

THE VOLUME EDUCATION ACADEMY

Excellence in Engineering & Medical Entrance Preparation

JEE ADVANCED MOCK TEST — ANSWER SHEET & SOLUTIONS

Physics | Chemistry | Mathematics | Evaluator Copy — Do Not Distribute to Candidates

QUICK ANSWER KEY

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	B	3	A	4	B	5	D
6	A	7	A, B, D	8	A, B, C, D	9	A, C, D	10	A, B, C
11	20	12	2	13	4	14	3	15	1
16	A	17	C	18	A	19	A	20	B
21	C	22	A, B, D	23	A, B, C	24	A, B, D	25	A, B, C
26	3	27	7	28	8	29	6	30	4
31	C	32	B	33	B	34	B	35	A
36	B	37	B, D	38	A, B, C, D	39	A, B, C	40	A, B, C, D
41	2	42	12	43	10	44	30	45	0

Section	Correct	Wrong	Unattempted
Section 1 (Single Correct)	+3	-1	0
Section 2 (Multi Correct)	+4 / Partial	-2	0
Section 3 (Integer Type)	+4	0	0

DETAILED SOLUTIONS — SUBJECT WISE

■ PHYSICS

SECTION 1 — Single Correct Answer Type (Q.1 to Q.6)

Q1	Correct Answer: A	✓ +Mark
Solution: Time: $h = \frac{1}{2}gt^2 \rightarrow 80 = \frac{1}{2}(10)t^2 \rightarrow t = 4 \text{ s}$. Range = $20 \times 4 = 80 \text{ m}$.		
Q2	Correct Answer: B	✓ +Mark
Solution: In series, charge is same. $V \propto 1/C$. $V_1/V_2 = C_2/C_1 = 6/4$. So $V_2 = (6/10) \times 100 = 60 \text{ V}$ across $4 \mu\text{F}$.		
Q3	Correct Answer: A	✓ +Mark
Solution: Each half has resistance $R/2$. Two halves in parallel: $R_{\text{eff}} = (R/2)(R/2)/(R/2 + R/2) = R/4$.		
Q4	Correct Answer: B	✓ +Mark
Solution: $\beta = \lambda D/d = (500 \times 10^{-9} \times 1)/(0.5 \times 10^{-3}) = 1.0 \times 10^{-3} \text{ m} = 1.0 \text{ mm}$.		
Q5	Correct Answer: D	✓ +Mark
Solution: $\lambda = h/\sqrt{2meV} \propto 1/\sqrt{V}$. As potential increases, wavelength decreases as $1/\sqrt{V}$.		

Q6	Correct Answer: A	✓ +Mark
Solution: $KE = \frac{1}{2}I\omega^2$. If $KE \rightarrow 2KE$ with same I : $2 \times \frac{1}{2}I\omega^2 = \frac{1}{2}I\omega'^2 \rightarrow \omega' = \omega\sqrt{2}$.		
SECTION 2 — One or More Correct Answer(s) Type (Q.7 to Q.10)		
Q7	Correct Answer: A, B, D	✓ +Mark
Solution: $v = A\omega \cos(\omega t)$: max at $t=0$ ($x=0$) $\rightarrow$ A correct. $a = -\omega^2 x$: zero at $x=0 \rightarrow$ B correct. KE is max at $x=0$, min at extreme $\rightarrow$ C wrong. Total $E = \frac{1}{2}m\omega^2 A^2 \rightarrow$ D correct.		
Q8	Correct Answer: A, B, C, D	✓ +Mark
Solution: Magnetic force is always perpendicular to velocity, so it does no work. Hence speed, KE, and $ p $ all remain constant. But direction changes continuously $\rightarrow$ circular/helical path. All options correct.		
Q9	Correct Answer: A, C, D	✓ +Mark
Solution: Stopping potential $V_{\text{stop}} = (h\nu - \phi)/e$. It depends on frequency ν (A), work function ϕ (C), and nature of surface determines ϕ (D). Intensity affects current, not stopping potential $\rightarrow$ B wrong.		
Q10	Correct Answer: A, B, C	✓ +Mark
Solution: Isothermal: $T = \text{const} \rightarrow \Delta U = 0$ for ideal gas (A). By first law $Q = \Delta U + W = W$ (B). Boyle's law: $PV = nRT = \text{const}$ (C). Temperature doesn't change $\rightarrow$ D wrong.		
SECTION 3 — Integer Answer Type (Q.11 to Q.15)		
Q11	Correct Answer: 20	✓ +Mark
Solution: $H = u^2/2g = (20)^2/(2 \times 10) = 400/20 = 20$ m.		
Q12	Correct Answer: 2	✓ +Mark
Solution: $R_{\text{eq}} = (3 \times 6)/(3+6) = 18/9 = 2 \Omega$.		
Q13	Correct Answer: 4	✓ +Mark
Solution: Number of half-lives = $8/4 = 2$. Fraction = $(1/2)^2 = 1/4$, so $N = 4$.		
Q14	Correct Answer: 3	✓ +Mark
Solution: $E = hc/\lambda = (6.6 \times 10^{-34} \times 3 \times 10^8)/(6 \times 10^{-7}) = 3.3 \times 10^{-19} \text{ J} \approx 3 \times 10^{-19} \text{ J}$, so $n = 3$.		
Q15	Correct Answer: 1	✓ +Mark
Solution: $\omega = 1/\sqrt{LC} = 1/\sqrt{1 \times 1} = 1 \text{ rad/s}$.		

■ CHEMISTRY

SECTION 1 — Single Correct Answer Type (Q.16 to Q.21)

Q16	Correct Answer: A	✓ +Mark
Solution: CO_2 : two double bonds ($\text{C}=\text{O}$), no lone pairs on C $\rightarrow$ sp hybridisation, linear shape with bond angle 180° .		
Q17	Correct Answer: C	✓ +Mark
Solution: Boiling point increases with molar mass due to stronger London dispersion forces. C_4H_{10} (butane) has highest molar mass among options.		

Q18	Correct Answer: A	✓ +Mark
Solution: $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2\uparrow$. Sodium reacts vigorously with water, producing sodium hydroxide and hydrogen gas.		
Q19	Correct Answer: A	✓ +Mark
Solution: Number from end nearest -OH: C1-C2(OH)-C3-C4 → 2-butanol. Parent chain = butane, -OH at C2.		
Q20	Correct Answer: B	✓ +Mark
Solution: The azimuthal quantum number l determines orbital shape: $l=0 \rightarrow s$ (sphere), $l=1 \rightarrow p$ (dumbbell), $l=2 \rightarrow d$, etc.		
Q21	Correct Answer: C	✓ +Mark
Solution: HCl is strong acid: $[\text{H}^+] = 0.001 \text{ M} = 10^{-3} \text{ M}$. $\text{pH} = -\log[\text{H}^+] = -\log(10^{-3}) = 3$.		
SECTION 2 — One or More Correct Answer(s) Type (Q.22 to Q.25)		
Q22	Correct Answer: A, B, D	✓ +Mark
Solution: Ionic compounds have high MP due to strong electrostatic forces (A). In molten state, ions are free → conduct electricity (B). They dissolve in polar solvents, not non-polar (C wrong). In aqueous solution, ions are free → conduct (D).		
Q23	Correct Answer: A, B, C	✓ +Mark
Solution: Exothermic: heat released, so $\Delta H < 0$ (A). Products at lower energy level (B). Heat released to surroundings (C). $\Delta G = \Delta H - T\Delta S$; ΔG negative only if $T\Delta S < \Delta H \rightarrow D$ not always true.		
Q24	Correct Answer: A, B, D	✓ +Mark
Solution: Alkenes have formula C_nH_{2n} . C_2H_4 ($n=2$): $2 \times 2 = 4$ ✓. C_3H_6 ($n=3$): $2 \times 3 = 6$ ✓. C_4H_{10} is butane (alkane, $\text{C}_n\text{H}_{2n+2}$) ✗. C_5H_{10} ($n=5$): $2 \times 5 = 10$ ✓.		
Q25	Correct Answer: A, B, C	✓ +Mark
Solution: Rate increases with temperature (more collisions, more energetic) (A), higher concentration (B), and catalyst (lowers E_a) (C). Colour has no effect on reaction rate (D wrong).		
SECTION 3 — Integer Answer Type (Q.26 to Q.30)		
Q26	Correct Answer: 3	✓ +Mark
Solution: $\text{HC}\equiv\text{CH}$: $\text{H}-\text{C}$ σ bond (1) + $\text{C}\equiv\text{C}$ has 1 σ + 2 π bonds + $\text{C}-\text{H}$ σ bond (1) = 3 sigma bonds total.		
Q27	Correct Answer: 7	✓ +Mark
Solution: K is +1, O is -2. $+1 + x + 4(-2) = 0 \rightarrow x = +7$. Mn has oxidation state +7.		
Q28	Correct Answer: 8	✓ +Mark
Solution: Ar: 2,8,8. The outermost (third) shell contains 8 electrons — the octet configuration.		
Q29	Correct Answer: 6	✓ +Mark
Solution: $1 \text{ mol C}_2\text{H}_2 \rightarrow 3 \text{ mol CO}_2$. So $2 \text{ mol C}_2\text{H}_2 \rightarrow 6 \text{ mol CO}_2$.		
Q30	Correct Answer: 4	✓ +Mark
Solution: The element has 4 electron shells (2,8,8,1) → Period 4. This is potassium ($Z=19$).		

SECTION 1 — Single Correct Answer Type (Q.31 to Q.36)

Q31	Correct Answer: C	✓ +Mark
Solution: $\lim_{x \rightarrow 0} \sin(3x)/x = \lim_{x \rightarrow 0} 3 \cdot \sin(3x)/(3x) = 3 \cdot 1 = 3$, using standard limit $\sin(\theta)/\theta \rightarrow 1$.		
Q32	Correct Answer: B	✓ +Mark
Solution: $\det(A) = (1)(4) - (2)(3) = 4 - 6 = -2$.		
Q33	Correct Answer: B	✓ +Mark
Solution: $\sin(x) = x/2$. At $x=0$: both sides 0. For $x \in (0, \pi]$: $\sin(x) > 0$ and decreasing from 1, while $x/2$ increases from 0. They intersect exactly once (besides $x=0$) — one solution in $(0, \pi]$.		
Q34	Correct Answer: B	✓ +Mark
Solution: Let $y = x^x$. $\ln y = x \ln x$. Differentiating: $(1/y)(dy/dx) = \ln x + 1$. So $dy/dx = x^x(1 + \ln x)$.		
Q35	Correct Answer: A	✓ +Mark
Solution: Intersection: $x^2 = x \rightarrow x = 0, 1$. Area = $\int_0^1 (x - x^2) dx = [x^2/2 - x^3/3]_0^1 = 1/2 - 1/3 = 1/6$.		
Q36	Correct Answer: B	✓ +Mark
Solution: Standard form: $(x - h)^2 + (y - k)^2 = r^2$. Centre $(2, -3)$: $(x - 2)^2 + (y + 3)^2 = 25$.		

SECTION 2 — One or More Correct Answer(s) Type (Q.37 to Q.40)

Q37	Correct Answer: B, D	✓ +Mark
Solution: $\sin(x)/x$: limit is 1 but $f(0)$ undefined $\rightarrow$ not continuous at 0 (A wrong). $ x $ is continuous everywhere (B correct). $1/x$: undefined at 0 (C wrong). $x \cdot \sin(1/x)$: bounded by $ x \rightarrow$ limit 0, define $f(0)=0 \rightarrow$ continuous (D correct).		
Q38	Correct Answer: A, B, C, D	✓ +Mark
Solution: Standard parabola $y^2 = 4ax$: Focus $(a, 0)$ (A ✓), Directrix $x = -a$ (B ✓), Vertex at $(0,0)$ (C ✓), Axis is x-axis (D ✓). All four are correct.		
Q39	Correct Answer: A, B, C	✓ +Mark
Solution: $\det(A) = 0$ means A is singular (A), so inverse doesn't exist (B). Rows are linearly dependent (C). But A need not be zero matrix (D wrong — e.g., $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$).		
Q40	Correct Answer: A, B, C, D	✓ +Mark
Solution: All four are standard integration results: $\int \sin x = -\cos x + C$ (A), $\int e^x = e^x + C$ (B), $\int (1/x) = \ln x + C$ (C), Power rule (D). All correct.		

SECTION 3 — Integer Answer Type (Q.41 to Q.45)

Q41	Correct Answer: 2	✓ +Mark
Solution: Discriminant $= 25 - 24 = 1 > 0$. Two distinct real roots: $x = 2$ and $x = 3$.		
Q42	Correct Answer: 12	✓ +Mark
Solution: $f'(x) = 3x^2$. $f'(2) = 3(4) = 12$.		
Q43	Correct Answer: 10	✓ +Mark
Solution: $nCr = 5!/(3! \times 2!) = (5 \times 4)/(2 \times 1) = 10$.		
Q44	Correct Answer: 30	✓ +Mark
Solution: $S = n/2 \times (a + l) = 5/2 \times (2 + 10) = 5/2 \times 12 = 30$.		

Q45**Correct Answer: 0****✓ +Mark****Solution:** $|z|^2 = 3^2 + b^2 = 9$. So $b^2 = 0$, $b = 0$. $|b| = 0$.