JEE Main 2027 Mock Test 3

Paper 1 (B.E./B.Tech) · Full-length mock test in the latest JEE Main pattern, with answer key and solutions.

Duration	3 hours
Questions	75: 25 each in Mathematics, Physics and Chemistry (Section A: 20 MCQs; Section B: 5 numerical-value questions)
Marking	+4 for a correct answer, −1 for a wrong answer, 0 if not attempted
Maximum marks	300
Note	Original mock test written to the JEE Main pattern. It is NOT an NTA previous year question paper.

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Mathematics

Section A · Multiple choice (one correct option)

Q1. The value of $i + i^2 + i^3 + i^4$ is

(A) i (B) 0
(C) 1 (D) −1

Q2. If $x^2 - 6x + k = 0$ has real and equal roots, then k equals

(A) 9 (B) 3
(C) 36 (D) 6

Q3. The determinant of the 3 × 3 diagonal matrix with diagonal entries 1, 2, 3 is

(A) 6 (B) 3
(C) 0 (D) 1

Q4. A committee of 2 men (from 5) and 1 woman (from 4) can be formed in

(A) 40 ways (B) 20 ways
(C) 60 ways (D) 35 ways

Q5. The middle term in the expansion of $(1 + x)^6$ is

(A) $15x^3$ (B) $20x^3$
(C) $6x^3$ (D) $20x^2$

Q6. If 2, b, 8 are in AP, then b equals

(A) 4 (B) 5
(C) 16 (D) 6

Q7. $\lim_{x \to 2} (x^2 - 4)/(x - 2)$ equals

(A) 0 (B) not defined
(C) 2 (D) 4

Q8. The derivative of $\sin^2 x$ is

(A) 2 sin x (B) $\cos^2 x$
(C) sin 2x (D) 2 cos x

Q9. $\int x\, e^x\, dx$ equals

(A) $e^x(x + 1) + C$ (B) $x^2 e^x/2 + C$
(C) $x\, e^x + C$ (D) $e^x(x - 1) + C$

Q10. The maximum value of 3 sin x + 4 cos x is

(A) 5 (B) 4
(C) 7 (D) 1

Q11. The order of the differential equation $d^3y/dx^3 + 2(dy/dx)^2 = 0$ is

(A) 2 (B) 3
(C) 5 (D) 1

Q12. The angle between the lines y = x and y = −x is

(A) π/4 (B) π/3
(C) 0 (D) π/2

Q13. The length of the latus rectum of the parabola $x^2 = 8y$ is

(A) 8 (B) 4
(C) 16 (D) 2

Q14. The midpoint of $(2, -4)$ and $(6, 8)$ is

(A) $(4, 2)$ (B) $(2, 6)$
(C) $(8, 4)$ (D) $(4, -2)$

Q15. $\hat{i} \times \hat{j}$ equals

(A) $\hat{i} + \hat{j}$ (B) $\hat{k}$
(C) $-\hat{k}$ (D) 0

Q16. The direction cosines of the z-axis are

(A) $(1, 1, 1)$ (B) $(0, 1, 0)$
(C) $(1, 0, 0)$ (D) $(0, 0, 1)$

Q17. The median of 3, 7, 1, 9, 5 is

(A) 3 (B) 7
(C) 5 (D) 9

Q18. A and B are independent with $P(A) = 0.5$ and $P(B) = 0.4$. $P(A \cap B)$ is

(A) 0.9 (B) 0.45
(C) 0.1 (D) 0.2

Q19. If $\cos\theta = 3/5$, then $\cos 2\theta$ equals

(A) $-7/25$ (B) $-24/25$
(C) $7/25$ (D) $24/25$

Q20. The domain of $f(x) = \sqrt{(x - 3)}$ is

(A) $x > 3$ (B) $x \le 3$
(C) $x \ge 3$ (D) all real x

Section B · Numerical value (enter the answer as a number)

Q21. The number of 4-letter arrangements of the letters of MATHS (no repetition) is ____.

Q22. The sum $1 + 2 + 3 + \ldots + 30$ is ____.

Q23. The area of the triangle with vertices $(0, 0)$, $(4, 0)$ and $(0, 6)$ is ____ square units.

Q24. If $f(x) = 2x^2 + 3x$, then $f'(2)$ is ____.

Q25. The number of real solutions of $x^2 - 5|x| + 6 = 0$ is ____.

Physics

Section A · Multiple choice (one correct option)

Q26. The SI unit of impulse is
(A) kg m/s^2 (B) J s
(C) N s (D) N/s

Q27. A car covers half a distance at 40 km/h and the other half at 60 km/h. Its average speed is
(A) 45 km/h (B) 52 km/h
(C) 48 km/h (D) 50 km/h

Q28. A projectile's range equals its maximum height when the angle of projection is
(A) $\tan^{-1}4$ (B) $\tan^{-1}2$
(C) 60° (D) 45°

Q29. $\mu_s = 0.5$. The least horizontal force to move a 10 kg block ($g = 10$ m/s^2) is
(A) 50 N (B) 100 N
(C) 5 N (D) 25 N

Q30. If the momentum of a body is doubled, its kinetic energy becomes
(A) unchanged (B) $\sqrt{2}$ times
(C) 4 times (D) 2 times

Q31. In a 1-D elastic collision of equal masses with one at rest, the bodies
(A) rebound with equal speeds (B) exchange velocities
(C) move together (D) both stop

Q32. The moment of inertia of a thin ring about its central axis is
(A) MR^2 (B) ½MR^2
(C) 2MR^2 (D) (2/5)MR^2

Q33. The orbital speed of a satellite close to Earth's surface is about
(A) 11.2 km/s (B) 7.9 km/s
(C) 3.1 km/s (D) 1 km/s

Q34. Water flows at 5 m/s through a 2 cm^2 pipe section. In a 1 cm^2 section its speed is
(A) 10 m/s (B) 5 m/s
(C) 20 m/s (D) 2.5 m/s

Q35. In an adiabatic process
(A) $\Delta T = 0$ (B) $\Delta U = 0$
(C) $W = 0$ (D) $Q = 0$

Q36. C_p/C_v for a monatomic ideal gas is
(A) 3/2 (B) 5/3
(C) 7/5 (D) 4/3

Q37. For $y = 0.1 \sin(100\pi t - 2\pi x)$ (SI units), the wave speed is
(A) 100 m/s (B) 0.02 m/s
(C) 200 m/s (D) 50 m/s

Q38. The work done in moving a charge along an equipotential surface is

(A) infinite (B) zero
(C) positive (D) negative

Q39. Filling a parallel-plate capacitor fully with a dielectric of K = 4 makes its capacitance

(A) 1/4 times (B) unchanged
(C) 4 times (D) 2 times

Q40. Current in terms of drift velocity is

(A) $I = neAv_d$ (B) $I = neA/v_d$
(C) $I = nAv_d/e$ (D) $I = nev_d/A$

Q41. The field inside a long solenoid with 1000 turns/m carrying 2 A is

(A) $8\pi \times 10^{-7}$ T (B) $4\pi \times 10^{-4}$ T
(C) $2\pi \times 10^{-4}$ T (D) $8\pi \times 10^{-4}$ T

Q42. Lenz's law is a consequence of the conservation of

(A) energy (B) charge
(C) mass (D) momentum

Q43. An object is 20 cm in front of a concave mirror of focal length 10 cm. The image forms

(A) at infinity (B) 20 cm behind the mirror
(C) 10 cm in front of the mirror (D) 20 cm in front of the mirror

Q44. The threshold wavelength for a metal of work function 3.1 eV is

(A) 310 nm (B) 124 nm
(C) 620 nm (D) 400 nm

Q45. The mass number of a nucleus decreases by 4 in

(A) alpha decay (B) beta-plus decay
(C) gamma decay (D) beta-minus decay

Section B · Numerical value (enter the answer as a number)

Q46. Speed (in m/s) of a body after falling 20 m from rest ($g = 10$ m/s^2) is ____.

Q47. Gravitational PE (in J) of a 2 kg mass at a height of 5 m ($g = 10$ m/s^2) is ____.

Q48. Three 3 μF capacitors in series give an equivalent capacitance (in μF) of ____.

Q49. The number of half-lives for activity to fall to 1/16 of its initial value is ____.

Q50. The focal length (in cm) of a lens of power +2.5 D is ____.

Chemistry

Section A · Multiple choice (one correct option)

Q51. The empirical formula of glucose, $C_6H_{12}O_6$, is

(A) $C_2H_4O_2$ (B) CH_2O
(C) $C_6H_{12}O_6$ (D) CHO

Q52. The quantum numbers n = 2, l = 1 describe a

(A) 2p orbital (B) 2s orbital
(C) 3d orbital (D) 1p orbital

Q53. The H–O–H bond angle in water is about

(A) 120° (B) 104.5°
(C) 107° (D) 109.5°

Q54. Which molecule contains a triple bond?

(A) N_2 (B) O_2
(C) F_2 (D) Cl_2

Q55. Entropy increases during

(A) liquefaction of a gas (B) melting of ice
(C) condensation of steam (D) freezing of water

Q56. The conjugate base of HSO_4^- is

(A) SO_3^{2-} (B) SO_4^{2-}
(C) H_2SO_4 (D) HSO_3^-

Q57. Colligative properties depend on the

(A) colour of the solution (B) nature of the solute
(C) molar mass of the solvent (D) number of solute particles

Q58. In the electrolysis of molten NaCl, the product at the cathode is

(A) sodium metal (B) hydrogen gas
(C) chlorine gas (D) oxygen gas

Q59. For rate = $k[A]^2[B]$, the overall order is

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

Q60. The largest atom among Li, Na, K and Rb is

(A) Rb (B) K
(C) Li (D) Na

Q61. Zinc reacts with dilute H_2SO_4 to release

(A) H_2S (B) O_2
(C) SO_2 (D) H_2

Q62. The most common oxidation state of lanthanoids is

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

Q63. The geometry of $[Ni(CN)_4]^{2-}$ is
(A) tetrahedral (B) linear
(C) octahedral (D) square planar

Q64. The IUPAC name of $CH_3–CH(CH_3)–CH_3$ is
(A) 2-Methylpropane (B) 2-Methylbutane
(C) Butane (D) 1-Methylpropane

Q65. The most stable conformation of ethane is
(A) staggered (B) skew
(C) eclipsed (D) planar

Q66. A simple test for unsaturation in an alkene is that
(A) a red colour appears (B) it turns blue
(C) a white precipitate forms (D) bromine water is decolourised

Q67. Chloroform exposed to air and light slowly forms
(A) chloropicrin (B) phosgene
(C) methane (D) ethanol

Q68. Phenol is more acidic than ethanol because the phenoxide ion is
(A) less stable (B) resonance stabilised
(C) hydrogen bonded (D) more basic

Q69. The carbylamine test is given by
(A) secondary amines (B) amides
(C) tertiary amines (D) primary amines

Q70. Glucose and fructose are
(A) anomers (B) identical
(C) enantiomers (D) functional isomers

Section B · Numerical value (enter the answer as a number)

Q71. Moles of oxygen atoms in 2 mol of H_2SO_4 is ____.

Q72. The number of unpaired electrons in O_2 (MO theory) is ____.

Q73. The pH of a solution with $[H^+] = 1 \times 10^{-5}$ M is ____.

Q74. The number of chiral carbons in open-chain glucose is ____.

Q75. The molar mass of $CaCO_3$ (in g/mol) is ____.

Answer key

Q1 B	**Q2** A	**Q3** A	**Q4** A	**Q5** B
Q6 B	**Q7** D	**Q8** C	**Q9** D	**Q10** A
Q11 B	**Q12** D	**Q13** A	**Q14** A	**Q15** B
Q16 D	**Q17** C	**Q18** D	**Q19** A	**Q20** C
Q21 120	**Q22** 465	**Q23** 12	**Q24** 11	**Q25** 4
Q26 C	**Q27** C	**Q28** A	**Q29** A	**Q30** C
Q31 B	**Q32** A	**Q33** B	**Q34** A	**Q35** D
Q36 B	**Q37** D	**Q38** B	**Q39** C	**Q40** A
Q41 D	**Q42** A	**Q43** D	**Q44** D	**Q45** A
Q46 20	**Q47** 100	**Q48** 1	**Q49** 4	**Q50** 40
Q51 B	**Q52** A	**Q53** B	**Q54** A	**Q55** B
Q56 B	**Q57** D	**Q58** A	**Q59** C	**Q60** A
Q61 D	**Q62** C	**Q63** D	**Q64** A	**Q65** A
Q66 D	**Q67** B	**Q68** B	**Q69** D	**Q70** D
Q71 8	**Q72** 2	**Q73** 5	**Q74** 4	**Q75** 100

Solutions

Q1 · Mathematics · Answer: **(B) 0**
$i - 1 - i + 1 = 0$.

Q2 · Mathematics · Answer: **(A) 9**
Discriminant $36 - 4k = 0$.

Q3 · Mathematics · Answer: **(A) 6**
Product of the diagonal entries.

Q4 · Mathematics · Answer: **(A) 40 ways**
${}^5C_2 \times 4 = 40$.

Q5 · Mathematics · Answer: **(B) $20x^3$**
$T_4 = {}^6C_3 x^3 = 20x^3$.

Q6 · Mathematics · Answer: **(B) 5**
$b = (2 + 8)/2$.

Q7 · Mathematics · Answer: **(D) 4**
Cancel $(x - 2)$: limit is $x + 2 = 4$.

Q8 · Mathematics · Answer: **(C) sin 2x**
$2 \sin x \cos x = \sin 2x$.

Q9 · Mathematics · Answer: **(D) $e^x(x - 1) + C$**
By parts: $x e^x - e^x + C$.

Q10 · Mathematics · Answer: **(A) 5**
$\sqrt{(3^2 + 4^2)} = 5$.

Q11 · Mathematics · Answer: **(B) 3**
Highest derivative is the third.

Q12 · Mathematics · Answer: **(D) π/2**
Slopes 1 and −1 multiply to −1.

Q13 · Mathematics · Answer: **(A) 8**
$x^2 = 4ay$ with a = 2: latus rectum 4a = 8.

Q14 · Mathematics · Answer: **(A) (4, 2)**
((2 + 6)/2, (−4 + 8)/2).

Q15 · Mathematics · Answer: **(B) $\hat{k}$**
Right-handed system.

Q16 · Mathematics · Answer: **(D) (0, 0, 1)**
It makes 90°, 90°, 0° with the axes.

Q17 · Mathematics · Answer: **(C) 5**
Sorted: 1, 3, 5, 7, 9.

Q18 · Mathematics · Answer: **(D) 0.2**
P(A)P(B) = 0.2.

Q19 · Mathematics · Answer: **(A) −7/25**
$2\cos^2\theta - 1 = 18/25 - 1$.

Q20 · Mathematics · Answer: **(C) x ≥ 3**
x − 3 ≥ 0.

Q21 · Mathematics · Answer: **120**
${}^5P_4 = 120$.

Q22 · Mathematics · Answer: **465**
30 × 31/2 = 465.

Q23 · Mathematics · Answer: **12**
½ × 4 × 6 = 12.

Q24 · Mathematics · Answer: **11**
f′(x) = 4x + 3 = 11.

Q25 · Mathematics · Answer: **4**
|x| = 2 or 3, so x = ±2, ±3.

Q26 · Physics · Answer: **(C) N s**
Impulse = force × time.

Q27 · Physics · Answer: **(C) 48 km/h**
2 × 40 × 60/(40 + 60) = 48 km/h.

Q28 · Physics · Answer: **(A) $\tan^{-1}4$**
R = H gives tan θ = 4.

Q29 · Physics · Answer: **(A) 50 N**
$\mu_s mg = 0.5 \times 100$.

Q30 · Physics · Answer: **(C) 4 times**
$K = p^2/2m$.

Q31 · Physics · Answer: **(B) exchange velocities**
Standard result for equal masses.

Q32 · Physics · Answer: **(A) MR^2**
All mass is at distance R.

Q33 · Physics · Answer: **(B) 7.9 km/s**
$v = \sqrt{(gR)} \approx 7.9$ km/s.

Q34 · Physics · Answer: **(A) 10 m/s**
$A_1v_1 = A_2v_2$.

Q35 · Physics · Answer: **(D) Q = 0**
No heat exchange.

Q36 · Physics · Answer: **(B) 5/3**
(5/2)R ÷ (3/2)R.

Q37 · Physics · Answer: **(D) 50 m/s**
$v = \omega/k = 100\pi/2\pi$.

Q38 · Physics · Answer: **(B) zero**
$W = q\Delta V$ and $\Delta V = 0$.

Q39 · Physics · Answer: **(C) 4 times**
$C = K\varepsilon_0 A/d$.

Q40 · Physics · Answer: **(A) $I = neAv_d$**
Charge crossing an area per second.

Q41 · Physics · Answer: **(D) $8\pi \times 10^{-4}$ T**
$B = \mu_0 nI = 4\pi \times 10^{-7} \times 2000$.

Q42 · Physics · Answer: **(A) energy**
The induced current opposes the change that produces it.

Q43 · Physics · Answer: **(D) 20 cm in front of the mirror**
Object at 2f gives a real image at 2f.

Q44 · Physics · Answer: **(D) 400 nm**
$\lambda = 1240/3.1$ nm.

Q45 · Physics · Answer: **(A) alpha decay**
An α particle is ^{4}He.

Q46 · Physics · Answer: **20**
$v = \sqrt{(2gh)} = \sqrt{400}$.

Q47 · Physics · Answer: **100**
$mgh = 2 \times 10 \times 5$.

Q48 · Physics · Answer: **1**
$1/C = 3 \times (1/3)$.

Q49 · Physics · Answer: **4**
$(1/2)^4 = 1/16$.

Q50 · Physics · Answer: **40**
$f = 1/2.5$ m = 0.4 m.

Q51 · Chemistry · Answer: **(B) CH_2O**
Divide by 6.

Q52 · Chemistry · Answer: **(A) 2p orbital**
$l = 1$ is a p orbital.

Q53 · Chemistry · Answer: **(B) 104.5°**
Two lone pairs compress the tetrahedral angle.

Q54 · Chemistry · Answer: **(A) N_2**
N≡N.

Q55 · Chemistry · Answer: **(B) melting of ice**
Solid to liquid increases disorder.

Q56 · Chemistry · Answer: **(B) SO_4^{2-}**
Remove one H^+.

Q57 · Chemistry · Answer: **(D) number of solute particles**
Definition of colligative properties.

Q58 · Chemistry · Answer: **(A) sodium metal**
$Na^+ + e^- \rightarrow Na$.

Q59 · Chemistry · Answer: **(C) 3**
2 + 1 = 3.

Q60 · Chemistry · Answer: **(A) Rb**
Size increases down a group.

Q61 · Chemistry · Answer: **(D) H_2**
$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$.

Q62 · Chemistry · Answer: **(C) +3**
Characteristic Ln^{3+}.

Q63 · Chemistry · Answer: **(D) square planar**
Strong-field CN^- gives dsp^2.

Q64 · Chemistry · Answer: **(A) 2-Methylpropane**
Three-carbon chain with a methyl on C2.

Q65 · Chemistry · Answer: **(A) staggered**
Minimum torsional strain.

Q66 · Chemistry · Answer: **(D) bromine water is decolourised**
Br_2 adds across the C=C bond.

Q67 · Chemistry · Answer: **(B) phosgene**
Oxidation gives $COCl_2$.

Q68 · Chemistry · Answer: **(B) resonance stabilised**
Negative charge delocalises into the ring.

Q69 · Chemistry · Answer: **(D) primary amines**
$R–NH_2$ + $CHCl_3$ + KOH gives an isocyanide.

Q70 · Chemistry · Answer: **(D) functional isomers**
Aldohexose versus ketohexose, both $C_6H_{12}O_6$.

Q71 · Chemistry · Answer: **8**
4 O per molecule × 2.

Q72 · Chemistry · Answer: **2**
Two electrons in degenerate π* orbitals.

Q73 · Chemistry · Answer: **5**
$-\log(10^{-5})$.

Q74 · Chemistry · Answer: **4**
C2, C3, C4 and C5.

Q75 · Chemistry · Answer: **100**
40 + 12 + 48.