Interactive Practice & Step-by-Step Solutions: Practice chapter-wise PYQs with timer & full explanation on The Crucible.

Open on The Crucible ↗

Application of Derivatives — Mean Value Theorem · WBJEE 2023 PYQ Practice on Crucible ↗

1. Let $f:[1,3]\to\mathbb{R}$ be continuous and be derivable in $(1,3)$ and $f'(x)=[f(x)]^2+4\forall x\in(1,3)$. Then

(A) $f(3)-f(1)=5$ holds

(B) $f(3)-f(1)=5$ does not hold

(C) $f(3)-f(1)=3$ holds

(D) $f(3)-f(1)=4$ holds

Limits — Algebraic and Rational Limits · WBJEE 2023 PYQ Practice on Crucible ↗

2. $f(x)$ is a differentiable function and given $f'(2)=6$ and $f'(1)=4$, then $L=\lim_{h\to0}\frac{f\left(2+2h+h^2\right)-f(2)}{f(1+h-h^2)-f(1)}$

(A) does not exist

(B) equal to -3

(C) equal to 3

(D) equal to $3/2$

Indefinite Integration — Miscellaneous Forms · WBJEE 2023 PYQ Practice on Crucible ↗

3. If $I=\int\frac{x^2dx}{(x\sin x+\cos x)^2}=f(x)+\tan x+c$, then $f(x)$ is

(A) $\frac{\sin x}{x\sin x+\cos x}$

(B) $\frac{1}{(x\sin x+\cos x)^2}$

(C) $\frac{-x}{\cos x(x\sin x+\cos x)}$

(D) $\frac{1}{\sin x(x\cos x+\sin x)}$

Definite Integration — Miscellaneous · WBJEE 2023 PYQ Practice on Crucible ↗

4. The expression $\frac{\int_0^n[x]dx}{\int_0^n\{x\}dx}$, where $[x]$ and $\{x\}$ are respectively integral and fractional part of x and $n\in\mathbb{N}$, is equal to

(A) $\frac{1}{n-1}$

(B) $\frac{1}{n}$

(C) n

(D) $n-1$

Differential Equations · WBJEE 2023 PYQ Practice on Crucible ↗

5. If $y=\frac{x}{\log_e|cx|}$ is the solution of the differential equation $\frac{dy}{dx}=\frac{y}{x}+\phi\left(\frac{x}{y}\right)$, then $\phi\left(\frac{x}{y}\right)$ is given by

(A) $\frac{y^2}{x^2}$

(B) $-\frac{y^2}{x^2}$

(C) $\frac{x^2}{y^2}$

(D) $-\frac{x^2}{y^2}$

Differentiation — Higher order derivatives · WBJEE 2023 PYQ Practice on Crucible ↗

6. The function $y = e^{kx}$ satisfies $\left(\frac{d^2y}{dx^2} + \frac{dy}{dx}\right)\left(\frac{dy}{dx} - y\right) = y\frac{dy}{dx}$. It is valid for

(A) exactly one value of k
(B) two distinct values of k
(C) three distinct values of k
(D) infinitely many values of k

Hyperbola — Tangent to hyperbola · WBJEE 2023 PYQ Practice on Crucible ↗

7. If a hyperbola passes through the point $\mathrm{P}(\sqrt{2}, \sqrt{3})$ and foci at $(\pm 2, 0)$ then the tangent to this hyperbola at P is

(A) $\mathrm{y} = \mathrm{x}\sqrt{6} - \sqrt{3}$
(B) $\mathrm{y} = \mathrm{x}\sqrt{3} - \sqrt{6}$
(C) $\mathrm{y} = \mathrm{x}\sqrt{6} + \sqrt{3}$
(D) $y = x\sqrt{3} + \sqrt{6}$

Properties of Triangles · WBJEE 2023 PYQ Practice on Crucible ↗

8. A, B are fixed points with coordinates $(0, a)$ and $(0, b)(a > 0, b > 0)$. P is variable point $(x, 0)$ referred to rectangular axis. If the angle $\angle \mathrm{APB}$ is maximum, then

(A) $x^2 = ab$
(B) $x^2 = a + b$
(C) $x = \frac{1}{ab}$
(D) $x = \frac{a+b}{2}$

Vector Algebra — Scalar Triple Product · WBJEE 2023 PYQ Practice on Crucible ↗

9. The value of ' a ' for which the scalar triple product formed by the vectors $\vec{a} = \hat{i} + a\hat{j} + \hat{k}, \vec{\beta} = \hat{j} + a\hat{k}$ and $\vec{\gamma} = a\hat{i} + \hat{k}$ is maximum, is

(A) 3
(B) -3
(C) $-\frac{1}{\sqrt{3}}$
(D) $\frac{1}{\sqrt{3}}$

Permutation Combination — Arrangement under Constraint · WBJEE 2023 PYQ Practice on Crucible ↗

10. The number of ways in which the letters of the word 'VERTICAL' can be arranged without changing the order of the vowels is

(A) $6! \times 3!$
(B) $\frac{8!}{3}$
(C) $6! \times 3$
(D) $\frac{8!}{3!}$

Probability · WBJEE 2023 PYQ Practice on Crucible ↗

11. Let S be the sample space of the random experiment of throwing simultaneously two unbiased dice and $E_k = \{a, b) \in S : ab = k\}$. If $p_k = P(E_k)$, then the correct among the following is :

(A) $p_1 < p_{10} < p_4$ **(B)** $\mathrm{p_2 < p_8 < p_{14}}$

(C) $\mathrm{p_4 < p_8 < p_{17}}$ **(D)** $\mathrm{p_2 < p_{16} < p_5}$

Trigonometric Equations — Solving Trigonometric Equation · WBJEE 2023 PYQ Practice on Crucible ↗

12. If $\frac{1}{6}\sin\theta, \cos\theta, \tan\theta$ are in G.P., then the solution set of θ is

(A) $\mathrm{2n\pi \pm \frac{\pi}{6}}$ **(B)** $\mathrm{2n\pi \pm \frac{\pi}{3}}$

(C) $\mathrm{n\pi + (-1)^n \frac{\pi}{3}}$ **(D)** $\mathrm{n\pi + \frac{\pi}{3}}$

Kinetic Theory of Gases — Speed of Gas · WBJEE 2023 PYQ Practice on Crucible ↗

13. Six molecules of an ideal gas have velocities $1, 3, 5, 5, 6$ and $5\ \mathrm{m/s}$ respectively. At any given temperature, if $\overline{V}$ and V_{rms} represent average and rms speed of the molecules, then

(A) $\overline{V} = 5\ \mathrm{m/s}$ **(B)** $V_{rms} > \overline{V}$

(C) $V_{\mathrm{rms}}^2 < \overline{V}^2$ **(D)** $V_{rms} = \overline{V}$

Atomic Physics — Bohr's Atomic Model · WBJEE 2023 PYQ Practice on Crucible ↗

14. If the potential energy of a hydrogen atom in the first excited state is assumed to be zero, then the total energy of $n = \infty$ state is,

(A) $3.4\mathrm{eV}$ **(B)** $6.8\mathrm{eV}$

(C) 0 **(D)** ∞

Center of Mass Momentum and Collision — Momentum · WBJEE 2023 PYQ Practice on Crucible ↗

15. A mouse of mass m jumps on the outside edge of a rotating ceiling fan of moment of inertia I and radius R. The fractional loss of angular velocity of the fan as a result is

(A) $\frac{mR^2}{\mathrm{I+mR^2}}$ **(B)** $\frac{I}{I+mR^2}$

(C) $\frac{\mathrm{I-mR^2}}{\mathrm{I}}$ **(D)** $\frac{I-mR^2}{I+mR^2}$

Gravitation · WBJEE 2023 PYQ Practice on Crucible ↗

16. A modified gravitational potential is given by $V = -\frac{GM}{r} + \frac{A}{r^2}$. If the constant A is expressed in terms of gravitational constant (G), mass (M) and velocity of light (c), then from dimensional analysis, A is,

(A) $\frac{\mathrm{G^2M^2}}{\mathrm{c^2}}$ **(B)** $\frac{\mathrm{GM}}{\mathrm{c^2}}$

(C) $\frac{1}{\mathrm{c^2}}$ **(D)** Dimensionless

Thermodynamics — First Law of Thermodynamics · WBJEE 2022 PYQ Practice on Crucible ↗

17. Consider a thermodynamic process where internal energy $U = AP^2\ \mathrm{V}(\ \mathrm{A} =$ constant). If the process is performed adiabatically, then

(A) $AP^2(V+1) =$ constant **(B)** $(\mathrm{AP}+1)^2\ \mathrm{V} = \mathrm{constant}$

(C) $(\mathrm{AP}+1)\mathrm{V}^2 =$ constant **(D)** $\frac{V}{(AP+1)^2} =$ constant

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Dual Nature of Matter — Matter Waves · WBJEE 2022 PYQ Practice on Crucible ↗

18. If the kinetic energies of an electron, an alpha particle and a proton having same de-Broglie wavelength are $\varepsilon_1, \varepsilon_2$ and ε_3 respectively, then

(A) $\varepsilon_1 > \varepsilon_3 > \varepsilon_2$ **(B)** $\varepsilon_1 = \varepsilon_2 = \varepsilon_2$

(C) $\varepsilon_1 < \varepsilon_3 < \varepsilon_2$ **(D)** $\varepsilon_1 > \varepsilon_2 > \varepsilon_3$

Wave Optics — Youngs Double Slit Experiment · WBJEE 2022 PYQ Practice on Crucible ↗

19. In Young's double slit experiment with a monochromatic light, maximum intensity is 4 times the minimum intensity in the interference pattern. What is the ratio of the intensities of the two interfering waves?

(A) $1/9$ **(B)** $1/3$

(C) $1/16$ **(D)** $1/2$

Mathematics in Physics — Multiplication of Vectors · WBJEE 2022 PYQ Practice on Crucible ↗

20. The expression $\bar{A}(A+B)+(B+AA)(A+\bar{B})$ simplifies to

(A) $A+B$ **(B)** AB

(C) $\overline{\mathrm{A+B}}$ **(D)** $\bar{A}+\bar{B}$

Units and Dimensions — Dimensions · WBJEE 2022 PYQ Practice on Crucible ↗

21. The Entropy (S) of a black hole can be written as $S = \beta k_B A$, where k_B is the Boltzmann constant and A is the area of the black hole. Then β has dimension of

(A) L^2 **(B)** $\mathrm{ML}^2\ \mathrm{T}^{-1}$

(C) L^{-2} **(D)** dimensionless

Chemical Bonding and Molecular Structure · WBJEE 2023 PYQ Practice on Crucible ↗

22. The correct order of boiling points of N-ethylethanamine (I), ethoxyethane (II) and butan-2-ol (III) is

(A) III $<$ II $<$ I **(B)** II $<$ III $<$ I

(C) II $<$ I $<$ III **(D)** III $<$ I $<$ II

Solid State — Cubic system · WBJEE 2023 PYQ Practice on Crucible ↗

23. What is the edge length of the unit cell of a body centred cubic crystal of an element whose atomic radius is $75\mathrm{pm}$?

(A) $170\mathrm{pm}$ **(B)** $175\mathrm{pm}$

(C) $178\mathrm{pm}$ **(D)** $173.2\mathrm{pm}$

Some Basic Concepts of Chemistry — Mole concept · WBJEE 2023 PYQ Practice on Crucible ↗

24. Arrange the following in order of increasing mass I. 1 mole of N_2 II. $0.5\ \mathrm{mole}^2$ of O_3 III. $3.011 \times 10^{23}\mathrm{molecules}$ of O_2 IV. 0.5 gram atom of O_2

(A) IV $<$ III $<$ II $<$ I **(B)** IV $<$ I $<$ III $<$ II

(C) III $<$ II $<$ IV $<$ I **(D)** I $<$ III $<$ II $<$ IV

Chemical Kinetics — Integrated rate laws · WBJEE 2023 PYQ Practice on Crucible ↗

25. If in case of a radio isotope the value of half-life $(T_{1/2})$ and decay constant (λ) are identical in magnitude, then their value should be

(A) $0.693/2$ **(B)** $(0.693)^{1/2}$

(C) $(0.693)^2$ **(D)** 0.693

Classification of Elements and Periodicity in Properties — Periodic properties · WBJEE 2023 PYQ Practice on Crucible ↗

26. Suppose a gaseous mixture of $\mathrm{He}, \mathrm{Ne}, \mathrm{Ar}$ and Kr is treated with photons of the frequency appropriate to ionize Ar. What ion(s) will be present in the mixture?

(A) Ar^{+}

(B) $\mathrm{Ar}^{+} + \mathrm{Kr}$

(C) $\mathrm{Ar}^{+} + \mathrm{He}^{+} + \mathrm{Ne}^{+}$

(D) $\mathrm{He}^{+} + \mathrm{Ar}^{+} + \mathrm{Kr}^{+}$

Solutions · WBJEE 2023 PYQ Practice on Crucible ↗

27. A solution containing $4\ \mathrm{g}$ of polymer in 4.0 litre solution at $27^{\circ}\mathrm{C}$ shows an osmotic pressure of $3.0 \times 10^{-4}\ \mathrm{atm}$. The molar mass of the polymer in $\mathrm{g/mol}$ is

(A) 820000

(B) 82000

(C) 8200

(D) 820

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d and f Block Elements — F-Block elements · WBJEE 2023 PYQ Practice on Crucible ↗

28. $4f^2$ electronic configuration is found in

(A) Pr

(B) Pr^{3+}

(C) Nd^{3+}

(D) Pm^{3+}

Structure of Atom — Quantum mechanical model · WBJEE 2022 PYQ Practice on Crucible ↗

29. Which one of the following is the correct set of four quantum numbers (n, l, m, s) ?

(A) $\left(3, 0, -1, +\frac{1}{2}\right)$

(B) $\left(4, 3, -2, -\frac{1}{2}\right)$

(C) $\left(3, 1, -2, -\frac{1}{2}\right)$

(D) $\left(4, 2, -3, +\frac{1}{2}\right)$

States of Matter — Kinetic theory of gases · WBJEE 2022 PYQ Practice on Crucible ↗

30. The average speed of H_2 at T_1 K is equal to that of O_2 at T_2 K. The ratio $T_1 : T_2$ is

(A) $1 : 6$

(B) $16 : 1$

(C) $1 : 4$

(D) None of these

Answer Key (Q1 to Q30)

Click any question number below to practice chapter-wise PYQs on The Crucible ↗

1: (B)	2: (C)	3: (C)	4: (D)	5: (B)	6: (C)	7: (A)	8: (A)	9: (C)	10: (D)
11: (A)	12: (B)	13: (B)	14: (B)	15: (A)	16: (A)	17: (B)	18: (A)	19: (A)	20: (A)
21: (C)	22: (C)	23: (D)	24: (A)	25: (B)	26: (B)	27: (B)	28: (B)	29: (B)	30: (D)

Sample Solution — Question 1 (WBJEE 2023 PYQ · Correct Option: B)

Open on The Crucible ↗

Q1. Let $f : [1, 3] \to \mathbb{R}$ be continuous and be derivable in $(1, 3)$ and $f'(x) = [f(x)]^2 + 4 \forall x \in (1, 3)$. Then

$\begin{aligned}

& \text { Hint : } f^{\prime}(c)=(f(c))^2+4=\frac{f(3)-f(1)}{2} \\

& \Rightarrow f(3)-f(1)=2(f(c))^2+8

\end{aligned}$

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