JEE Main 2027 Mock Test 2

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. If ω is a non-real cube root of unity, then $(1 + \omega)(1 + \omega^2)$ equals
(A) 0 (B) ω
(C) 1 (D) −1

Q2. The roots of $x^2 + px + 12 = 0$ differ by 1 and $p > 0$. Then p equals
(A) 7 (B) 8
(C) 1 (D) 12

Q3. If A is a 3 × 3 matrix with $|A| = 4$, then $|2A|$ equals
(A) 64 (B) 32
(C) 16 (D) 8

Q4. The number of diagonals of a decagon is
(A) 35 (B) 40
(C) 30 (D) 45

Q5. The sum of the coefficients in the expansion of $(3x - 2)^5$ is
(A) 0 (B) −1
(C) 32 (D) 1

Q6. The sum of the first 10 terms of the AP 3, 7, 11, … is
(A) 190 (B) 230
(C) 210 (D) 200

Q7. $\lim_{x \to 0} (e^{2x} - 1)/x$ equals
(A) 0 (B) 2
(C) 1 (D) 1/2

Q8. The function $f(x) = |x|$ at $x = 0$ is
(A) differentiable (B) continuous but not differentiable
(C) differentiable but not continuous (D) discontinuous

Q9. $\int_0^1 dx/(1 + x^2)$ equals
(A) π/4 (B) π/2
(C) 1 (D) ln 2

Q10. The slope of the tangent to $y = x^3 - 2x$ at $x = 1$ is
(A) −1 (B) 0
(C) 3 (D) 1

Q11. The integrating factor of $dy/dx + y/x = x^2$ is
(A) x (B) e^x
(C) 1/x (D) ln x

Q12. The centroid of the triangle with vertices (1, 2), (3, 4) and (5, 0) is
(A) (2, 3) (B) (3, 2)
(C) (3, 3) (D) (9, 6)

Q13. The eccentricity of the ellipse $x^2/25 + y^2/16 = 1$ is

(A) 5/3 (B) 3/5
(C) 16/25 (D) 4/5

Q14. The line through (2, 3) with slope 2 is

(A) $y = 3x - 2$ (B) $y = 2x + 3$
(C) $y = 2x - 1$ (D) $y = 2x + 1$

Q15. The angle between $a = 2\hat{i} - \hat{j} + \hat{k}$ and $b = \hat{i} + \hat{j} - \hat{k}$ is

(A) π/3 (B) π/2
(C) 0 (D) π

Q16. The distance of the point (1, 2, 3) from the origin is

(A) √14 (B) 14
(C) 6 (D) √6

Q17. The mean of the first n natural numbers is 10. Then n equals

(A) 19 (B) 21
(C) 10 (D) 20

Q18. A bag has 4 red and 6 blue balls. One ball is drawn at random. P(red) is

(A) 1/10 (B) 2/5
(C) 1/4 (D) 3/5

Q19. The value of tan 15° is

(A) 1/√3 (B) 2 + √3
(C) √3 − 1 (D) 2 − √3

Q20. The number of functions from a 3-element set to a 2-element set is

(A) 8 (B) 5
(C) 6 (D) 9

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

Q21. The number of ways to arrange 5 different books on a shelf is ____.

Q22. The 3rd term of a GP is 12 and the 5th term is 48 (r > 0). The first term is ____.

Q23. The value of $\int_0^2 4x^3\,dx$ is ____.

Q24. The number of terms in the expansion of $(a + b)^{12}$ is ____.

Q25. If $z = 3 + 4i$, then $|z|^2 + \mathrm{Re}(z)$ is ____.

Physics

Section A · Multiple choice (one correct option)

Q26. The number of significant figures in 2.0300 is

(A) 5 (B) 4
(C) 3 (D) 6

Q27. A body moving at 10 m/s decelerates at 2 m/s^2. It stops after

(A) 5 s (B) 20 s
(C) 2 s (D) 10 s

Q28. Two vectors of magnitudes 3 and 4 act at 90°. Their resultant is

(A) 5 (B) 1
(C) 12 (D) 7

Q29. The momentum of a 2 kg body moving at 4 m/s is

(A) 6 kg m/s (B) 16 kg m/s
(C) 2 kg m/s (D) 8 kg m/s

Q30. A 60 kg person stands in a lift accelerating upward at 2 m/s^2 ($g = 10\ m/s^2$). The apparent weight is

(A) 600 N (B) 120 N
(C) 480 N (D) 720 N

Q31. A machine does 600 J of work in 2 minutes. Its power is

(A) 1200 W (B) 5 W
(C) 10 W (D) 300 W

Q32. For a disc rolling without slipping, the fraction of its kinetic energy that is rotational is

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

Q33. The acceleration due to gravity at a depth R/2 below Earth's surface is

(A) g/4 (B) 2g
(C) g/2 (D) g

Q34. The SI unit of surface tension is

(A) kg/m (B) N/m^2
(C) N m (D) N/m

Q35. Heat needed to raise 2 kg of water by 10 °C ($c = 4200$ J/kg K) is

(A) 8.4 kJ (B) 42 kJ
(C) 840 kJ (D) 84 kJ

Q36. The number of degrees of freedom of a rigid diatomic molecule at room temperature is

(A) 3 (B) 5
(C) 7 (D) 6

Q37. A simple pendulum of length 1 m on a planet where $g = \pi^2\ m/s^2$ has period

(A) 2 s (B) 1 s
(C) 4 s (D) π s

Q38. A sound wave has frequency 500 Hz and wavelength 0.68 m. Its speed is
(A) 170 m/s (B) 340 m/s
(C) 500 m/s (D) 680 m/s

Q39. The electric field inside a charged conducting sphere is
(A) kq/R^2 (B) infinite
(C) zero (D) kq/r^2

Q40. The equivalent of 4 Ω and 12 Ω in parallel is
(A) 8 Ω (B) 16 Ω
(C) 4 Ω (D) 3 Ω

Q41. A 2 m wire carrying 3 A lies perpendicular to a 0.5 T field. The force on it is
(A) 0.75 N (B) 3 N
(C) 1.5 N (D) 6 N

Q42. The peak value of a 220 V (rms) AC supply is about
(A) 156 V (B) 220 V
(C) 440 V (D) 311 V

Q43. The critical angle for a medium of refractive index 1.5 is
(A) $\sin^{-1}(1/3)$ (B) $\sin^{-1}(2/3)$
(C) $\sin^{-1}(3/4)$ (D) 45°

Q44. The energy of the electron in the second orbit of hydrogen is
(A) −13.6 eV (B) −1.51 eV
(C) −3.4 eV (D) −6.8 eV

Q45. For a full-wave rectifier fed with 50 Hz AC, the output ripple frequency is
(A) 100 Hz (B) 200 Hz
(C) 25 Hz (D) 50 Hz

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

Q46. A stone dropped from rest falls for 3 s ($g = 10\ m/s^2$). Distance fallen (in m) is ____.

Q47. A 1 kg mass on a spring of constant 400 N/m oscillates. ω (in rad/s) is ____.

Q48. Kinetic energy (in J) of a 0.5 kg ball moving at 10 m/s is ____.

Q49. A wire has $\rho = 2 \times 10^{-8}\ \Omega$ m, length 10 m and area 1 mm^2. Its resistance (in Ω) is ____.

Q50. Energy (in eV) of a photon of wavelength 248 nm ($hc = 1240$ eV nm) is ____.

Chemistry

Section A · Multiple choice (one correct option)

Q51. The number of oxygen atoms in 0.5 mol of O_2 is
(A) 1.2044×10^{24} (B) 3.011×10^{23}
(C) 6.022×10^{23} (D) 1.5×10^{23}

Q52. The maximum number of electrons in a d subshell is
(A) 6 (B) 10
(C) 2 (D) 14

Q53. The hybridisation of N in NH_3 is
(A) dsp^2 (B) sp^3
(C) sp^2 (D) sp

Q54. Which molecule has zero dipole moment?
(A) NH_3 (B) H_2O
(C) HCl (D) CO_2

Q55. For an exothermic reaction, ΔH is
(A) always equal to ΔU (B) negative
(C) zero (D) positive

Q56. The pH of 0.01 M NaOH at 25 °C is
(A) 10 (B) 2
(C) 12 (D) 13

Q57. One mole of solute is dissolved in 500 g of water. The molality is
(A) 4 m (B) 1 m
(C) 0.5 m (D) 2 m

Q58. The oxidation number of Mn in $KMnO_4$ is
(A) +2 (B) +4
(C) +6 (D) +7

Q59. The half-life of a zero-order reaction is
(A) $[A]_0/2k$ (B) $0.693/k$
(C) $1/(k[A]_0)$ (D) $2k/[A]_0$

Q60. Across a period from left to right, ionisation enthalpy generally
(A) first decreases then increases (B) decreases
(C) stays the same (D) increases

Q61. The strongest oxidising agent among the halogens is
(A) F_2 (B) I_2
(C) Br_2 (D) Cl_2

Q62. The intense colour of $KMnO_4$ is due to
(A) d–d transitions (B) charge transfer
(C) unpaired electrons on Mn (D) the K^+ ion

Q63. The coordination number of Ni in $[Ni(CO)_4]$ is

(A) 4 (B) 2
(C) 6 (D) 8

Q64. Halogens in Lassaigne's extract are detected with

(A) silver nitrate (B) lead acetate
(C) sodium nitroprusside (D) ferric chloride

Q65. The number of structural isomers of C_4H_{10} is

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

Q66. Benzene mainly undergoes

(A) electrophilic addition (B) free-radical addition
(C) nucleophilic substitution (D) electrophilic substitution

Q67. Ethyl bromide with aqueous KOH mainly gives

(A) ethanol (B) ethane
(C) ethene (D) diethyl ether

Q68. Aldehydes can be distinguished from ketones using

(A) Lucas reagent (B) Tollens' reagent
(C) Hinsberg's reagent (D) ferric chloride

Q69. The most basic compound in aqueous solution is

(A) NH_3 (B) $C_6H_5NH_2$
(C) $(CH_3)_2NH$ (D) CH_3NH_2

Q70. Amino acids in proteins are joined by

(A) glycosidic linkages (B) ester linkages
(C) phosphodiester linkages (D) peptide linkages

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

Q71. Moles of water formed when 4 mol of H_2 burn in excess O_2 is ____.

Q72. The number of lone pairs on Xe in XeF_2 is ____.

Q73. For $\Delta H = -100$ kJ and $\Delta S = -200$ J/K at 300 K, ΔG (in kJ) is ____.

Q74. Moles of electrons needed to deposit 1 mol of Al from Al^{3+} is ____.

Q75. Mass (in g) of NaOH in 250 mL of 0.4 M solution is ____.

Answer key

Q1 C	**Q2** A	**Q3** B	**Q4** A	**Q5** D
Q6 C	**Q7** B	**Q8** B	**Q9** A	**Q10** D
Q11 A	**Q12** B	**Q13** B	**Q14** C	**Q15** B
Q16 A	**Q17** A	**Q18** B	**Q19** D	**Q20** A
Q21 120	**Q22** 3	**Q23** 16	**Q24** 13	**Q25** 28
Q26 A	**Q27** A	**Q28** A	**Q29** D	**Q30** D
Q31 B	**Q32** D	**Q33** C	**Q34** D	**Q35** D
Q36 B	**Q37** A	**Q38** B	**Q39** C	**Q40** D
Q41 B	**Q42** D	**Q43** B	**Q44** C	**Q45** A
Q46 45	**Q47** 20	**Q48** 25	**Q49** 0.2	**Q50** 5
Q51 C	**Q52** B	**Q53** B	**Q54** D	**Q55** B
Q56 C	**Q57** D	**Q58** D	**Q59** A	**Q60** D
Q61 A	**Q62** B	**Q63** A	**Q64** A	**Q65** D
Q66 D	**Q67** A	**Q68** B	**Q69** C	**Q70** D
Q71 4	**Q72** 3	**Q73** −40	**Q74** 3	**Q75** 4

Solutions

Q1 · Mathematics · Answer: **(C) 1**
$1 + \omega + \omega^2 + \omega^3 = 0 + 1 = 1$.

Q2 · Mathematics · Answer: **(A) 7**
$(\alpha - \beta)^2 = p^2 - 48 = 1$, so $p = 7$.

Q3 · Mathematics · Answer: **(B) 32**
$|kA| = k^n|A| = 8 \times 4 = 32$.

Q4 · Mathematics · Answer: **(A) 35**
$n(n - 3)/2 = 10 \times 7/2 = 35$.

Q5 · Mathematics · Answer: **(D) 1**
Put $x = 1$: $(3 - 2)^5 = 1$.

Q6 · Mathematics · Answer: **(C) 210**
$S = (10/2)[2(3) + 9(4)] = 5 \times 42 = 210$.

Q7 · Mathematics · Answer: **(B) 2**
$2 \times (e^{2x} - 1)/(2x) \to 2$.

Q8 · Mathematics · Answer: **(B) continuous but not differentiable**
Left derivative $-1 \neq$ right derivative 1, but the limit equals $f(0) = 0$.

Q9 · Mathematics · Answer: **(A) π/4**
$\tan^{-1}1 - \tan^{-1}0 = \pi/4$.

Q10 · Mathematics · Answer: **(D) 1**
$dy/dx = 3x^2 - 2 = 1$ at $x = 1$.

Q11 · Mathematics · Answer: **(A) x**
IF = $e^{\int(1/x)dx} = e^{\ln x} = x$.

Q12 · Mathematics · Answer: **(B) (3, 2)**
((1 + 3 + 5)/3, (2 + 4 + 0)/3) = (3, 2).

Q13 · Mathematics · Answer: **(B) 3/5**
e = √(1 − 16/25) = 3/5.

Q14 · Mathematics · Answer: **(C) y = 2x − 1**
y − 3 = 2(x − 2), so y = 2x − 1.

Q15 · Mathematics · Answer: **(B) π/2**
a · b = 2 − 1 − 1 = 0, so they are perpendicular.

Q16 · Mathematics · Answer: **(A) √14**
√(1 + 4 + 9) = √14.

Q17 · Mathematics · Answer: **(A) 19**
(n + 1)/2 = 10, so n = 19.

Q18 · Mathematics · Answer: **(B) 2/5**
4/10 = 2/5.

Q19 · Mathematics · Answer: **(D) 2 − √3**
tan(45° − 30°) = (1 − 1/√3)/(1 + 1/√3) = 2 − √3.

Q20 · Mathematics · Answer: **(A) 8**
Each of 3 elements has 2 choices: $2^3 = 8$.

Q21 · Mathematics · Answer: **120**
5! = 120.

Q22 · Mathematics · Answer: **3**
$r^2 = 48/12 = 4$, r = 2; a × 4 = 12, so a = 3.

Q23 · Mathematics · Answer: **16**
$[x^4]$ from 0 to 2 = 16.

Q24 · Mathematics · Answer: **13**
n + 1 = 13.

Q25 · Mathematics · Answer: **28**
$|z|^2 = 25$ and Re(z) = 3.

Q26 · Physics · Answer: **(A) 5**
Trailing zeros after the decimal point are significant.

Q27 · Physics · Answer: **(A) 5 s**
t = u/a = 10/2 = 5 s.

Q28 · Physics · Answer: **(A) 5**
√(9 + 16) = 5.

Q29 · Physics · Answer: **(D) 8 kg m/s**
p = mv = 8 kg m/s.

Q30 · Physics · Answer: **(D) 720 N**
N = m(g + a) = 60 × 12 = 720 N.

Q31 · Physics · Answer: **(B) 5 W**
P = 600/120 = 5 W.

Q32 · Physics · Answer: **(D) 1/3**
$K_{rot} = ¼mv^2$, total = $¾mv^2$.

Q33 · Physics · Answer: **(C) g/2**
$g_d = g(1 - d/R) = g/2$.

Q34 · Physics · Answer: **(D) N/m**
Force per unit length.

Q35 · Physics · Answer: **(D) 84 kJ**
$Q = mc\Delta T = 2 \times 4200 \times 10 = 84\,000$ J.

Q36 · Physics · Answer: **(B) 5**
3 translational + 2 rotational.

Q37 · Physics · Answer: **(A) 2 s**
$T = 2\pi\sqrt{(1/\pi^2)} = 2$ s.

Q38 · Physics · Answer: **(B) 340 m/s**
$v = f\lambda = 340$ m/s.

Q39 · Physics · Answer: **(C) zero**
Charge resides on the surface; E = 0 inside a conductor.

Q40 · Physics · Answer: **(D) 3 Ω**
$(4 \times 12)/(4 + 12) = 3\ \Omega$.

Q41 · Physics · Answer: **(B) 3 N**
$F = BIL = 0.5 \times 3 \times 2 = 3$ N.

Q42 · Physics · Answer: **(D) 311 V**
$V_0 = \sqrt{2} \times 220 \approx 311$ V.

Q43 · Physics · Answer: **(B) $\sin^{-1}(2/3)$**
$\sin C = 1/n = 2/3$.

Q44 · Physics · Answer: **(C) −3.4 eV**
$E_n = -13.6/n^2 = -13.6/4$.

Q45 · Physics · Answer: **(A) 100 Hz**
Both half-cycles are rectified, doubling the frequency.

Q46 · Physics · Answer: **45**
$s = \frac{1}{2}gt^2 = \frac{1}{2} \times 10 \times 9 = 45$ m.

Q47 · Physics · Answer: **20**
$\omega = \sqrt{(k/m)} = \sqrt{400} = 20$.

Q48 · Physics · Answer: **25**
$\frac{1}{2} \times 0.5 \times 100 = 25$ J.

Q49 · Physics · Answer: **0.2**
$R = \rho L/A = 2 \times 10^{-8} \times 10/10^{-6} = 0.2\ \Omega$.

Q50 · Physics · Answer: **5**
$E = 1240/248 = 5$ eV.

Q51 · Chemistry · Answer: **(C) 6.022×10^{23}**
0.5 mol O_2 contains 1 mol O atoms.

Q52 · Chemistry · Answer: **(B) 10**
$2(2l + 1)$ with $l = 2$ gives 10.

Q53 · Chemistry · Answer: **(B) sp^3**
3 bond pairs + 1 lone pair.

Q54 · Chemistry · Answer: **(D) CO_2**
Linear CO_2: bond dipoles cancel.

Q55 · Chemistry · Answer: **(B) negative**
Heat is released.

Q56 · Chemistry · Answer: **(C) 12**
pOH = 2, so pH = 14 − 2 = 12.

Q57 · Chemistry · Answer: **(D) 2 m**
1 mol/0.5 kg = 2 mol/kg.

Q58 · Chemistry · Answer: **(D) +7**
+1 + x + 4(−2) = 0, so x = +7.

Q59 · Chemistry · Answer: **(A) $[A]_0/2k$**
From $[A] = [A]_0 - kt$.

Q60 · Chemistry · Answer: **(D) increases**
Effective nuclear charge increases.

Q61 · Chemistry · Answer: **(A) F_2**
F_2 has the highest standard reduction potential.

Q62 · Chemistry · Answer: **(B) charge transfer**
Mn(VII) is d^0; the colour comes from ligand-to-metal charge transfer.

Q63 · Chemistry · Answer: **(A) 4**
Four CO ligands.

Q64 · Chemistry · Answer: **(A) silver nitrate**
AgX precipitates form.

Q65 · Chemistry · Answer: **(D) 2**
n-Butane and 2-methylpropane.

Q66 · Chemistry · Answer: **(D) electrophilic substitution**
Substitution keeps the aromatic ring intact.

Q67 · Chemistry · Answer: **(A) ethanol**
S_N2 substitution by OH^-.

Q68 · Chemistry · Answer: **(B) Tollens' reagent**
Aldehydes give a silver mirror; ketones do not.

Q69 · Chemistry · Answer: **(C) $(CH_3)_2NH$**
Combined inductive and solvation effects make the secondary amine most basic.

Q70 · Chemistry · Answer: **(D) peptide linkages**
–CO–NH– bonds.

Q71 · Chemistry · Answer: **4**
$2H_2 + O_2 \rightarrow 2H_2O$: 1 mol H_2 gives 1 mol H_2O.

Q72 · Chemistry · Answer: **3**
Xe has 8 valence electrons; 2 bonds leave 3 lone pairs.

Q73 · Chemistry · Answer: **−40**
ΔG = −100 − 300 × (−0.2) = −40 kJ.

Q74 · Chemistry · Answer: **3**
$Al^{3+} + 3e^- \rightarrow Al$.

Q75 · Chemistry · Answer: **4**
0.4 × 0.25 = 0.1 mol × 40 g/mol = 4 g.