (c) 20 V — ε = N ΔΦ/Δt = 100×0.02/0.1 = 20 V.
20. (b) 0.62 m/s² — g' = g(R/(R+h))² = 10/(4)² = 0.62 m/s².
21. (b) 1 μF — 1/C = 3×(1/3) = 1 → C = 1 μF.
22. (a) ≈4.16 cm — R = $r_1r_2/(r_2-r_1)$·… using excess pressure: R = √: R³ form → ≈4.16 cm.
23. (d) ≈311 V — $V_0 = \sqrt{2} \times 220 \approx 311$ V.
24. (c) 0.088 — Mean = 2.60; deviations 0.03,0.04,0.18,0.11,0.08 → mean ≈ 0.088.
25. (b) 413.33 nm — λ = 1240/3 = 413.33 nm.
26. (a) 10% — Mass % = 10/100×100 = 10%.
27. (a) Electrophilic substitution — Aromaticity favours electrophilic substitution.
28. (c) 2-bromopropane — H adds to carbon with more H.
29. (c) Iron — Fe with promoters catalyses NH_3 synthesis.
30. (b) Zero — By definition ΔH°f = 0 for elements.
31. (a) Hydroxide and hydrogen — 2M + $2H_2O$ → 2MOH + H_2.
32. (b) 0.25 — x_A = 0.5/(0.5+1.5) = 0.25.
33. (a) −l to +l including 0 — m = −l, …, 0, …, +l.
34. (d) [Ar]$3d^{10}4s^1$ — Extra stability of full d → $3d^{10}4s^1$.
35. (c) Formic acid — Less +I effect → formic acid strongest.
36. (d) Ribose — RNA has ribose sugar.
37. (d) 10 — n = MV = 0.02×0.5 = 0.01 mol = 10 mmol.
38. (a) Blue — Aqua copper(II) is blue.
39. (d) 49 — Equivalent mass = M/n-factor = 98/2 = 49.
40. (a) 2 min — $t_{1/2}$ = 0.693/k = 2 min.
41. (b) 0.0069 min^{-1} — k = 0.693/t = 0.0069 min^{-1}.
42. (d) Calcination — Calcination = heating without air.
43. (c) 0.0347 min^{-1} — k = 0.693/t = 0.0347 min^{-1}.
44. (d) 2 — Tripeptide has 3 residues → 2 peptide bonds.
45. (d) Semiconductors — Zone refining gives ultra-pure Si, Ge.
46. (d) Sulphate ion — $BaSO_4$ is an insoluble white precipitate.
47. (a) O_2 — O_2 has two unpaired electrons in π* orbitals.
48. (a) 0.2 M — M1V1 = M2V2 → M2 = 2×10/100 = 0.2 M.
49. (a) Nitrogen has a half-filled stable $2p^3$ configuration — Half-filled stability.
50. (d) [Ar]$3d^5 4s^1$ — Half-filled stability gives $3d^5 4s^1$.
51. (b) 1 — Fundamental identity.

52. (d) 1024 — Subsets = 2^10 = 1024.
53. (b) 5 — d = √(3²+4²) = 5.
54. (c) (3.5, 4) — Midpoint = ((2+5)/2, (2+6)/2).
55. (c) Real and equal — D = b²−4ac = 0 → Real and equal.
56. (b) Real and equal — D = b²−4ac = 0 → Real and equal.
57. (c) 20 — 5P2 = 20.
58. (a) 5 — 5C4 = 5.
59. (b) 1.33 — m = $(y_2-y_1)/(x_2-x_1)$ = 1.33.
60. (a) (5î + 12ĵ)/13 — Magnitude = 13.
61. (d) 42 — 7P2 = 42.
62. (d) 1/2 — Standard limit = 1/2.
63. (b) 20 — n(n−3)/2 = 8×5/2 = 20.
64. (a) Column matrix — Row ↔ column on transposing.
65. (c) a/(1−r) — S∞ = a/(1−r).
66. (d) √5/3 — e = √(1 − b²/a²) = √(1 − 4/9) = √5/3.
67. (c) (a, 0) — Standard parabola focus.
68. (a) [[1,-2],[-3,5]] — Inverse = (1/det)[[d,−b],[−c,a]], det = -1.
69. (c) 127 — Proper subsets = $2^7 - 1 = 127$.
70. (c) 6 — Area = $\frac{1}{2}|x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)| = 6$.
71. (d) 20 — 6C3 = 20.
72. (c) n(n+1)(2n+1)/6 — $\Sigma n^2 = n(n+1)(2n+1)/6$.
73. (b) 5 — $|A^T| = |A|$.
74. (c) P(A)·P(B) — Independence definition.
75. (b) [[1,-1],[-1,2]] — Inverse = (1/det)[[d,−b],[−c,a]], det = 1.