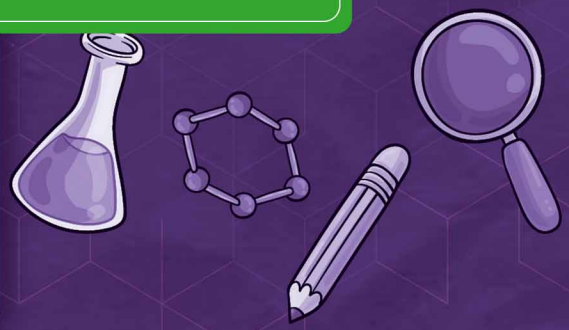
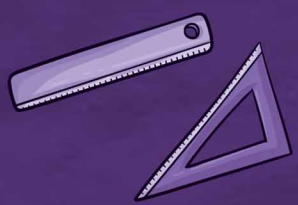
SAMPLE CONTENT

Includes Statistical Analysis of all shifts



MHT-CET PCM

SOLVED PAPERS 2023



- Self-Assessment Score Card
- Smart Keys : Thinking Hatke & Caution

All 12 sets of papers conducted in 2023

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MHT-CET (PCM)

SOLVED PAPERS - 2023

All 12 sets of papers conducted in 2023

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- Answers and Solutions provided for all the papers.
- Trend analysis of all the shifts in the form of:
  - Graphs of difficulty levels of each shift
  - Tables of Chapter-wise analysis of all shifts
- Conceptual mapping of each question in accordance with the chapter and subtopic/exercise is provided in the Solutions
- Smart Keys (*Thinking Hatke* & *Caution*) provided to crack questions efficiently
- Includes Self-Assessment Score Card for each paper to evaluate progress

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PREFACE

Our latest offering, **'MHT-CET (PCM) Solved Papers - 2023'** is an exclusive compilation of 12 authentic MHT-CET exam papers conducted by State Common Entrance Test Cell. This compilation includes Question papers of Physics, Chemistry & Mathematics that took place in year 2023 from **May 9 to May 14** in morning and afternoon shifts. The book includes all the Question Papers of PCM and thus acts as a central repository for all the questions asked in year 2023 in one place.

Answers and **Solutions** are provided for each question paper. To enhance their problem-solving abilities, solutions are provided wherever necessary to assist students in comprehending the underlying concepts. To make conceptual mapping simple, the solutions include the **subtopic/exercise** number from the chapter where a question is anchored. In cases where multiple concepts from the same or other chapters are needed to answer a question, it is marked as Multifarious.

Smart Keys (Thinking Hatke and **Caution)** are provided selectively in the solutions to stimulate lateral thinking to effectively solve a question and apprise students about mistakes often made while solving MCQs. The book includes a Self-Assessment Score Card at the end of each paper that has been meticulously created for the purpose of self-evaluation.

To give students an understanding of the weighting allotted to each chapter, a *statistical analysis* of the number of questions asked per chapter each shift in a subject is offered in tabular form. Additionally, a *graphical analysis* of the twelve papers for each subject is included at the start of the book to elaborate on the breakdown of the difficulty level of questions asked in each subject. Studying these representations should undoubtedly aid students in planning their study strategy for a particular chapter. Although there is a possibility that the weightage to a chapter and the level of difficulty of the question paper in the future examination may vary. Solving these papers offer students conviction of their preparedness from the examination point of view.

We are confident that this book will comprehensively cater to the needs of students and effectively assist them to achieve their goal.

Publisher

Edition: First

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

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A book affects eternity; one can never tell where its influence stops.

PAPER PATTERN

- There will be three papers of Multiple Choice Questions (MCQs) in 'Mathematics', 'Physics and Chemistry' and 'Biology' of 100 marks each.
- Duration of each paper will be 90 minutes.
- Questions will be based on the syllabus prescribed by Maharashtra State Board of Secondary and Higher Secondary Education with approximately 20% weightage given to Std. XI and 80% weightage will be given to Std. XII curriculum.
- Difficulty level of questions will be at par with JEE (Main) for Mathematics, Physics, Chemistry and at par with NEET for Biology.
- There will be no negative marking.
- Questions will be mainly application based.
- Details of the papers are as given below:

Paper	Subject(s)	No. of MCQs based on		Mark(s) Per Question	Total Marks	Duration in Minutes
		Std XI	Std XII			
Paper I	Mathematics	10	40	2	100	90
Paper II	Physics	10	40	1	100	90
	Chemistry	10	40			
Paper III	Biology	20	80	1	100	90

- Questions will be set on
  i. the entire syllabus of Std. XII of Physics, Chemistry, Mathematics and Biology subjects prescribed by Maharashtra Bureau of Textbook Production and curriculum Research, Pune, and
  ii. chapters / units from Std. XI curriculum as mentioned below:

Sr.no	Subject	Chapters/Units of Std. XI
1	Physics	Motion in a Plane, Laws of Motion, Gravitation, Thermal Properties of Matter, Sound, Optics, Electrostatics, Semiconductors
2	Chemistry	Some Basic Concepts of Chemistry, Structure of Atom, Chemical Bonding, Redox Reactions, Elements of Group 1 and Group 2, States of Matter (Gaseous and Liquid States), Adsorption and Colloids (Surface Chemistry), Hydrocarbons, Basic Principles of Organic Chemistry
3	Mathematics	Trigonometry II, Straight Line, Circle, Measures of Dispersion, Probability, Complex Numbers, Permutations and Combinations, Functions, Limits, Continuity
4	Biology	Biomolecules, Respiration and Energy Transfer, Human Nutrition, Excretion and Osmoregulation

- **Language of Question Paper:**
  The medium for examination shall be English / Marathi / Urdu for Physics, Chemistry and Biology. Mathematics paper shall be in English only.
- **Duration of Online Computer Based Test (CBT):**
  The duration of the examination for PCB is 180 minutes and PCM is 180 minutes.
  a. **For PCM** - This paper is having 2 Groups of Physics-Chemistry and Mathematics with total 180 Minutes Duration, first 90 minutes Physics and Chemistry will be enabled and only after completion of first 90 minutes' time Physics-Chemistry group will be auto submitted and Mathematics group will be enabled with 90 minutes' duration.
  b. **For PCB** - This paper is having 2 Groups of Physics-Chemistry and Biology with total 180 Minutes Duration, first 90 minutes Physics and Chemistry will be enabled and only after completion of time response for Physics-Chemistry group will be auto submitted and Biology group will be enabled with 90 minutes' duration.

[Note: Candidate should note that if he/she is appearing for both the groups i.e., PCM and PCB, the Percentile / Percentage score of Physics or Chemistry will not be interchanged among the groups.**]**

INDEX

Sr. No.	Date of Examination	Page No.	
		Question Paper	Answers and Solutions
1	MHT-CET 2023 : 9th May (Shift I)	1	133
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3	MHT-CET 2023 : 10th May (Shift I)	23	170
4	MHT-CET 2023 : 10th May (Shift II)	34	190
5	MHT-CET 2023 : 11th May (Shift I)	45	208
6	MHT-CET 2023 : 11th May (Shift II)	56	227
7	MHT-CET 2023 : 12th May (Shift I)	67	247
8	MHT-CET 2023 : 12th May (Shift II)	78	266
9	MHT-CET 2023 : 13th May (Shift I)	89	285
10	MHT-CET 2023 : 13th May (Shift II)	100	302
11	MHT-CET 2023 : 14th May (Shift I)	111	321
12	MHT-CET 2023 : 14th May (Shift II)	122	339

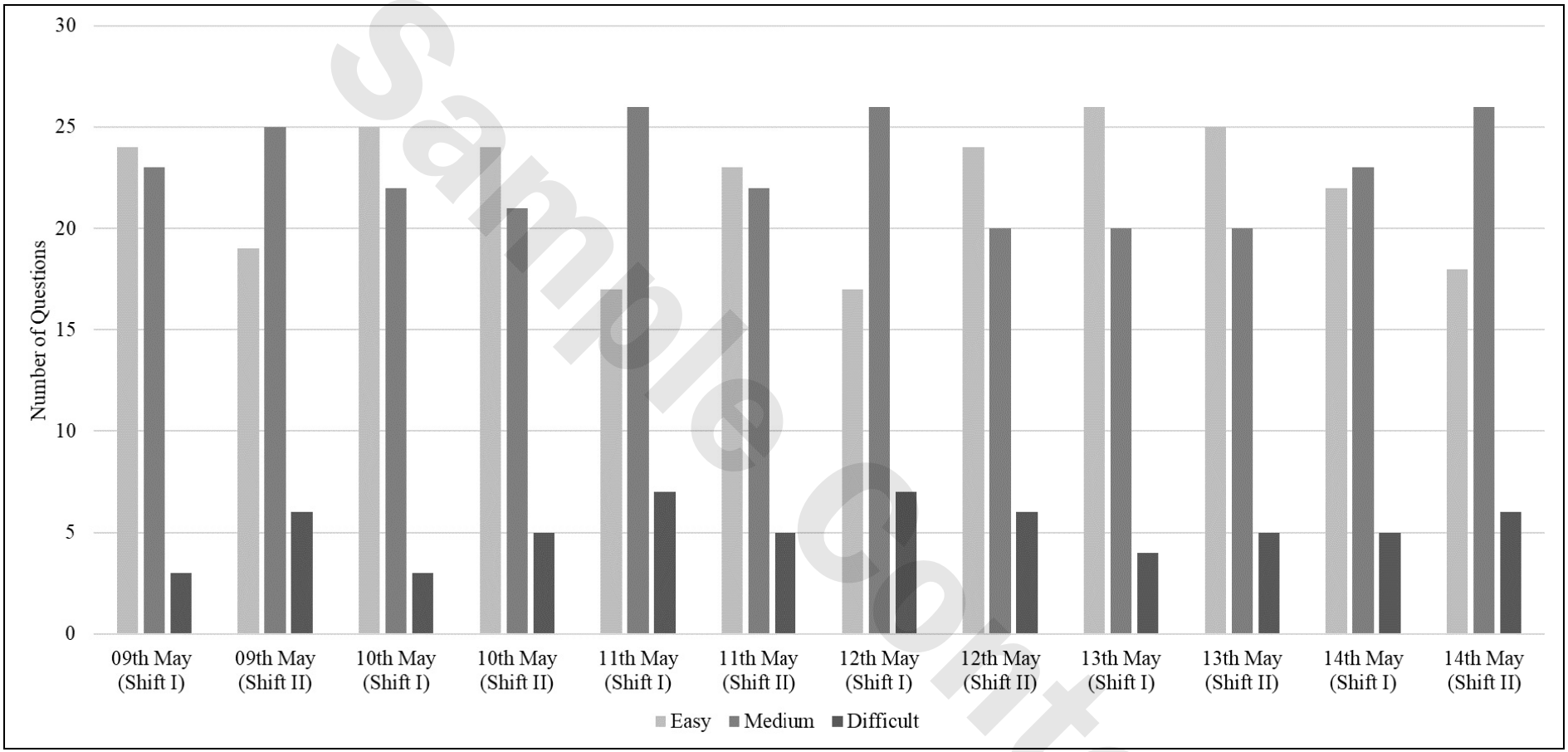
PHYSICS

Chapter-wise Analysis of MHT-CET 2023 Exam Papers

Ch. No.	Std.	Chapter Name	09th May Shift I	09th May Shift II	10th May Shift I	10th May Shift II	11th May Shift I	11th May Shift II	12th May Shift I	12th May Shift II	13th May Shift I	13th May Shift II	14th May Shift I	14th May Shift II	Total
3	11th	Motion in a Plane	1	2	1	2	1	2	0	3	2	2	1	1	18
4	11th	Laws of Motion	1	2	1	1	1	1	1	0	1	1	1	1	12
5	11th	Gravitation	2	2	2	1	2	2	2	4	2	2	2	2	25
7	11th	Thermal Properties of Matter	1	1	1	1	1	2	1	2	1	2	0	1	14
8	11th	Sound	0	0	1	1	1	1	1	1	3	0	0	1	10
9	11th	Optics	2	2	2	2	2	2	2	2	2	0	2	2	22
10	11th	Electrostatics	0	0	1	0	1	0	1	0	1	2	3	2	11
14	11th	Semiconductors	0	1	2	2	1	1	1	1	1	1	1	1	13
1	12th	Rotational Dynamics	3	1	3	4	3	2	4	2	2	2	3	3	32
2	12th	Mechanical Properties of Fluids	3	3	3	2	3	4	3	3	3	2	3	3	35
3	12th	Kinetic Theory of Gases and Radiation	4	2	3	4	3	4	4	3	3	3	4	3	40
4	12th	Thermodynamics	2	3	2	2	2	0	1	1	2	2	2	2	21
5	12th	Oscillations	5	5	3	4	2	1	3	4	3	5	4	3	42
6	12th	Superposition of Waves	3	3	3	2	3	4	3	2	2	3	3	3	34
7	12th	Wave Optics	3	3	3	3	3	3	3	3	2	3	3	3	35
8	12th	Electrostatics	2	3	3	3	4	3	3	3	3	4	1	2	34
9	12th	Current Electricity	2	2	2	2	2	2	2	2	2	1	2	2	23
10	12th	Magnetic Fields due to Electric Current	3	2	2	2	2	4	4	3	2	2	3	2	31
11	12th	Magnetic Materials	1	1	1	1	1	1	0	0	1	1	0	1	9
12	12th	Electromagnetic Induction	3	3	3	3	4	3	2	3	3	3	3	3	36
13	12th	AC Circuits	2	3	3	3	2	3	3	3	3	3	3	4	35
14	12th	Dual Nature of Radiation and Matter	4	2	2	2	2	2	2	2	2	2	1	1	24
15	12th	Structure of Atoms and Nuclei	1	2	2	1	2	1	2	1	2	2	3	2	21
16	12th	Semiconductor Devices	2	2	1	2	2	2	2	2	2	2	2	2	23
		Total	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**600**

PHYSICS

Difficulty level-wise Analysis of MHT-CET 2023 Exam Papers



E – Easy: Questions whose answers can be directly and easily answered by the information given in Std. XI and XII Textbooks.
M – Medium: These questions require students to identify and apply the appropriate concepts which they studied from Std. XI and XII Textbooks.
D – Difficult: The most Challenging Questions that require application of various concepts and encourage students to think beyond the information given in the textbooks.

Analysis

- **Analysis of questions by difficulty level:** Although the proportion of easy, medium, and difficult questions varies amongst the twelve papers, the number of easy and medium questions is almost equal, with a few difficult questions.
  This indicates that the entrance exam emphasizes on thorough reading and grasping of textual content as well as understanding and application of concepts. Students are advised to study the chapters minutely and focus on the application of formulae and concepts while preparing for the entrance exam.

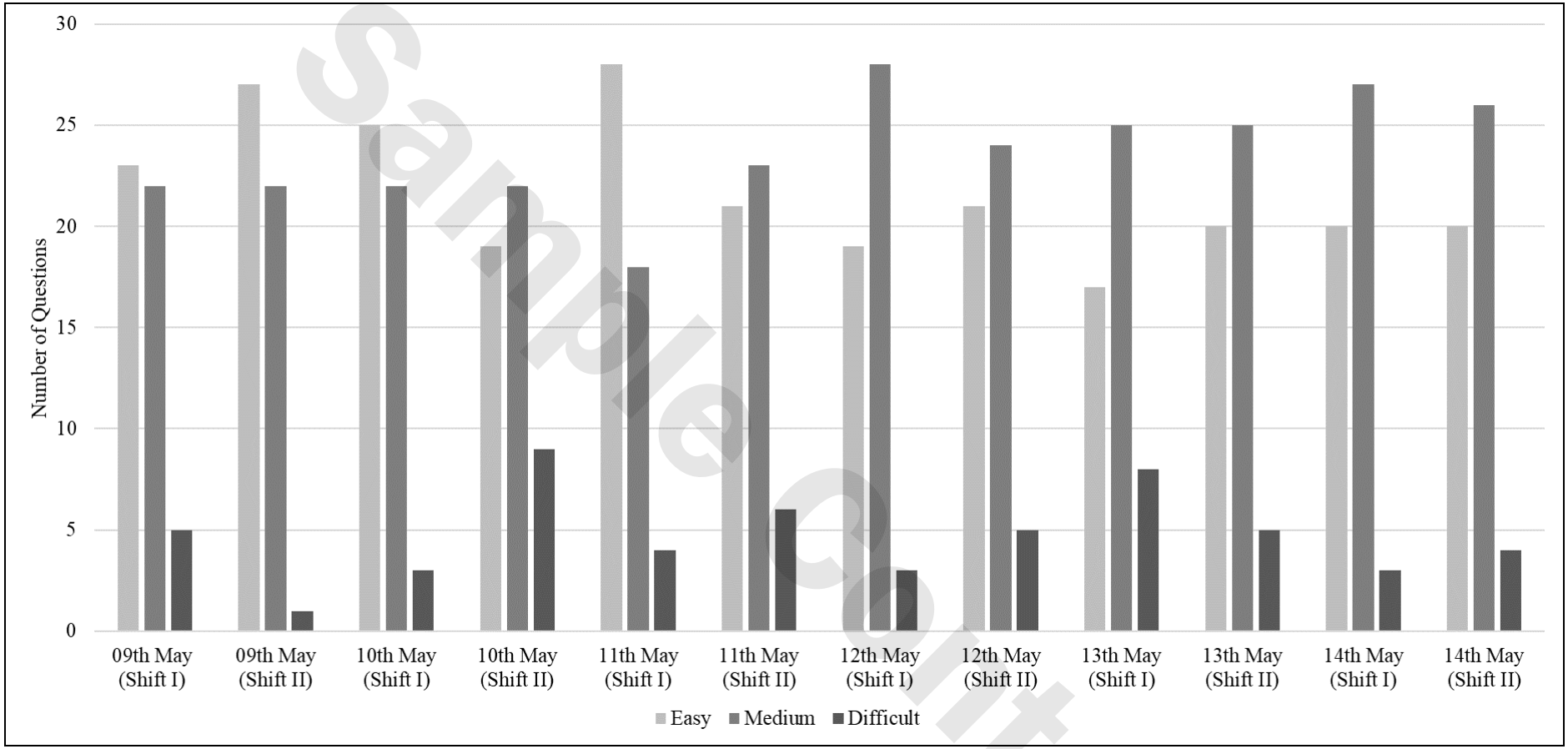
CHEMISTRY

Chapter-wise Analysis of MHT-CET 2023 Exam Papers

Ch. No.	Std.	Chapter Name	09th May Shift I	09th May Shift II	10th May Shift I	10th May Shift II	11th May Shift I	11th May Shift II	12th May Shift I	12th May Shift II	13th May Shift I	13th May Shift II	14th May Shift I	14th May Shift II	Total
1	11th	Some Basic Concepts of Chemistry	1	1	1	1	1	1	1	1	1	1	1	1	12
4	11th	Structure of Atom	2	2	2	2	2	2	2	2	2	2	2	2	24
5	11th	Chemical Bonding	1	1	1	1	1	1	1	1	1	1	1	1	12
6	11th	Redox Reactions	1	1	1	1	1	1	1	1	1	0	1	1	11
8	11th	Elements of Group 1 and Group 2	1	1	1	1	1	1	1	1	1	1	1	1	12
10	11th	States of Matter: Gaseous and Liquid States	1	1	1	1	1	1	1	1	1	1	1	1	12
11	11th	Adsorption and Colloids	0	1	1	1	1	1	1	0	1	1	1	1	10
14	11th	Basic Principles of Organic Chemistry	2	2	1	1	1	2	0	2	1	2	1	1	16
15	11th	Hydrocarbons	1	0	1	1	1	0	2	1	1	1	1	1	11
1	12th	Solid State	3	3	3	3	3	3	3	3	3	3	3	3	36
2	12th	Solutions	3	3	3	3	3	3	3	3	3	3	3	3	36
3	12th	Ionic Equilibria	3	3	3	3	3	3	3	3	3	3	3	3	36
4	12th	Chemical Thermodynamics	3	3	3	3	3	3	3	3	3	3	3	3	36
5	12th	Electrochemistry	3	3	3	3	3	3	3	3	3	4	3	3	37
6	12th	Chemical Kinetics	3	3	3	3	3	3	3	3	3	3	4	3	37
7	12th	Elements of Groups 16, 17 and 18	2	2	2	2	2	2	2	2	2	2	2	2	24
8	12th	Transition and Inner Transition Elements	3	2	2	2	2	2	2	2	2	2	1	2	24
9	12th	Coordination Compounds	2	2	2	2	2	2	2	2	2	2	2	2	24
10	12th	Halogen Derivatives	3	3	3	3	3	3	3	4	3	3	3	3	37
11	12th	Alcohols, Phenols and Ethers	3	3	2	3	4	2	3	2	3	2	3	3	33
12	12th	Aldehydes, Ketones and Carboxylic Acids	3	3	3	3	3	3	3	2	3	3	3	3	35
13	12th	Amines	1	2	3	2	2	3	2	3	2	2	2	2	26
14	12th	Biomolecules	2	2	2	2	2	2	2	2	2	2	2	2	24
15	12th	Introduction to Polymer Chemistry	2	2	2	2	2	2	2	2	2	2	2	2	24
16	12th	Green Chemistry and Nanochemistry	1	1	1	1	0	1	1	1	1	1	1	1	11
		Total	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**600**

CHEMISTRY

Difficulty level-wise Analysis of MHT-CET 2023 Exam Papers



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Analysis

- **Analysis of questions by difficulty level:** Although the proportion of easy, medium, and difficult questions varies amongst the twelve papers, the quantity of easy and medium questions is nearly equal, with a few difficult questions.
  This demonstrates that the entrance exam places a strong emphasis on careful reading, comprehension of the text, and application of principles. When studying for the entrance exam, it is advisable that students pay close attention to each chapter, concentrate on comprehending various chemical reactions, and practice solving numerical problems.

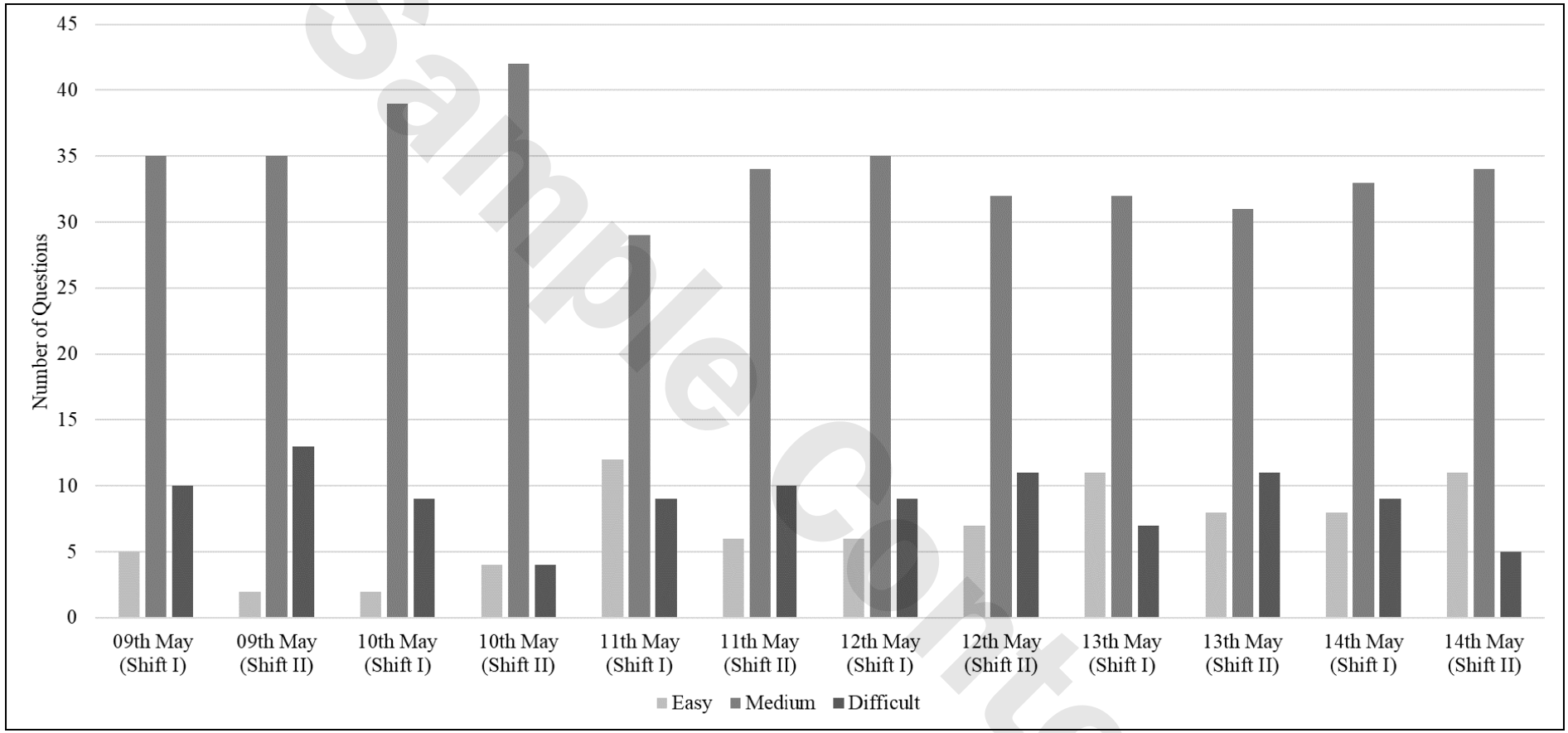
MATHEMATICS

Chapter-wise Analysis of MHT-CET 2023 Exam Papers

Ch. No.	Std.	Part	Chapter Name	09th May Shift I	09th May Shift II	10th May Shift I	10th May Shift II	11th May Shift I	11th May Shift II	12th May Shift I	12th May Shift II	13th May Shift I	13th May Shift II	14th May Shift I	14th May Shift II	Total
3	11th	I	Trigonometry-2	1	1	1	1	1	1	1	1	1	1	1	1	12
5	11th	I	Straight line	1	1	1	1	1	1	1	1	1	1	1	1	12
6	11th	I	Circle	1	1	1	1	1	1	1	1	1	1	1	1	12
8	11th	I	Measures of Dispersion	1	1	1	1	1	1	1	1	1	1	1	1	12
9	11th	I	Probability	1	1	1	1	1	1	1	1	1	1	1	1	12
1	11th	II	Complex Numbers	1	1	1	1	1	1	1	1	1	1	1	1	12
3	11th	II	Permutations and Combinations	1	1	1	1	1	1	1	1	1	1	1	1	12
6	11th	II	Functions	1	1	1	1	1	1	1	1	1	1	1	1	12
7	11th	II	Limits	1	1	1	1	1	1	1	1	1	1	1	1	12
8	11th	II	Continuity	1	1	1	1	1	1	1	1	1	1	1	1	12
1	12th	I	Mathematical Logic	2	2	2	2	1	2	2	2	2	2	2	2	23
2	12th	I	Matrices	1	1	1	1	2	1	1	1	1	1	1	1	13
3	12th	I	Trigonometric Functions	5	5	5	5	5	5	5	6	5	5	4	5	60
4	12th	I	Pair of straight Lines	0	1	1	1	2	1	1	1	1	1	1	1	12
5	12th	I	Vectors	7	6	7	7	8	6	5	6	6	6	6	5	75
6	12th	I	Line and Plane	3	4	3	3	3	4	5	4	4	4	4	4	45
7	12th	I	Linear Programming	1	1	1	1	1	1	1	1	1	1	1	1	12
1	12th	II	Differentiation	3	3	3	3	4	3	3	3	3	3	3	3	37
2	12th	II	Applications of Derivatives	6	6	5	5	4	5	5	5	3	5	4	6	59
3	12th	II	Indefinite Integration	5	4	4	4	3	4	4	3	4	4	6	4	49
4	12th	II	Definite Integration	0	1	1	1	2	0	1	1	1	1	1	1	11
5	12th	II	Application of Definite Integration	1	1	1	1	1	2	1	1	1	1	1	1	13
6	12th	II	Differential Equations	2	2	3	3	2	3	3	3	4	3	3	3	34
7	12th	II	Probability Distribution	2	2	2	2	1	2	2	2	2	2	2	2	23
8	12th	II	Binomial Distribution	2	1	1	1	1	1	1	1	2	1	1	1	14
			Total	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**600**

MATHEMATICS

Difficulty level-wise Analysis of MHT-CET 2023 Exam Papers



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Analysis

- **Analysis of questions by difficulty level:** While the distribution of easy, medium, and difficult questions varies among the twelve papers, a notable trend is the prevalence of medium-level questions, with a smaller number of both difficult and easy questions.
  This suggests that the entrance exam places a strong emphasis on the comprehension and practical application of concepts. Students are encouraged to approach their preparation by meticulously studying the chapters, with a particular focus on effectively applying formulas and concepts in order to excel in the entrance exam.

Physics and Chemistry

Time: 90 Minutes Total Marks: 100

PHYSICS

1. A rubber ball filled with water, having a small hole is used as the bob of a simple pendulum. The time period of such a pendulum
(A) is a constant.
(B) decreases with time.
(C) increases with time.
(D) first increases and then decreases, finally having same value as at the beginning.

2. The ratio of wavelengths for transition of electrons from 2nd orbit to 1st orbit of Helium (He^{++}) and Lithium (Li^{+++}) is (Atomic number of Helium = 2, Atomic number of Lithium = 3)
(A) 9 : 4 (B) 4 : 9
(C) 9 : 36 (D) 2 : 3

3. For an intrinsic semiconductor (n_h and n_e are the number of holes per unit volume and number of electrons per unit volume respectively)
(A) $n_h < n_e$ (B) $n_h = n_e$
(C) $n_h = \frac{n_e}{2}$ (D) $n_h > n_e$

4. A 5.0 V stabilized power supply is required to be designed using a 12 V DC power supply as input source. The maximum power rating of zener diode is 2.0 W. The minimum value of resistance R_s in Ω connected in series with zener diode will be
(A) 16.5 (B) 17.5
(C) 18.5 (D) 15.5

5. A jar 'P' is filled with gas having pressure, volume and temperature P,V,T respectively. Another gas jar Q filled with a gas having pressure 2P, volume $\frac{V}{4}$ and temperature 2T. The ratio of the number of molecules in jar P to those in jar Q is
(A) 1 : 1 (B) 1 : 2
(C) 2 : 1 (D) 4 : 1

6. The magnetic flux through a loop of resistance 10 Ω varying according to the relation$\phi = 6t^2 + 7t + 1$, where ϕ is in milliweber, time is in second at time t = 1s the induced e.m.f. is
(A) 12 mV (B) 7 mV
(C) 19 mV (D) 19 V

7. A thin rod of length 'L' is bent in the form of a circle. Its mass is 'M'. What force will act on mass 'm' placed at the centre of this circle?
(G = constant of gravitation)
(A) zero (B) $\frac{GMm}{4L^2\pi^2}$
(C) $\frac{4\pi^2GMm}{L}$ (D) $\frac{2GMm}{L^2}$

8. The coil of an a.c. generator has 100 turns, each of cross-sectional area 2 m^2. It is rotating at constant angular speed 30 rad/s, in a uniform magnetic field of 2×10^{-2} T. If the total resistance of the circuit is 600 Ω then maximum power dissipated in the circuit is
(A) 6 W (B) 9 W
(C) 12 W (D) 24 W

9. A beam of unpolarized light passes through a tourmaline crystal A and then it passes through a second tourmaline crystal B oriented so that its principal plane is parallel to that of A. The intensity of emergent light is I_0. Now B is rotated by 45º about the ray. The emergent light will have intensity ($\cos 45^\circ = \frac{1}{\sqrt{2}}$)
(A) $\frac{I_0}{2}$ (B) $\frac{I_0}{\sqrt{2}}$
(C) $\frac{\sqrt{2}}{I_0}$ (D) $\frac{2}{I_0}$

10. The materials suitable for making electromagnets should have
(A) high retentivity and high coercivity
(B) low retentivity and low coercivity
(C) high retentivity and low coercivity
(D) low retentivity and high coercivity

11. A body falls on a surface of coefficient of restitution 0.6 from a height of 1 m. Then the body rebounds to a height of
(A) 1 m (B) 0.36 m
(C) 0.4 m (D) 0.6 m

12. In a diffraction pattern due to single slit of width 'a', the first minimum is observed at an angle of 30º when the light of wavelength 5400 Å is incident on the slit. The first secondary maximum is observed at an angle of $(\sin 30^\circ = \frac{1}{2})$

(A) $\sin^{-1}\left(\frac{3}{4}\right)$ (B) $\sin^{-1}\left(\frac{2}{3}\right)$

(C) $\sin^{-1}\left(\frac{1}{2}\right)$ (D) $\sin^{-1}\left(\frac{1}{4}\right)$

13. A stone is projected vertically upwards with speed 'v'. Another stone of same mass is projected at an angle of 60º with the vertical with the same speed 'v'. The ratio of their potential energies at the highest points of their journey is [$\sin 30^\circ = \cos 60^\circ = 0.5$, $\cos 30^\circ = \sin 60^\circ = \frac{\sqrt{3}}{2}$]

(A) 4 : 1 (B) 3 : 2

(C) 2 : 1 (D) 1 : 1

14. An electron (mass m) is accelerated through a potential difference of 'V' and then it enters in a magnetic field of induction 'B' normal to the lines. The radius of the circular path is (e = electronic charge)

(A) $\sqrt{\frac{2eV}{m}}$ (B) $\sqrt{\frac{2Vm}{eB^2}}$

(C) $\sqrt{\frac{2Vm}{eB}}$ (D) $\sqrt{\frac{2Vm}{e^2B}}$

15. A capacitor, an inductor and an electric bulb are connected in series to an a.c. supply of variable frequency. As the frequency of the supply is increased gradually, then the electric bulb is found to

(A) increase in brightness.

(B) decrease in brightness.

(C) increase, reach a maximum and then decrease in brightness.

(D) show no change in brightness.

16. When both source and listener are approaching each other the observed frequency of sound is given by (V_L and V_S is the velocity of listener and source respectively, n_0 = radiated frequency)

(A) $n = n_0\left[\frac{V + V_L}{V - V_S}\right]$ (B) $n = n_0\left[\frac{V - V_L}{V + V_S}\right]$

(C) $n = n_0\left[\frac{V - V_L}{V - V_S}\right]$ (D) $n = n_0\left[\frac{V + V_L}{V + V_S}\right]$

17. Water is flowing through a horizontal pipe in stream line flow. At the narrowest part of the pipe

(A) velocity is maximum and pressure is minimum.

(B) pressure is maximum and velocity is minimum.

(C) both pressure and velocity are minimum.

(D) both pressure and velocity are maximum.

18. The angle of prism is A and one of its refracting surface is silvered. Light rays falling at an angle of incidence '2A' on the first surface return back through the same path after suffering reflection at the silvered surface. The refractive index of the material of the prism is

(A) $2\sin\left(\frac{A}{2}\right)$ (B) 2 tan A

(C) 2 cos A (D) 2 sin A

19. The maximum velocity of a particle performing S.H.M. is 'V'. If the periodic time is made $\left(\frac{1}{3}\right)^{rd}$ and the amplitude is doubled, then the new maximum velocity of the particle will be

(A) $\frac{V}{6}$ (B) $\frac{3V}{2}$ (C) 3V (D) 6V

20. A conducting wire of length 2500 m is kept in east-west direction, at a height of 10 m from the ground. If it falls freely on the ground then the current induced in the wire is (Resistance of wire = $25\sqrt{2}$ Ω, acceleration due to gravity g = 10 m/s^2, $B_H = 2 \times 10^{-5}$ T)

(A) 0.2 A (B) 0.02 A

(C) 0.01 A (D) 2 A

21. For an electron moving in the n^{th} Bohr orbit the deBroglie wavelength of an electron is

(A) nπr (B) $\frac{\pi r}{n}$ (C) $\frac{nr}{2\pi}$ (D) $\frac{2\pi r}{n}$

22. A square lamina of side 'b' has same mass as a disc of radius 'R' the moment of inertia of the two objects about an axis perpendicular to the plane and passing through the centre is equal. The ratio $\frac{b}{R}$ is

(A) 1 : 1 (B) $\sqrt{3}$: 1

(C) $\sqrt{6}$: 1 (D) 1 : $\sqrt{3}$

23. A body weighs 300 N on the surface of the earth. How much will it weigh at a distance $\frac{R}{2}$ below the surface of earth? (R → Radius of earth)

(A) 300 N (B) 250 N

(C) 200 N (D) 150 N

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To see complete chapter buy **Target Notes** or **Target E-Notes**

48. A closed organ pipe of length 'L_1' and an open organ pipe contain diatomic gases of densities 'ρ_1' and 'ρ_2' respectively. The compressibilities of the gases are same in both pipes, which are vibrating in their first overtone with same frequency. The length of the open organ pipe is (Neglect end correction)

(A) $\frac{4L_1}{3}$ (B) $\frac{4L_1}{3}\sqrt{\frac{\rho_1}{\rho_2}}$

(C) $\frac{4L_1}{3}\sqrt{\frac{\rho_2}{\rho_1}}$ (D) $\frac{3}{4L_1}\sqrt{\frac{\rho_1}{\rho_2}}$

49. From a metallic surface photoelectric emission is observed for frequencies ν_1 and ν_2 ($\nu_1 > \nu_2$) of the incident light. The maximum values of the kinetic energy of the photoelectrons emitted in the two cases are in the ratio 1 : x. Hence the threshold frequency of the metallic surface is

(A) $\frac{\nu_1 - \nu_2}{x}$ (B) $\frac{\nu_1 - \nu_2}{x-1}$

(C) $\frac{x\nu_1 - \nu_2}{x-1}$ (D) $\frac{x\nu_2 - \nu_1}{x-1}$

50. In an AC circuit, the current is $i = 5\sin(100t - \frac{\pi}{2})$ A and voltage is e = 200 sin (100 t) volt. Power consumption in the circuit is ($\cos 90^\circ = 0$)

(A) 200 W (B) 0 W
(C) 40 W (D) 1000 W

CHEMISTRY

1. Which of the following molecules has no lone pair of electrons on central atom?

(A) SO_2 (B) SF_6
(C) NH_3 (D) SF_4

2. Calculate ΔG° for the cell:

$Sn_{(s)}\left|Sn^{++}_{(1M)}\right|\left|Ag^{+}_{(1M)}\right|Ag_{(s)}$ at 25 °C (E°_{cell} = 0.90 V)

(A) –173.7 kJ (B) –225.3 kJ
(C) –100.2 kJ (D) –290.8 kJ

3. Which from following statements is NOT correct?

(A) All alkali metals are silvery white.
(B) Density of potassium is less than sodium.
(C) Compounds of group-1 elements are diamagnetic.
(D) Melting point of group-1 elements increase down the group.

4. A compound made of elements A and B form fcc structure. Atoms of A are at the corners and atoms of B are present at the centres of faces of cube. What is the formula of the compound?

(A) AB (B) AB_2
(C) AB_3 (D) A_2B

5. What are different possible oxidation states exhibited by scandium?

(A) +4 (B) +5
(C) +4, +5 (D) +2, +3

6. Which from following is the slope of the graph of rate versus concentration of the reactant for first order reaction?

(A) –k (B) k
(C) $\frac{k}{2.303}$ (D) $\frac{-k}{2.303}$

7. What is the packing efficiency of silver metal in its unit cell?

(A) 52.4% (B) 68.0%
(C) 32.0% (D) 74.0%

8. Which from following polymers is obtained from C_2F_4?

(A) PVC
(B) Polyisobutylene
(C) Polyacrylonitrile
(D) Teflon

9. Calculate current in ampere required to deposit 4.8 g Cu from it's salt solution in 30 minutes. [Molar mass of Cu = 63.5 g mol^{-1}]

(A) 8.1 ampere (B) 6.4 ampere
(C) 10.5 ampere (D) 12.3 ampere

10. Identify number of moles of donor atoms in 2n mole of SCN^-.

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

11. 0.2 M aqueous solution of glucose has osmotic pressure 4.9 atm at 300 K. What is the concentration of glucose if it has osmotic pressure 1.5 atm at same temperature?

(A) 0.03 M (B) 0.04 M
(C) 0.05 M (D) 0.06 M

12. Identify the product when phenol is heated with zinc dust.

(A) Benzoquinone (B) Cyclohexane
(C) Benzene (D) Cyclohexanol

13. Identify the product 'B' in the following reaction.

Dry ice $\xrightarrow[\text{Dry ether}]{CH_3MgBr}$ A $\xrightarrow[\text{dil. HCl}]{H_2O}$ B

(A) Methanoic acid (B) Ethanoic acid
(C) Methanol (D) Ethanol

14. Which among the following reactions exhibits $\Delta H = \Delta U$?

(A) $H_{2(g)} + Br_{2(g)} \rightarrow 2HBr_{(g)}$
(B) $2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$
(C) $PCl_{5(g)} \rightarrow PCl_{3(g)} + Cl_{2(g)}$
(D) $C_{(s)} + 2H_2O_{(g)} \rightarrow 2H_{2(g)} + CO_{2(g)}$

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To see complete chapter buy **Target Notes** or **Target E-Notes**

Mathematics

Time: 90 Minutes Total Marks: 100

1. If two vertices of a triangle are A(3, 1, 4) and B(– 4, 5, –3) and the centroid of the triangle is G(–1, 2, 1), then the third vertex C of the triangle is
(A) (2, 0, 2) (B) (–2, 0, 2)
(C) (0, –2, 2) (D) (2, –2, 0)

2. In a Binomial distribution with n = 4, if 2P(X = 3) = 3P(X = 2), then the variance is
(A) $\frac{36}{169}$ (B) $\frac{144}{169}$
(C) $\frac{9}{169}$ (D) $\frac{16}{169}$

3. Let two non-collinear vectors $\hat{a}$ and $\hat{b}$ form an acute angle. A point P moves, so that at any time t the position vector $\overline{OP}$, where O is origin, is given by $\hat{a}\sin t + \hat{b}\cos t$, when P is farthest from origin O, let M be the length of $\overline{OP}$ and $\hat{u}$ be the unit vector along $\overline{OP}$, then
(A) $\hat{u} = \frac{\hat{a}+\hat{b}}{|\hat{a}+\hat{b}|}$ and $M = \left(1+\hat{a}\cdot\hat{b}\right)^{\frac{1}{2}}$
(B) $\hat{u} = \frac{\hat{a}-\hat{b}}{|\hat{a}-\hat{b}|}$ and $M = \left(1+\hat{a}\cdot\hat{b}\right)^{\frac{1}{2}}$
(C) $\hat{u} = \frac{\hat{a}+\hat{b}}{|\hat{a}+\hat{b}|}$ and $M = \left(1+2\hat{a}\cdot\hat{b}\right)^{\frac{1}{2}}$
(D) $\hat{u} = \frac{\hat{a}-\hat{b}}{|\hat{a}-\hat{b}|}$ and $M = \left(1-2\hat{a}\cdot\hat{b}\right)^{\frac{1}{2}}$

4. The number of solutions in $[0, 2\pi]$ of the equation $16^{\sin^2 x} + 16^{\cos^2 x} = 10$ is
(A) 2 (B) 4 (C) 6 (D) 8

5. The differential equation of all parabolas, whose axes are parallel to Y-axis, is
(A) $y_3 = 1$ (B) $y_3 = -1$
(C) $y_3 = 0$ (D) $yy_3 + y_1 = 0$

6. The value of c of Lagrange's mean value theorem for $f(x) = \sqrt{25-x^2}$ on [1, 5] is
(A) $\sqrt{15}$ (B) 5 (C) $\sqrt{10}$ (D) 1

7. $\int \frac{x+1}{x\left(1+xe^x\right)^2}dx =$
(A) $\log\left|\frac{xe^x}{1+xe^x}\right| + c$, where c is a constant of integration.
(B) $\log\left|\frac{xe^x}{1+xe^x}\right| - \frac{1}{1+xe^x} + c$, where c is a constant of integration.
(C) $\log|1+xe^x| + \frac{1}{1+xe^x} + c$, where c is a constant of integration.
(D) $\log\left|\frac{xe^x}{1+xe^x}\right| + \frac{1}{1+xe^x} + c$, where c is a constant of integration.

8. If $Z_1 = 4i^{40} - 5i^{35} + 6i^{17} + 2$, $Z_2 = -1 + i$, where $i = \sqrt{-1}$, then $|Z_1 + Z_2| =$
(A) 5 (B) 13
(C) 12 (D) 15

9. The approximate value of $\log_{10}998$ is (given that $\log_{10}e = 0.4343$)
(A) 3.0008686 (B) 1.9991314
(C) 2.0008686 (D) 2.9991314

10. If $\sin^{-1}x + \cos^{-1}y = \frac{3\pi}{10}$, then the value of $\cos^{-1}x + \sin^{-1}y$ is
(A) $\frac{\pi}{10}$ (B) $\frac{7\pi}{10}$
(C) $\frac{9\pi}{10}$ (D) $\frac{3\pi}{10}$

11. The area (in sq. units) of the region $A = \left\{(x,y) / \frac{y^2}{2} \le x \le y+4\right\}$ is
(A) 30 (B) $\frac{53}{3}$
(C) 16 (D) 18

12. A, B, C are three events, one of which must and only one can happen. The odds in favor of A are 4 : 6, the odds against B are 7 : 3. Thus, odds against C are
(A) 7 : 3 (B) 4 : 6
(C) 6 : 4 (D) 3 : 7

13. The value of α, so that the volume of the parallelopiped formed by $\hat{i}+\alpha\hat{j}+\hat{k}$, $\hat{j}+\alpha\hat{k}$ and $\alpha\hat{i}+\hat{k}$ becomes maximum, is
(A) $\frac{-1}{\sqrt{3}}$ (B) $\frac{1}{\sqrt{3}}$
(C) $-\sqrt{3}$ (D) $\sqrt{3}$

14. Two sides of a triangle are $\sqrt{3}+1$ and $\sqrt{3}-1$ and the included angle is 60°, then the difference of the remaining angles is
(A) 30° (B) 45°
(C) 60° (D) 90°

Page no. **9** to **10** are purposely left blank.

To see complete chapter buy **Target Notes** or **Target E-Notes**

41. If f(1) = 1, f ′(1) = 3, then the derivative of $f(f(f(x))) + (f(x))^2$ at $x = 1$ is
(A) 12 (B) 19
(C) 23 (D) 33

42. Three fair coins numbered 1 and 0 are tossed simultaneously. Then variance Var (X) of the probability distribution of random variable X, where X is the sum of numbers on the uppermost faces, is
(A) 0.7 (B) 0.75
(C) 0.65 (D) 0.62

43. $\int \frac{1}{\sin(x-a)\sin x}\,dx =$
(A) sin a(log(sin(x – a) · cosec x)) + c, where c is a constant of integration.
(B) cosec a(log(sin(x – a) · cosec x)) + c, where c is a constant of integration.
(C) – sin a(log(sin(x – a) · sin x)) + c, where c is a constant of integration.
(D) – cosec a(log(sin(x – a) · sin x)) + c, where c is a constant of integration.

44. The derivative of f(sec x) with respect to g(tan x) at $x = \frac{\pi}{4}$, where $f'(\sqrt{2}) = 4$ and $g'(1) = 2$, is
(A) 2 (B) $\frac{1}{\sqrt{2}}$
(C) $\sqrt{2}$ (D) $\frac{1}{2\sqrt{2}}$

45. The scalar product of the vector $\hat{i}+\hat{j}+\hat{k}$ with a unit vector along the sum of the vectors $2\hat{i}+4\hat{j}-5\hat{k}$ and $\lambda\hat{i}+2\hat{j}+3\hat{k}$ is equal to 1, then value of λ is
(A) 1 (B) 2
(C) 3 (D) 4

46. The number of discontinuities of the greatest integer function $f(x) = [x], x \in \left(-\frac{7}{2}, 100\right)$
(A) 104 (B) 100
(C) 102 (D) 103

47. If $\left[\left(\bar{a}+2\bar{b}+3\bar{c}\right)\times\left(\bar{b}+2\bar{c}+3\bar{a}\right)\right]\cdot\left(\bar{c}+2\bar{a}+3\bar{b}\right) = 54$, then the value of $\left[\bar{a}\ \bar{b}\ \bar{c}\right]$ is
(A) 0 (B) 1
(C) 3 (D) 2

48. A spherical raindrop evaporates at a rate proportional to its surface area. If originally its radius is 3mm and 1 hour later it reduces to 2mm, then the expression for the radius R of the raindrop at any time t is
(A) 6R = t + 2
(B) R(t + 2) = 6
(C) R = 6(t + 2)
(D) 6R = t

49. If the Cartesian equation of a line is $6x - 2 = 3y + 1 = 2z - 2$, then the vector equation of the line is
(A) $\bar{r} = \left(\frac{1}{3}\hat{i}-\frac{1}{3}\hat{j}+\hat{k}\right)+\lambda\left(\hat{i}+2\hat{j}+3\hat{k}\right)$
(B) $\bar{r} = \left(\hat{i}+\hat{j}+\hat{k}\right)+\lambda\left(\hat{i}+2\hat{j}+3\hat{k}\right)$
(C) $\bar{r} = \left(\frac{-1}{3}\hat{i}+\frac{1}{3}\hat{j}+\hat{k}\right)+\lambda\left(\hat{i}-2\hat{j}+3\hat{k}\right)$
(D) $\bar{r} = \left(\frac{1}{3}\hat{i}-\frac{1}{3}\hat{j}-\hat{k}\right)+\lambda\left(\hat{i}-\hat{j}+\hat{k}\right)$

50. The volume of parallelopiped, whose coterminous edges are given by $\bar{u} = \hat{i}+\hat{j}+\lambda\hat{k}$, $\bar{v} = \hat{i}+\hat{j}+3\hat{k}$, $\bar{w} = 2\hat{i}+\hat{j}+\hat{k}$ is 1 cu. units. If θ is the angle between $\bar{u}$ and $\bar{w}$, then the value of cos θ is
(A) $\frac{3}{4}$ (B) $\frac{5}{6}$
(C) $\frac{1}{5}$ (D) $\frac{1}{6}$

MHT-CET - 2023 9th May (Shift – I) Score card		
Subject	**Total Number of correct answers**	**Total Marks:**
Physics		(Out of 50)
Chemistry		(Out of 50)
Mathematics		(Out of 100)
Total		(Out of 200)

[*In Physics and Chemistry, each question carries 1 Mark. In Mathematics, each question carries 2 Marks. There is no negative marking for wrong answers.*]

9th May (Shift – I)

PHYSICS

1. (D) Std.12 | Ch-5 | Subtopic-5.12

From $T = 2\pi\sqrt{\frac{L}{g}}$

The effective length increases due to this flow of water. Therefore, T increases. As the water flows out, the length decreases and becomes equal to the original length. Hence, the time period becomes equal to the value at the beginning.

2. (A) Std.12 | Ch-15 | Subtopic-15.5

Using Rydberg's Formula,

$$\frac{1}{\lambda} = R_H Z^2\left[\frac{1}{n^2} - \frac{1}{m^2}\right]$$

$$\Rightarrow \lambda \propto \frac{1}{Z^2}$$

$\therefore$ $\lambda_{Li} : \lambda_{He} = 9 : 4$

3. (B) Std.11 | Ch-14 | Subtopic-14.4

4. (B) Std.12 | Ch-16 | Subtopic-16.3

Using the series resistance formula for a zener diode

$$R_S = \frac{(V_S - V_Z)}{I_{Z\max}}$$

$$I_{Zmax} = \frac{P_Z}{V_Z} = \frac{2}{5} = 400 \text{ mA}$$

$\therefore$ $$R_S = \frac{(12-5)}{400\times10^{-3}} = \frac{7}{400}\times10^3$$

$$= 17.5\ \Omega$$

5. (D) Std.12 | Ch-3 | Subtopic-3.1

According to the ideal gas equation $PV = Nk_BT$

For jar P, we have

$PV = N_1k_BT$ ....(i)

For jar Q, we have,

$$(2P)\left(\frac{V}{4}\right) = N_2k_B(2T)$$

$\Rightarrow PV = 4N_2\, k_B\, T$ ....(ii)

From equations (i) and (ii)

$$N_1 = 4N_2 \quad \Rightarrow \frac{N_1}{N_2} = 4$$

$\therefore$ $N_1 : N_2 = 4 : 1$

6. (C) Std.12 | Ch-12 | Subtopic-12.2

Given R = 10 Ω, $\phi = 6t^2 + 7t + 1$ mWb, t = 1s

From $e = \frac{d\phi}{dt}$,

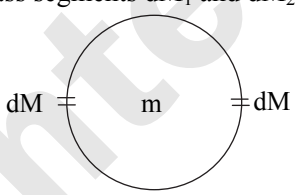
$$e = \frac{d}{dt}\left(6t^2 + 7t + 1\right) = 12t + 7$$

Put t = 1 in the above equation,

$\therefore$ e = 19 mV

7. (A) Std.11 | Ch-5 | Subtopic-5.3

Consider two diametrically and equal small and equal mass segments dM_1 and dM_2



$\therefore$ Force at the centre due to dM_1 is

$$F_1 = \frac{GmdM_1}{r^2}$$

Similarly,

Force at the centre due to dM_2 is

$$F_2 = \frac{GmdM_2}{r^2}$$

But $F_1 = -F_2$

$\Rightarrow F_1 + F_2 = 0$ ($\because$ the forces cancel each other out as they are equal and opposite)

If this process is done for all such dM segments, we find the net force at the centre of the circle to be zero.

8. (C) Std.12 | Ch-13 | Subtopic-13.6

N = 100, A = 2 m^2, ω = 30 rad/s,

B = 2×10^{-2} T, R = 600 Ω

Maximum power dissipated in the circuit

$$P_{max} = E_{rms} \times I_{rms} = \frac{E_0}{\sqrt{2}} \times \frac{I_0}{\sqrt{2}}$$

$$= \frac{E_0 I_0}{2} \quad \text{....(i)}$$

But $I_0 = \frac{E_0}{R}$ ....(ii)

Putting (2) into (1) we get,

$$I_0 = \frac{E_0^{\,2}}{2R}$$

But $E_0 = NAB\omega$

$E_0 = 100 \times 2 \times 2 \times 10^{-2} \times 30$

$= 120$ V

$\therefore$ $$P_{max} = \frac{120\times120}{2\times600} = 12 \text{ W}$$

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To see complete chapter buy **Target Notes** or **Target E-Notes**

Total kinetic energy

$E_K = \frac{1}{2} I\omega^2 + \frac{1}{2} MV^2$

$= \frac{MV^2}{5} + \frac{MV^2}{2}$

$= \frac{7MV^2}{10}$ ....(ii)

Dividing (ii) by (i), we get,

$\frac{E_K}{E_{rot}} = \frac{\left(\frac{7MV^2}{10}\right)}{\left(\frac{MV^2}{5}\right)} = \frac{7}{2}$

44. (B) Std.12 | Ch-1 | Subtopic-1.5

The ratio of moments of inertia of two discs of the same mass and same thickness but of different densities is given by $\frac{I_1}{I_2} = \frac{R_1^2}{R_2^2} = \frac{d_2}{d_1}$

45. (C) Std.12 | Ch-6 | Subtopic-6.7

The fundamental frequency of a string is given by

Given: $l = l_1 + l_2 + l_3$ ....(i)

$n = \frac{1}{2l}\sqrt{\frac{T}{m}}$

$\Rightarrow n \propto \frac{1}{l}$ or $nl = k$

$\therefore$ $l_1 = \frac{k}{n_1}$, $l_2 = \frac{k}{n_2}$ and $l_3 = \frac{k}{n3}$ ....(ii)

$\therefore$ Original length $l = \frac{k}{n}$ ....(iii)

Putting eq (ii) and (iii) into eq (i)

$\frac{k}{n} = \frac{k}{n_1} + \frac{k}{n_2} + \frac{k}{n_3}$

$\therefore$ $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$

46. (D) Std.12 | Ch-5 | Subtopic-5.12

Thinking Hatke - Q.46

In outer space, g = 0. Therefore, T = ∞.

47. (C) Std.12 | Ch-8 | Subtopic-8.2

Thinking Hatke - Q.47

We know the electric field inside a shell is zero. So, we only consider the electric field due to the solid sphere.

$\therefore$ Using $E = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$, we get

$E = \frac{1}{4\pi\varepsilon_0}\frac{(3Q)}{R^2}$

48. (B) Std.12 | Ch-6 | Subtopic-6.7

Given both gases are vibrating in the first overtone with same frequency, we get

$f_{closed} = f_{open}$

$\Rightarrow \frac{3v}{4L_1} = \frac{v}{L_2}$

According to Laplace's correction

$v = \sqrt{\frac{\gamma P}{\rho}}$

$\frac{3}{4L_1} \times \sqrt{\frac{\gamma P}{\rho_1}} = \frac{1}{L_2} \times \sqrt{\frac{\gamma P}{\rho_2}}$

$\therefore$ $L_2 = \frac{4L_1}{3}\sqrt{\frac{\rho_1}{\rho_2}}$

49. (C) Std.12 | Ch-14 | Subtopic-14.2

Using Einstein's photoelectric equation,

$E_k = h\nu - \phi_0$

$E_k = h\nu - h\nu_0$

$\therefore$ $E_{K_1} = h(\nu_1 - \nu_0)$ and $E_{K_2} = h(\nu_2 - \nu_0)$

Given $\frac{E_{K_1}}{E_{K_2}} = \frac{1}{x}$

$\Rightarrow \frac{\nu_1 - \nu_0}{\nu_2 - \nu_0} = \frac{1}{x}$

$(\nu_1 - \nu_0)x = \nu_2 - \nu_0$

$\nu_1 x - \nu_0 x = \nu_2 - \nu_0$

$\therefore$ $\nu_1 x - \nu_2 = \nu_0 x - \nu_0$

$\nu_1 x - \nu_2 = \nu_0(x - 1)$

$\therefore$ $\nu_0 = \frac{\nu_1 x - \nu_2}{x - 1}$

50. (B) Std.12 | Ch-13 | Subtopic-13.6

$P = I_{rms} V_{rms} \cos\phi$

$\phi = 90°$

$\therefore$ $P = 0$ ($\because \cos 90° = 0$)

CHEMISTRY

1. (B) Std.11 | Ch-5 | Subtopic-5.3

Molecule	No. of lone pairs on the central atom
SO_2	1
SF_6	0
NH_3	1
SF_4	1

2. (A) Std.12 | Ch-5 | Subtopic-5.8

$\Delta G° = -nF E°_{cell}$

$= -2 \times 96500 \times 0.90$

$= -173700$ J

$= -173.7$ kJ

Page no. **139** to **140** are purposely left blank.

To see complete chapter buy **Target Notes** or **Target E-Notes**

36. **(B)** Std.11 | Ch-6 | Subtopic-6.2

CaC_2

$\therefore$ $+2 + (x \times 2) = 0$ or $x = -1$

$K_2C_2O_4$

$\therefore$ $(+1 \times 2) + (x \times 2) + (-2 \times 4) = 0$ or $x = +3$

37. **(A)** Std.11 | Ch-15 | Subtopic-15.1

$$\underset{\text{Methyl magnesium iodide}}{CH_3 - Mg - I} + H - O - H \xrightarrow{\text{dry ether}} \underset{\text{Methane}}{CH_3 - H} + MgI(OH)$$

From the reaction, n moles water molecules are required to prepare n moles of methane from n moles of methyl magnesium iodide.

38. **(B)** Std.12 | Ch-8 | Subtopic-8.6

In the contact process of industrial production of sulfuric acid; sulphur dioxide and oxygen from the air react reversibly over a solid catalyst of platinised asbestos.

39. **(C)** Std.12 | Ch-6 | Subtopic-6.3

Rate = $k [A]^2[B]$

$\therefore$ $k = \dfrac{\text{rate}}{[A]^2[B]}$

$$k = \frac{1.8 \times 10^{-2}\ \text{mol dm}^{-3}\ \text{s}^{-1}}{\left(0.2\ \text{mol dm}^{-3}\right)^2 \times 0.1\ \text{mol dm}^{-3}}$$

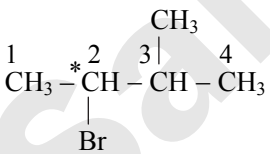
$= 4.5\ \text{mol}^{-2}\ \text{dm}^6\ \text{s}^{-1}$

40. **(B)** Std.12 | Ch-2 | Multifarious

41. **(B)** Std.12 | Ch-12 | Subtopic-12.8

42. **(A)** Std.12 | Ch-15 | Subtopic-15.6

43. **(C)** Std.12 | Ch-10 | Subtopic-10.5



2-Bromo-3-methylbutane is a chiral molecule.

44. **(B)** Std.11 | Ch-1 | Subtopic-1.7

Atomic mass is the mass of an atom of the element.

Mass of 1 atom of the element = 10 u

Now, 1 u = 1.66056×10^{-24} g

Therefore, 10 u = 1.66056×10^{-23} g

45. **(A)** Std.12 | Ch-3 | Subtopic-3.9

$$A_2B_{3(s)} \rightleftharpoons 2A^{3+}_{(aq)} + 3B^{2-}_{(aq)}$$

Here, $x = 2$, $y = 3$

$K_{sp} = x^x\, y^y\, S^{x+y}$

$= (2)^2\,(3)^3\,S^{2+3}$

$= 108S^5$

$K_{sp} = 108 \times (1 \times 10^{-3})^5$

$= 108 \times 10^{-15}$

$= 1.08 \times 10^{-13}$

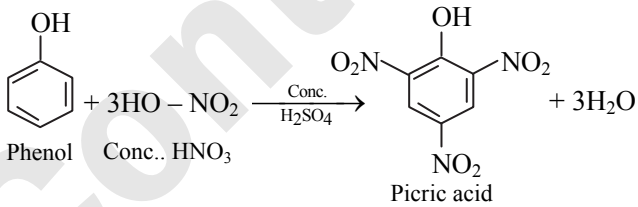
46. **(A)** Std.12 | Ch-7 | Subtopic-7.3

The general electronic configuration of the group 16 elements is $ns^2\ np^4$.

Among the given options, Se is a group 16 element.

47. **(C)** Std.12 | Ch-11 | Subtopic-11.4

Phenol reacts with concentrated nitric acid in presence of concentrated H_2SO_4 to form 2,4,6-trinitrophenol (picric acid).



48. **(A)** Std.12 | Ch-14 | Subtopic-14.2

49. **(A)** Std.12 | Ch-16 | Subtopic-16.7

50. **(D)** Std.12 | Ch-10 | Subtopic-10.6

Alkyl halide (R – X) on treatment with KNO_2 forms alkyl nitrite (R - O – N = O).

MATHEMATICS

1. **(B)** Std.12 | Part-1 | Ch-5 | Exercise-5.2

Let $\bar{a}, \bar{b}, \bar{c}$ and $\bar{g}$ be the position vectors of A, B, C and G respectively.

$\bar{a} = 3\hat{i} + 1\hat{j} + 4\hat{k}$,

$\bar{b} = -4\hat{i} + 5\hat{j} - 3\hat{k}$,

$\bar{g} = -\hat{i} + 2\hat{j} + \hat{k}$,

G is centroid of ΔABC.

$\therefore$ $\bar{g} = \dfrac{\bar{a} + \bar{b} + \bar{c}}{3}$

$3\bar{g} = \bar{a} + \bar{b} + \bar{c}$

$3\left(-\hat{i} + 2\hat{j} + \hat{k}\right) = 3\hat{i} + \hat{j} + 4\hat{k} - 4\hat{i} + 5\hat{j} - 3\hat{k} + \bar{c}$

$\therefore$ $\bar{c} = -3\hat{i} + 6\hat{j} + 3\hat{k} - 3\hat{i} - \hat{j} - 4\hat{k} + 4\hat{i} - 5\hat{j} + 3\hat{k}$

$= -2\hat{i} + 0\hat{j} + 2\hat{k}$

$\therefore$ Third vertex C $\equiv (-2, 0, 2)$

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