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

Open on The Crucible ↗

Kinetic Theory of Gases — Pressure and Energy of gas · COMEDK 2023 PYQ

Practice on Crucible ↗

**1.** The mean energy per molecule for a diatomic gas is

**(A)** $\frac{5k_BT}{N}$

**(B)** $\frac{5k_BT}{2N}$

**(C)** $\frac{5k_BT}{2}$

**(D)** $\frac{3k_BT}{2}$

---

Oscillations — Simple Harmonic Motion · COMEDK 2023 PYQ

Practice on Crucible ↗

**2.** The phase difference between displacement and velocity of a particle in simple harmonic motion is

**(A)** $\pi\text{rad}$

**(B)** $3\pi/2\text{rad}$

**(C)** zero

**(D)** $\pi/2\text{rad}$

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Nuclear Physics — Nuclear structure · COMEDK 2023 PYQ

Practice on Crucible ↗

**3.** The mass density of a nucleus varies with mass number $A$ as

**(A)** $\mathring{A}$

**(B)** $A^2$

**(C)** $\frac{1}{A}$

**(D)** $\ln A$

---

Communication System — Propagation of EM Waves · COMEDK 2023 PYQ

Practice on Crucible ↗

**4.** A TV tower has a height $72\ \text{m}$. The maximum distance upto which TV transmission can be received is (Take, radius of the earth as $6.4 \times 10^6\ \text{m}$)

**(A)** 27.52 km

**(B)** 34.25 km

**(C)** 30.35 km

**(D)** 25.12 km

---

Waves and Sound — Doppler's Effect · COMEDK 2023 PYQ

Practice on Crucible ↗

**5.** With what velocity should an observer approach a stationary sound source, so that the apparent frequency of sound should appear double the actual frequency?

**(A)** $v/2$

**(B)** $3v$

**(C)** $2v$

**(D)** $v$

Electromagnetic Induction · COMEDK 2023 PYQ — Practice on Crucible ↗

**6.** The magnetic flux linked with a coil satisfies the relation $\phi = \left(4t^2 + 6t + 9\right)\ \mathrm{Wb}$, where $t$ is time in second. The emf induced in the coil at $t = 2\ \mathrm{s}$ is

**(A)** $22\ \mathrm{V}$
**(B)** $18\ \mathrm{V}$
**(C)** $16\ \mathrm{V}$
**(D)** $40\ \mathrm{V}$

---

Thermodynamics — First Law of Thermodynamics · COMEDK 2023 PYQ — Practice on Crucible ↗

**7.** If $150\ \mathrm{J}$ of heat is added to a system and the work done by the system is $110\ \mathrm{J}$, then change in internal energy will be

**(A)** $40\ \mathrm{J}$
**(B)** $110\ \mathrm{J}$
**(C)** $150\ \mathrm{J}$
**(D)** $260\ \mathrm{J}$

---

Atomic Physics — Atomic Spectrum · COMEDK 2023 PYQ — Practice on Crucible ↗

**8.** The first emission of hydrogen atomic spectrum in Lyman series appears at a wavelength of

**(A)** $\frac{3R}{4}\ \mathrm{cm}^{-1}$
**(B)** $\frac{4}{3R}\ \mathrm{cm}$
**(C)** $\frac{7R}{144}\ \mathrm{cm}^{-1}$
**(D)** $\frac{400}{9R}\ \mathrm{cm}$

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Alternating Current · COMEDK 2023 PYQ — Practice on Crucible ↗

**9.** In the case of an inductor

**(A)** voltage lags the current by $\pi/2$
**(B)** voltage leads the current by $\pi/2$
**(C)** voltage leads the current by $\pi/3$
**(D)** voltage leads the current by $\pi/4$

---

Gravitation — Acceleration Due to Gravity · COMEDK 2023 PYQ — Practice on Crucible ↗

**10.** The height vertically above the earth's surface at which the acceleration due to gravity becomes $1\%$ of its value at the surface is

**(A)** $8R$
**(B)** $9R$
**(C)** $10R$
**(D)** $20R$

Polymers — Classification of Polymers · COMEDK 2023 PYQ
Practice on Crucible ↗

**11.** Which one of the following is an example of step growth polymerisation?

**(A)** Teflon
**(B)** Neoprene
**(C)** Nylon 6,6
**(D)** Buna-S

---

Environmental Chemistry — Air Pollution · COMEDK 2023 PYQ
Practice on Crucible ↗

**12.** Ozone in stratosphere is depleted by

**(A)** $C_7\ F_{16}$
**(B)** $CF_2Cl_2$
**(C)** $C_6H_6Cl_2$
**(D)** $CF_3Cl^2$

---

Solid State — Stoichiometric defects · COMEDK 2023 PYQ
Practice on Crucible ↗

**13.** Which defect leads to decrease in the density of crystal?

**(A)** Schottky
**(B)** F-centre
**(C)** Frenkel
**(D)** Interstitial

---

Ionic Equilibrium — Theories of Acids and Bases · COMEDK 2023 PYQ
Practice on Crucible ↗

**14.** In a $0.2M$ aqueous solution, lactic acid is $6.9\%$ dissociated. The value of dissociation constant is

**(A)** $1.2 \times 10^{-4}$
**(B)** $95 \times 10^{-4}$
**(C)** $6.5 \times 10^{-4}$
**(D)** $3.6 \times 10^{-2}$

---

Electrochemistry · COMEDK 2023 PYQ
Practice on Crucible ↗

**15.** Assuming no change in volume, the time required to obtain solution of $pH = 4$ by electrolysis of $100\ mL$ of $0.1MNaOH$ (using current $0.5\ A$ ) will be

**(A)** 1.93s
**(B)** 2.63s
**(C)** 1.80s
**(D)** 4.26s

Solutions · COMEDK 2023 PYQ — Practice on Crucible ↗

**16.** Which of the following shows negative deviation from Raoult's law?

**(A)** Benzene-acetone
**(B)** Benzene-chloroform
**(C)** Benzene-ethanol
**(D)** Benzene-carbon tetrachloride

---

Coordination Compounds · COMEDK 2023 PYQ — Practice on Crucible ↗

**17.** Which one of the following is an important component of chlorophyll

**(A)** Mn
**(B)** Mg
**(C)** Fe
**(D)** Zn

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General Principles and Processes of Isolation of Metals — Refining of Crude Metal · COMEDK 2023 PYQ — Practice on Crucible ↗

**18.** A volatile compound is formed by carbon monoxide and

**(A)** Cu
**(B)** Al
**(C)** Ni
**(D)** Si

---

States of Matter · COMEDK 2023 PYQ — Practice on Crucible ↗

**19.** The behaviour of real gas approaches ideal behaviour at

**(A)** low temperature, low pressure
**(B)** low pressure, high temperature
**(C)** high pressure, low temperature
**(D)** high temperature, high pressure

---

Structure of Atom — Bohr's model · COMEDK 2023 PYQ — Practice on Crucible ↗

**20.** Bohr's radius of $2\mathrm{nd}$ orbit of $\mathrm{Be}^{3+}$ is equal to that of

**(A)** 4th orbit of hydrogen
**(B)** 2nd orbit of $\mathrm{He}^{+}$
**(C)** 3 rd obit of $\mathrm{Li}^{2+}$
**(D)** 1st orbit of hydrogen

Application of Derivatives — Tangent Normal · COMEDK 2023 PYQ

Practice on Crucible ↗

**21.** The slope of the tangent to the curve, $y = x^2 - xy$ at $\left(1, \frac{1}{2}\right)$ is

**(A)** $\frac{4}{3}$

**(B)** $\frac{2}{3}$

**(C)** $\frac{3}{4}$

**(D)** $\frac{3}{2}$

---

Circle · COMEDK 2023 PYQ

Practice on Crucible ↗

**22.** The circle $x^2 + y^2 + 3x - y + 2 = 0$ cuts an intercept on $X$-axis of length

**(A)** 3

**(B)** 4

**(C)** 2

**(D)** 1

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Matrices — Adjoint and its Properties · COMEDK 2023 PYQ

Practice on Crucible ↗

**23.** If $A$ is a matrix of order $4 \, \text{such}$ that $A(\text{adj } A) = 10\text{I}$, then $|\text{adj } A|$ is equal to

**(A)** 10

**(B)** 100

**(C)** 1000

**(D)** 10000

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Indefinite Integration — Integration by Substitution · COMEDK 2023 PYQ

Practice on Crucible ↗

**24.** $\int \frac{xdx}{2(1+x)^{3/2}}$ is equal to

**(A)** $\frac{2+x}{\sqrt{1+x}} + C$

**(B)** $\frac{2+x}{x\sqrt{1+x}} + C$

**(C)** $\frac{x}{\sqrt{1+x}} + C$

**(D)** $-\frac{x}{\sqrt{1+x}} + C$

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Three Dimensional Geometry — Line in Space · COMEDK 2023 PYQ

Practice on Crucible ↗

**25.** The lines $\frac{x-1}{2} = \frac{y-4}{4} = \frac{z-2}{3}$ and $\frac{1-x}{1} = \frac{y-2}{5} = \frac{3-z}{a}$ are perpendicular to each other, then $a$ equals to

**(A)** -6

**(B)** 6

**(C)** $\frac{22}{3}$

**(D)** $-\frac{22}{3}$

**Probability · COMEDK 2023 PYQ** Practice on Crucible ↗

**26.** A five-digits number is formed by using the digits $1, 2, 3, 4, 5$ with no repetition. The probability that the numbers 1 and 5 are always together, is

**(A)** $\frac{2}{5}$ **(B)** $\frac{1}{5}$
**(C)** $\frac{3}{5}$ **(D)** $\frac{1}{4}$

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**Mathematical Induction · COMEDK 2023 PYQ** Practice on Crucible ↗

**27.** Using mathematical induction, the numbers $a_n s$ are defined by $a_0 = 1, a_{n+1} = 3n^2 + n + a_n, (n \geq 0)$. Then, $a_n$ is equal to

**(A)** $n^3 + n^2 + 1$ **(B)** $n^3 - n^2 + 1$
**(C)** $n^3 - n^2$ **(D)** $n^3 + n^2$

---

**Sequences and Series — Summation of Series · COMEDK 2023 PYQ** Practice on Crucible ↗

**28.** The value of $\frac{1}{2!} + \frac{2}{3!} + \ldots + \frac{99}{100!}$ is equal to

**(A)** $\frac{100!-1}{100!}$ **(B)** $\frac{100!+1}{100!}$
**(C)** $\frac{999!-1}{999!}$ **(D)** $\frac{999!+1}{999!}$

---

**Differential Equations · COMEDK 2023 PYQ** Practice on Crucible ↗

**29.** The differential equation of all non-vertical lines in a plane is

**(A)** $\frac{d^2y}{dx^2} = 0$ **(B)** $\frac{d^2x}{dy^2} = 0$
**(C)** $\frac{dy}{dx} = 0$ **(D)** $\frac{dx}{dy} = 0$

---

**Binomial Theorem · COMEDK 2023 PYQ** Practice on Crucible ↗

**30.** Find ${}^nC_{21}$, if ${}^nC_{10} = {}^nC_{12}$

**(A)** 1 **(B)** 21
**(C)** 22 **(D)** 2

## Answer Key (Q1 to Q30)

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

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

## Sample Solution — Question 1 (COMEDK 2023 PYQ · Correct Option: C)

Open on The Crucible ↗

**Q1.** The mean energy per molecule for a diatomic gas is

For an ideal gas, mean kinetic energy per molecule

$= \frac{f}{2}k_BT$

For diatomic gas, degree of freedom,

$f = 5$

$\therefore$ K.E per molecule $= \frac{5k_BT}{2}$

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