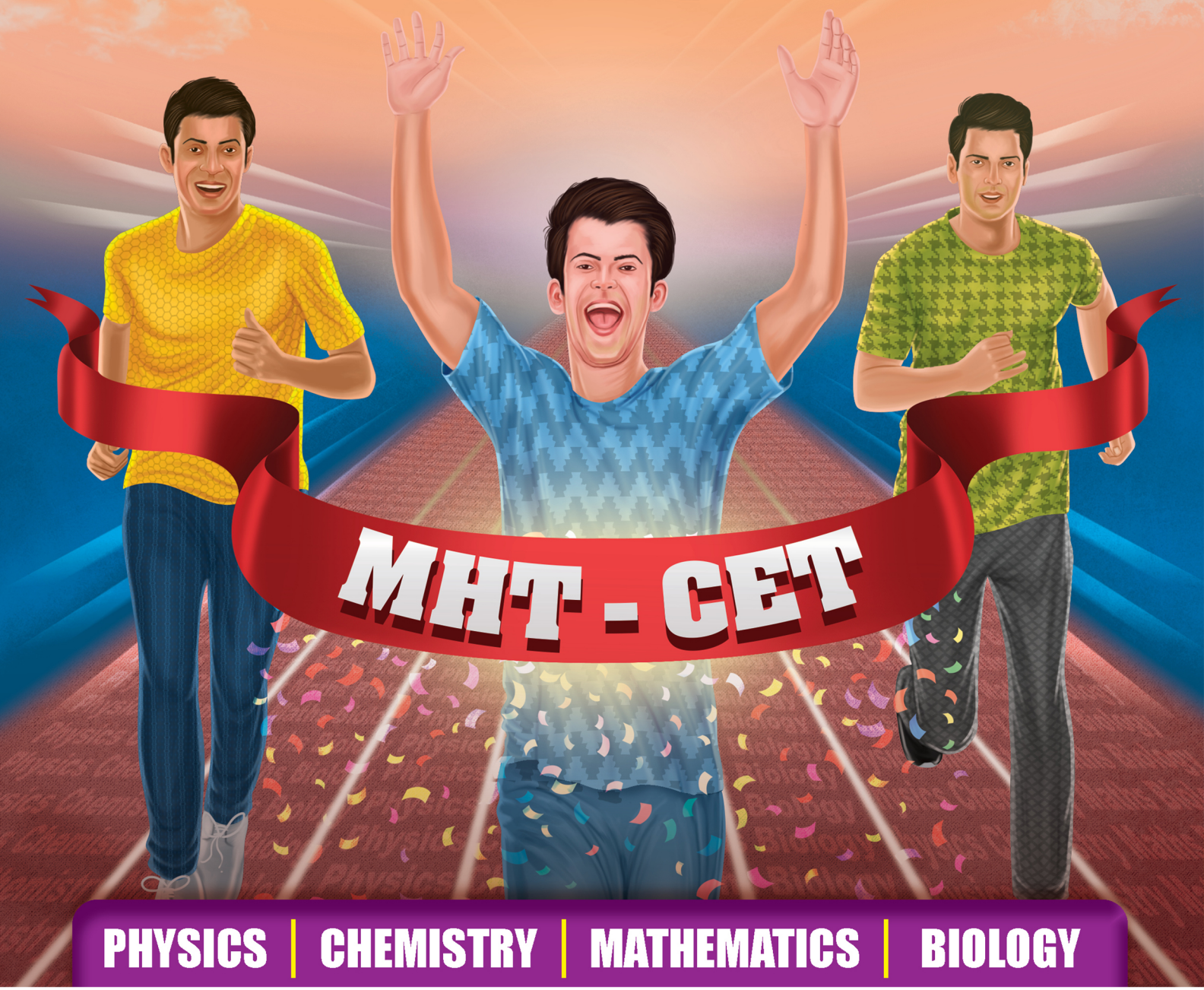
SAMPLE CONTENT

22 MODEL QUESTION PAPERS WITH SOLUTIONS



MHT - CET

PHYSICS | CHEMISTRY | MATHEMATICS | BIOLOGY

Target Publications®

Written in accordance with the latest MHT-CET Paper Pattern prescribed by
State Common Entrance Test Cell, Maharashtra State

Academicace

MHT-CET
22 MODEL QUESTION PAPERS WITH SOLUTIONS

PHYSICS | CHEMISTRY | MATHEMATICS | BIOLOGY

Salient Features

- Set of 22 Model Question Papers (with answers and solutions) for Physics, Chemistry, Mathematics and Biology.
- Prepared as per the latest paper pattern of MHT-CET examination
- Detailed Solutions provided to difficult MCQs for easy comprehension
- 21 Model Question Papers with answers and solutions are provided in book while 1 Model Question Paper with its solution is provided through Q.R. code.
- Includes Multiple **Smart Keys** to enhance understanding of concepts and problem solving skills:
  - ***Smart Code*** - ***Shortcut*** - ***Caution***
  - ***Thinking Hatke*** - ***Smart Tip***
- 4 Original MHT-CET Question Papers with Answers and Solutions through Q.R. codes.

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PREFACE

In the realm of education, where curiosity sparks intellect and knowledge paves the way, we proudly present ***MHT-CET: 22 Model Question Papers with Solutions (PCMB).*** This book is designed to assess the understanding students have gained over two years in junior college. It includes 21 Model Question Papers with solutions in the book, while 1 Model Question Paper with its solution is provided through Q.R. code.

Each test paper aligns with the MHT-CET exam pattern and touches upon all conceptual nodes of Physics, Chemistry, Mathematics, and Biology. The primary objective of this book is to help students gauge their preparedness for the examination.

To assist students, detailed solutions are provided for challenging MCQs. Additionally, *Smart Keys* offer strategic support to enhance problem-solving efficiency:

Smart Keys

- **Smart Code** provides simple and smart mnemonics for easy recall.
- **Shortcut** incorporates theoretical or formula-based short tricks for faster problem-solving.
- **Caution** apprises students about mistakes often made while solving MCQs.
- **Thinking Hatke** suggests innovative approaches to crack tricky questions.
- **Smart Tip** offers quick tricks to solve MCQs effectively in minimal time.

Previous years' examination papers have been provided via QR codes to offer students a glimpse of the complexity of the questions asked in the examination.

We hope that this book will enable students to optimize their time-management abilities to achieve high scores in the examination.

"With the right tools, even ordinary individuals achieve extraordinary results." We aspire for this book to be that perfect tool, helping students embark on a path to success.

Your feedback is invaluable! Write to us at: **mail@targetpublications.org**.

Publisher
Edition: Fourth

MHT-CET 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 Syllabus of State Council of Educational Research and Training, Maharashtra 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 State Council of Educational Research and Training, Maharashtra and

ii. chapters / units from Std. XI curriculum prescribed by State Council of Educational Research and Training, Maharashtra as mentioned below:

Sr.no	Subject	Chapters/Units of Std. XI
1	Physics	Vectors, Error Analysis, 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 2, States of Matter (Gaseous and Liquids), Adsorption and Colloids (Surface Chemistry), Hydrocarbons, Basic Principles of Organic Chemistry, Chemistry in Everyday Life
3	Mathematics	Trigonometry - II, Straight Line, Circle, Probability, Complex Numbers, Permutations and Combinations, Functions, Limits, Continuity, Conic Section
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.**]**

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Practice test Papers are the only way to assess your preparedness for the Exams.
Scan the adjacent QR code to know more about our ***"MHT-CET Test Series with Answer Key & Solutions for PCMB"*** books for the MHT-CET Entrance examination.

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MODEL TEST - 01 (Paper – I)

01

Time: 90 Minutes | Mathematics | Total Marks: 100

1. Co-ordinates of a point on the curve $y = x \sin x$ at which the normal is parallel to the line $4x + 4y = 3$ are

(A) $\left(-\frac{\pi}{2}, -\frac{\pi}{2}\right)$ (B) $\left(\frac{\pi}{2}, -\frac{\pi}{2}\right)$

(C) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (D) $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$

2. The differential equation of the family of curves $y = ae^{2(x+b)}$ is

(A) $\frac{dy}{dx} - y = 0$ (B) $\frac{dy}{dx} + y = 0$

(C) $\frac{dy}{dx} + 2y = 0$ (D) $\frac{dy}{dx} - 2y = 0$

3. Let $\bar{a}$ and $\bar{b}$ be two unit vectors and α be the angle between them, then $\bar{a} + \bar{b}$ is a unit vector, if $\alpha =$

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{3}$

(C) $\frac{2\pi}{3}$ (D) $\frac{\pi}{2}$

4. At any point on a curve, the slope of the tangent is equal to the sum of abscissa and the product of ordinate and abscissa of that point. If the curve passes through (0, 1), then the equation of the curve is

(A) $y = 2e^{\frac{x^2}{2}} - 1$ (B) $y = 2e^{\frac{x^2}{2}}$

(C) $y = e^{-x^2}$ (D) $y = 2e^{-x^2} - 1$

5. If the probability density function of a continuous random variable X is

$f(x) = k(1 - x^2)$; $0 < x < 1$

$= 0$; otherwise

Then $P\left(0 < X < \frac{1}{2}\right) =$

(A) $\frac{9}{11}$ (B) $\frac{11}{16}$

(C) $\frac{2}{3}$ (D) $\frac{15}{17}$

6. If the function $f(x) = x^3 - 6x^2 + ax + b$ satisfies Rolle's theorem in the interval [1, 3] and $f'\left(\frac{2\sqrt{3}+1}{\sqrt{3}}\right) = 0$, then

(A) $a = -11$ (B) $a = -6$

(C) $a = 6$ (D) $a = 11$

7. The inverse of $\begin{bmatrix} 1 & \cos\alpha \\ -\cos\alpha & -1 \end{bmatrix}$ is

(A) $\begin{bmatrix} 1 & \cos\alpha \\ -\cos\alpha & -1 \end{bmatrix}$

(B) $-\sec^2\alpha \begin{bmatrix} 1 & -\cos\alpha \\ -\cos\alpha & 1 \end{bmatrix}$

(C) $\operatorname{cosec}^2\alpha \begin{bmatrix} 1 & \cos\alpha \\ -\cos\alpha & -1 \end{bmatrix}$

(D) $\operatorname{cosec}^2\alpha \begin{bmatrix} 1 & -\cos\alpha \\ -\cos\alpha & 1 \end{bmatrix}$

8. The area of the region bounded by the curve $y = x^3$ and the lines $y = 8$ and $x = 0$ is

(A) 16 (B) 8

(C) 10 (D) 12

9. If the lines $\frac{x+1}{k} = \frac{y+3}{-1} = \frac{z-4}{1}$ and $\frac{x+10}{-1} = \frac{y+1}{-3} = \frac{z-1}{4}$ intersect each other, then the value of k is

(A) 7 (B) –8

(C) 9 (D) –10

10. $\int \frac{5\cos x + 4\sin x}{3\cos x + 2\sin x} dx =$

(A) $\frac{23x}{13} + \frac{2}{13}\log|3\cos x + 2\sin x| + c$

(B) $\frac{23x}{13} - \frac{2}{13}\log|2\cos x + 3\sin x| + c$

(C) $\frac{23x}{13} - \frac{2}{13}\log|3\cos x + 2\sin x| + c$

(D) $\frac{23x}{13} + \frac{2}{13}\log|2\cos x + 3\sin x| + c$

11. If $3\bar{a} + 5\bar{b} = 8\bar{c}$, then A divides BC in the ratio

(A) 8 : 5 externally (B) 8 : 5 internally

(C) 5 : 8 externally (D) 5 : 8 internally

12. $\int e^{\sin^{-1}x}\left(\frac{x + \sqrt{1-x^2}}{\sqrt{1-x^2}}\right) dx =$

(A) $xe^{\sin^{-1}x} + c$ (B) $x^2e^{\sin^{-1}x} + c$

(C) $\frac{1}{x}e^{\sin^{-1}x} + c$ (D) $\frac{1}{x^2}e^{\sin^{-1}x} + c$

13. The line $x - 2y = 0$ is perpendicular to one of the lines given by $ax^2 + 2hxy + by^2 = 0$, when

(A) $a + 4b = 4h$ (B) $a + b = 4h$

(C) $4a + b = h$ (D) $4a + b = 4h$

MODEL TEST - 21 (Paper – III)

21

Time: 90 Minutes | Biology | Total Marks: 100

1. Chemically all living organisms have three basic types of macromolecules, which are polymers of simple subunits called _____.
(A) nucleotides (B) dipeptide
(C) monomers (D) disaccharide

2. During respiration 38 ATP molecules per glucose molecule are produced in respiratory chain. 22 molecules of these 38 ATP molecules are produced from $NADH_2$/ $FADH_2$ during
(A) Embden Meyerhof pathway
(B) Krebs cycle
(C) oxidative decarboxylation
(D) glycolytic pathway

3. If the cells of the nucellus in the angiosperm ovule contain 24 chromosomes, then _____ chromosomes will be present in the endosperm of a self-pollinated flower.
(A) 24 (B) 48 (C) 36 (D) 12

4. How many synergids and antipodals respectively are present in a typical angiosperm embryo sac at maturity?
(A) Two and three (B) Three and two
(C) One and three (D) One and two

5. Select the CORRECT statement.
(A) Angiotensin II is a powerful vasodilator.
(B) Counter current mechanism takes place in the PCT.
(C) Reduction in Glomerular Filtration Rate activates JG cells to release renin.
(D) ADH increases the osmolarity of blood.

6. Which of the following is diploid?
(A) Secondary polar body
(B) Spermatid
(C) Spermatogonia
(D) Primary polar body

7. Given below are two statements:
Statement-I: Adrenal gland is the largest endocrine gland.
Statement-II: Zona glomerulosa is the outer thin part of adrenal cortex and it secretes mineralocorticoids.
In the light of above statements, choose the most appropriate answer from the options given below
(A) Both Statement-I and Statement-II are correct.
(B) Both Statement-I and Statement-II are incorrect.
(C) Statement-I is correct but Statement-II is incorrect.
(D) Statement-I is incorrect but Statement-II is correct.

8. Which of the following statements is correct with respect to life cycle of *Plasmodium*.
(A) When mosquito bites a man, gametocytes are injected.
(B) The sporozoites reproduce sexually in liver cells
(C) Female mosquito takes up sporozoites
(D) The gametocytes develop in RBCs.

9. In a pond there were 500 carp fishes in the beginning of the year. They have a birth rate of 4 offspring per carp per year. What will be the total number of carp fish at the end of that year?
(A) 2000 (B) 2500
(C) 3000 (D) 3500

10. From the following identify the statements that are CORRECT with respect to homologous and non-homologous region of X and Y chromosomes.
i. Non-homologous region of X chromosome is longer and contains more genes than that of non-homologous region of Y chromosome.
ii. X-linked genes are present on non-homologous region of X-chromosome.
iii. Y-linked genes are present on homologous region of Y-chromosome.
iv. Crossing over occurs only between homologous regions of X and Y chromosomes.
(A) i, ii and iii (B) ii and iii
(C) i, ii and iv (D) i and iii

11. Water has high
(A) specific heat
(B) heat of vaporization
(C) heat of fusion
(D) all of these

12. Match Column I and Column II and choose the correct option.

	Column 'A'		Column 'B'
i.	Callus	a.	Breeding crops for improving their nutritional value.
ii.	Morphogenesis	b.	DNA molecules carrying the desired gene.
iii.	Biofortification	c.	Unorganized mass of loosely arranged parenchymatous cells.
iv.	Vectors	d.	Development of different plant organs from callus.

ANSWERS AND SOLUTIONS

Model Test Paper 01

Paper – I (Mathematics)

1. (D)

$y = x \sin x$ …(i)

$\therefore \quad \frac{dy}{dx} = x\cos x + \sin x$

Slope of the normal $= -\frac{1}{\left(\frac{dy}{dx}\right)} = \frac{-1}{x\cos x + \sin x}$

Slope of the given line is –1.

Since the normal is parallel to the given line.

$\therefore \quad \frac{-1}{x\cos x + \sin x} = -1$

$\Rightarrow x\cos x + \sin x = 1$

$\Rightarrow x = \frac{\pi}{2}$

From (i), $y = \frac{\pi}{2}$

$\therefore$ Co-ordinates of the point are $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$.

2. (D)

$y = ae^{2(x+b)}$ …(i)

$\Rightarrow \frac{dy}{dx} = 2ae^{2(x+b)}$

$\Rightarrow \frac{dy}{dx} = 2y$ …[From (i)]

$\Rightarrow \frac{dy}{dx} - 2y = 0$

3. (C)

Since, $\bar{a}$ and $\bar{b}$ are unit vectors.

$\therefore \quad |\bar{a}| = |\bar{b}| = 1$ …(i)

Given, $|\bar{a} + \bar{b}| = 1$

$\Rightarrow |\bar{a} + \bar{b}|^2 = 1$

$\Rightarrow |\bar{a}|^2 + |\bar{b}|^2 + 2(\bar{a}.\bar{b}) = 1$

$\Rightarrow |\bar{a}|^2 + |\bar{b}|^2 + 2|\bar{a}||\bar{b}|\cos\alpha = 1$

$\Rightarrow 2 + 2\cos\alpha = 1$ …[From (i)]

$\Rightarrow \cos\alpha = -\frac{1}{2} \Rightarrow \alpha = \frac{2\pi}{3}$

4. (A)

$\frac{dy}{dx} = x + xy$

$\Rightarrow \frac{1}{1+y}dy = x\,dx$

Integrating on both sides, we get

$\int \frac{1}{1+y}dy = \int x\,dx + c$

$\log(1+y) = \frac{x^2}{2} + c$ …(i)

Since the required curve passes through (0, 1),

$c = \log 2$

$\therefore \quad \log(1+y) = \frac{x^2}{2} + \log 2$ …[From (i)]

$\Rightarrow \log\left(\frac{1+y}{2}\right) = \frac{x^2}{2}$

$\Rightarrow y = 2e^{\frac{x^2}{2}} - 1$

5. (B)

Since, f(x) is the p.d.f. of X.

$\therefore \quad \int_{-\infty}^{\infty} f(x)dx = 1$

$\Rightarrow \int_{-\infty}^{0} f(x)dx + \int_{0}^{1} f(x)dx + \int_{1}^{\infty} f(x)dx = 1$

$\Rightarrow 0 + \int_{0}^{1} k(1-x^2)dx + 0 = 1$

$\Rightarrow k\left[x - \frac{x^3}{3}\right]_0^1 = 1$

$\Rightarrow \frac{2}{3}k = 1$

$\Rightarrow k = \frac{3}{2}$

$P\left(0 < X < \frac{1}{2}\right) = \int_0^{\frac{1}{2}} f(x)\,dx = \int_0^{\frac{1}{2}} \frac{3}{2}(1-x^2)\,dx$

$= \frac{3}{2}\left[x - \frac{x^3}{3}\right]_0^{\frac{1}{2}} = \frac{3}{2}\left(\frac{1}{2} - \frac{1}{24}\right) = \frac{11}{16}$

6. (D)

$f(x) = x^3 - 6x^2 + ax + b$

$\Rightarrow f'(x) = 3x^2 - 12x + a$

Now, $f'(c) = 0 \Rightarrow f'\left(2 + \frac{1}{\sqrt{3}}\right) = 0$

$\Rightarrow 3\left(2 + \frac{1}{\sqrt{3}}\right)^2 - 12\left(2 + \frac{1}{\sqrt{3}}\right) + a = 0$

$\Rightarrow 3\left(4 + \frac{1}{3} + \frac{4}{\sqrt{3}}\right) - 12\left(2 + \frac{1}{\sqrt{3}}\right) + a = 0$

$\Rightarrow 12 + 1 + 4\sqrt{3} - 24 - 4\sqrt{3} + a = 0$

$\Rightarrow a = 11$

92. (C)
Let the number of atoms of element Y in hcp unit cell be n.
∴ Number of tetrahedral voids = 2n
As 2/3rd of the tetrahedral voids are occupied by atoms of element X,
Number of atoms of element X = $2n \times \frac{3}{4} = \frac{3n}{2}$
∴ Ratio of atoms of element X : atoms of element Y = $\frac{3n}{2} : n = 3 : 2$
The formula of the compound is X_3Y_2.

93. (B)
Molecules on the surface of liquid experience attractive forces in the downward direction

94. (A)
Co^{2+} and Cr^{3+} are coloured due to the presence of 3 unpaired electrons each. But Ti^{4+} is colourless because of absence of unpaired electrons.

95. (B) **96. (A)**

97. (B)
In the reaction, $PCl_{5(g)} \longrightarrow PCl_{3(g)} + Cl_{2(g)}$;
$\Delta n = 2 - 1 = +1$
$\Delta H = \Delta U + \Delta n_g RT$
∴ $\Delta H > \Delta U$

98. (B) **99. (C)**

100. (D)

Thinking Hatke - 100
To identify the structure, check the different groups bonded to the central carbon atom. Here, the central carbon atom is bonded to *one* −R group, *one* −H, and *two* −OR′ groups. This implies it is an acetal.

Paper – III (Biology)

1. (B) **2. (A)** **3. (B)**

4. (A)
I. Oesophagus is a thin muscular tube that lies behind trachea and is lined by mucous cells.
II. Histologically, oesophagus is made up of longitudinal and circular muscles that help in passage of food through oesophagus by peristaltic movements.

5. (A) **6. (A)**

7. (D)
Genetic material in HIV is in the form of ss RNA.

8. (D)
In criss-cross inheritance, the defect is carried from mother to son and from son to his daughter.

9. (C) **10. (A)** **11. (C)**

12. (C)
Sertoli cells line the seminiferous tubule and act like nurse cells by providing nourishment for the developing sperms.

13. (D) **14. (B)** **15. (D)**

16. (B)
Swimming is a complex polysynaptic reflex action.

17. (D) **18. (A)** **19. (A)**

20. (A) **21. (D)** **22. (B)**

23. (B) **24. (C)** **25. (D)**

26. (A)

27. (B)
Diosgenin is a steroid compound produced by Yam plant (*Dioscorea*) which is used in manufacture of antifertility pills.

28. (C) **29. (B)** **30. (B)**

31. (A)

32. (A)
I. The archaeocytes get coated with a thick resistant layer of secretion by amoebocytes.
II. Gemmules are produced to overcome unfavourable conditions.

33. (C) **34. (C)** **35. (A)**

36. (C) **37. (A)** **38. (A)**

39. (B)
Phosphorus is a major constituent of biological membranes, nucleic acids and cellular energy transfer systems. Exchanges of phosphorus between organism and environment are negligible.

40. (D)

Heads	Period
Dryopithecus	About 25 -20 mya
Ramapithecus	About 14-12 mya
Australopithecus	About 4 – 1.8 mya
Homo habilis	About 2.5 to 1.4 mya
Homo erectus	About 1.5 mya ago
Neanderthal man	About 100000 to 40000 years ago

Smart Code - 40
Stages of Human Evolution:
Doctor **Ram** **A**dvised to **Ha**ve **E**gg **N**oodle **S**oup
D *– **D**ryopithecus,* ***Ram*** *– **Ram**apithecus,* ***A*** *– **A**ustralopithecus,* ***Ha*** *– Homo **ha**bilis,* ***E*** *– Homo **e**rectus,* ***N*** *– **N**eanderthal man,* ***S*** *– Homo **s**apiens*

84. (A) **85. (C)** **86. (B)**

87. (C) **88. (B)** **89. (D)**

90. (A)

Caution - 90
In emphysema, breakdown of alveoli and shortness of breath occurs whereas in chronic bronchitis there is coughing, shortness of breath.

91. (B) **92. (B)**

93. (C)

Thinking Hatke - 93
We know that Jhum cultivation occurs in North east. This correct pairing (i- b) is observed in option (C) only. Therefore, the probability of having answer from other options is eliminated and option (C) is the correct answer.

94. (B)
Pyruvate dehydrogenase complex needs thiamine as a co-enzyme.

95. (C)
In an ovule, the haploid polar nuclei fuse together to form diploid secondary nucleus.

Smart Tip - 95
Haploid: Pollen grains, Male gametes, Vegetative and generative cell of pollen grain, Antipodals, Egg, synergids
Diploid: Anther, Sporogenous tissue, Microspore mother cells, Ovule, Integuments, Nucellus, Megaspore mother cells, Secondary nucleus, Zygote, Embryo, Perisperm, Scutellum
Triploid: Primary endosperm cell, endosperm

96. (C)

97. (D)
Volatile substances in spices – Lungs

98. (D)
Ventilators do not assist in the pumping of blood.

99. (A) **100. (A)**

43. (A)

$\int e^x\left[2\operatorname{cosec} 2x + \log(\tan x)\right] dx$

$= e^x \log(\tan x) + c$

$\ldots\left[\because \int e^x\left[f(x) + f'(x)\right]dx = e^x f(x) + c\right]$

44. (B)

Let R $(\bar{r})$ divide line AB internally in the ratio 1 : 3.

$\therefore \quad \bar{r} = \frac{\bar{b} + 3\bar{a}}{1+3}$

$= \frac{1(-\hat{i} + 3\hat{j} - 4\hat{k}) + 3(2\hat{i} - 6\hat{j} + 8\hat{k})}{4}$

$= \frac{5\hat{i} - 15\hat{j} + 20\hat{k}}{4}$

$= \frac{5\hat{i}}{4} + \left(\frac{-15\hat{j}}{4}\right) + 5\hat{k}$

$\therefore$ Co-ordinates of R are $\left(\frac{5}{4}, \frac{-15}{4}, 5\right)$

45. (A)

$a\cos^2\frac{C}{2} + c\cos^2\frac{A}{2} = \frac{3b}{2}$

$\Rightarrow a\left(\frac{1+\cos C}{2}\right) + c\left(\frac{1+\cos A}{2}\right) = \frac{3b}{2}$

$\Rightarrow \frac{a + a\cos C + c + c\cos A}{2} = \frac{3b}{2}$

$\Rightarrow (a + c) + (a\cos C + c\cos A) = 3b$

$\Rightarrow (a + c) + b = 3b$ …[by projection rule]

$\Rightarrow a + c = 2b$

$\Rightarrow$ a, b, c are in A.P.

46. (A)

Put $\log x = t$

$\Rightarrow x = e^t$

$\Rightarrow dx = e^t dt$

$\therefore \quad \int (\log x)^5 dx = \int t^5 e^t dt$

$= e^t(t^5 - 5t^4 + 20t^3 - 60t^2 + 120t - 120) + \text{constant}$

$= x[(\log x)^5 - 5(\log x)^4 + 20(\log x)^3 - 60(\log x)^2 + 120\log x - 120] + \text{constant}$

$\therefore \quad A = 1, B = -5, C = 20, D = -60, E = 120$ and $F = -120$

$\therefore \quad A + B + C + D + E + F = -44$

47. (D)

The distance of (1,1,1) from the origin is

$d = \sqrt{(1)^2 + (1)^2 + (1)^2} = \sqrt{3}$

Distance of (1,1,1) from

$x + y + z + k = 0$ is

$d_1 = \left|\frac{(1) + (1) + (1) + k}{\sqrt{(1)^2 + (1)^2 + (1)^2}}\right| = \pm\frac{k+3}{\sqrt{3}}$

Now, $\sqrt{3} = \pm\frac{1}{2}\left(\frac{k+3}{\sqrt{3}}\right)$ ….(given)

$\Rightarrow 6 = \pm(k + 3)$

$\Rightarrow k = 3, -9$

48. (A)

Here, a = 3, b = 2

$\therefore$ The area of the given ellipse = 6π sq. units

Shortcut - 48

Area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is πab sq. units.

49. (A)

$\tan^{-1} x - \cot^{-1} y - \cot^{-1} z = 0$

$\therefore \quad \tan^{-1} x - \frac{\pi}{2} + \tan^{-1} y - \frac{\pi}{2} + \tan^{-1} z = 0$

$\therefore \quad \tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$

$\therefore \quad \tan^{-1}\left[\frac{x + y + z - xyz}{1 - xy - yz - zx}\right] = 0$

$\therefore \quad \left[\frac{x + y + z - xyz}{1 - xy - yz - zx}\right] = 0$

$\therefore \quad xyz = x + y + z$

Shortcut - 49

$\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \tan^{-1}\left[\frac{x + y + z - xyz}{1 - xy - yz - zx}\right]$

50. (B)

$(\bar{a} + \bar{b})\cdot(\bar{a} + \bar{b}) = |\bar{a}|^2 + |\bar{b}|^2 + 2\bar{a}\cdot\bar{b}$

$\Rightarrow |\bar{a} + \bar{b}|^2 = 2.2\cos^2\frac{\theta}{2}$

$\Rightarrow \cos\theta = \frac{\theta}{2} = \frac{1}{2}|\bar{a} + \bar{b}|$

Paper – II (Physics and Chemistry)

PHYSICS

1. (C)

2. (B)

$E = -Rch \Rightarrow R = -\frac{E}{ch} = -\frac{13.6 \times 1.6 \times 10^{-19}}{3 \times 10^8 \times 6.6 \times 10^{-34}}$

$= 1.098 \times 10^7\ m^{-1}$

3. (C)

$c = \frac{Q}{m\Delta T} = s = 0.03$ cal/g °C

4. (B)

Since $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

$\frac{1}{v} = -\frac{1}{u} + \frac{1}{f}$

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