

# Model Question Papers

*With Solutions*

## STD. XII Sci.

### Salient Features

- A set of 4 Question Papers with solutions each for Physics, Chemistry, Maths & Biology (Total 16 Question Papers)
- Prepared as per the new board paper pattern.
- Includes Board Question Papers of 2015 and 2016.
- Complete answers to every question with relevant marking scheme.
- Graphs and diagrams provided wherever necessary.
- Simple and lucid language.
- Self-evaluative in nature.

*Solutions with relevant marking scheme to Board Question papers available in downloadable PDF format at [www.targetpublications.org/tp10121](http://www.targetpublications.org/tp10121)*

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## *Preface*

HSC is the cornerstone of a student's career as it opens up the doors to turn their dreams into reality. It acts as a platform for students to specialize in a field that interests them the most. However, to achieve this it becomes imperative to get into the details of each subject and to clarify its fundamentals. Adequate knowledge base thus helps kids to boost their self confidence and pave their way up in the final examinations.

It is rightly said, 'practice makes a man perfect'. Keeping this adage in mind, we are proud to introduce "**Std XII Science Model Question Papers**". This set of question papers provides students thorough practice for preparation of their final examinations. The book consists of 16 question papers in all based on Physics, Chemistry, Maths and Biology (*a set of four question papers for each subject*). Along with the question papers, we've provided model answers with relevant marking schemes so as to make sure that students understand the importance of each question. These question papers reflect the latest changes in content and paper pattern as updated by the Board of Higher Secondary Education.

Furthermore we have also included Board Question Papers of March, October 2015 and March, July 2016 examinations, solutions to which are available in downloadable PDF format at our website [www. targetpublications.org](http://www.targetpublications.org). The purpose behind this is to make students familiar with the current question pattern and marking schemes. It also gives them a holistic understanding of the exact nature of the board question papers.

We are sure that, these question papers would provide ample practice to students in a systematic manner and would boost their confidence to face the challenges posed in examinations.

We welcome your valuable suggestions and feedback towards this book.

*We wish the students all the best for their examinations.*

Yours faithfully

Publisher

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## PHYSICS : MARKING SCHEME

- There will be one single paper of 70 marks in Physics.
- Duration of the paper will be 3 hours.
- Physics paper will consist of two parts viz: Section-I and Section-II.
- Each section will be of 35 marks.
- Same answer sheet will be used for both the sections.
- Each section will consist of 4 questions.
- The sequence of the 4 questions in each section may or may not remain same.
- The paper pattern for Section–I and Section–II will be as follows:

**Question 1:****(7 Marks)**

This question will be based on Multiple Choice Questions.

There will be 7 MCQs, each carrying one mark.

One question will be based on calculations.

Students will have to attempt all these questions.

**Question 2:****(12 Marks)**

This question will contain 8 questions, each carrying 2 marks.

Students will have to answer any 6 out of the given 8 questions.

4 questions will be theory-based and 4 will be numericals.

**Question 3:****(9 Marks)**

This question will contain 4 questions, each carrying 3 marks.

Students will have to answer any 3 out of the given 4 questions.

2 questions will be theory-based and 2 will be numericals.

**Question 4:****(7 Marks)**

This question will contain 2 questions, each carrying 7 marks.

Students will have to answer any 1 out of the given 2 questions.

4/5 marks are allocated for theory-based question and 3/2 marks for numerical.

### Distribution of Marks According to Type of Questions

Type of Questions	Marks	Marks with option	Percentage (%)
Objectives	14	14	20
Short Answers	42	56	60
Brief Answers	14	28	20
<b>Total</b>	<b>70</b>	<b>98</b>	<b>100</b>



Sr. No.	Unit	Marks Without option	Marks with option
1	Circular Motion	04	05
2	Gravitation	03	05
3	Rotational Motion	04	06
4	Oscillations	05	07
5	Elasticity	03	04
6	Surface Tension	04	05
7	Wave Motion	03	04
8	Stationary Waves	05	07
9	Kinetic Theory of Gases and Radiation	04	06
10	Wave Theory of light	03	04
11	Interference and Diffraction	04	06
12	Electrostatics	03	04
13	Current Electricity	03	04
14	Magnetic Effects of Electric Current	03	04
15	Magnetism	03	04
16	Electromagnetic Induction	04	06
17	Electrons and Photons	03	04
18	Atoms, Molecules and Nuclei	04	06
19	Semiconductors	03	04
20	Communication Systems	02	03



# CHEMISTRY : MARKING SCHEME

- There will be one written paper of 70 Marks in Chemistry.
- Duration of the paper will be 3 hours.
- Chemistry paper will have two parts viz: Part I of 35 marks and Part II of 35 marks.
- Same Answer Sheet will be used for both the parts.
- In the question paper, for each part there will be 4 Questions.
- The sequence of the 4 Questions in each part may or may not remain same.
- Students have freedom to decide the sequence of answers.
- The paper pattern as per the marking scheme for Part I and Part II will be as follows:

**Question 1:** (7 Marks)

There will be 7 Multiple Choice Questions (MCQs), each carrying 1 mark.

Total marks = 7

**Question 2:** (12 Marks)

There will be 8 Questions out of which 6 Questions are to be answered, each carrying 2 marks.

Total marks = 12

**Question 3:** (9 Marks)

There will be 4 Questions out of which 3 Questions are to be answered, each carrying 3 marks.

Total marks = 9

(There will be 3 Questions based on numericals from Part I)

**Question 4:** (7 Marks)

There will be 2 Questions out of which 1 Question has to be answered.

It will carry 7 marks.

Total Marks = 7

(There will be 2/3 marks Questions based on numericals from Part I)

## Distribution of Marks According to Type of Questions

Type of Questions	Marks	Marks with option	Percentage (%)
Objectives	14	14	20
Short Answers	42	56	60
Brief Answers	14	28	20
<b>Total</b>	<b>70</b>	<b>98</b>	<b>100</b>



No.	Topic Name	Marks Without Option	Marks With Option
1	Solid State	04	06
2	Solutions and Colligative Properties	05	07
3	Chemical Thermodynamics and Energetics	06	08
4	Electrochemistry	05	07
5	Chemical Kinetics	04	06
6	General Principles and Processes of Isolation of Elements	03	05
7	p-Block Elements	08	10
8	d and f-Block Elements	05	06
9	Coordination Compounds	03	04
10	Halogen Derivatives of Alkanes and Arenes	04	06
11	Alcohols, Phenols and Ethers	04	06
12	Aldehydes, Ketones and Carboxylic Acids	05	07
13	Compounds Containing Nitrogen	04	06
14	Biomolecules	04	06
15	Polymers	03	04
16	Chemistry in Everyday Life	03	04



# MATHEMATICS : MARKING SCHEME

- There will be one single paper of 80 Marks in Mathematics.
- Duration of the paper will be 3 hours.
- Mathematics paper will consist of two parts viz: Part-I and Part-II.
- Each Part will be of 40 Marks.
- Same Answer Sheet will be used for both the parts.
- Each Part will consist of 3 Questions.
- The sequence of the Questions will be determined by the Moderator.
- The paper pattern for Part–I and Part–II will be as follows:

## Question 1:

This Question will carry 12 marks and consist of two sections (A) and (B) as follows: **(12 Marks)**

(A) This Question will be based on Multiple Choice Questions.

There will be 3 MCQs, each carrying two marks.

(B) This Question will have 5 sub-questions, each carrying two marks.

Students will have to attempt any 3 out of the given 5 sub-questions.

## Question 2:

This Question will carry 14 marks and consist of two sections (A) and (B) as follows: **(14 Marks)**

(A) This Question will have 3 sub-questions, each carrying three marks.

Students will have to attempt any 2 out of the given 3 sub-questions.

(B) This Question will have 3 sub-questions, each carrying four marks.

Students will have to attempt any 2 out of the given 3 sub-questions.

## Question 3:

This Question will carry 14 marks and consist of two sections (A) and (B) as follows: **(14 Marks)**

(A) This Question will have 3 sub-questions, each carrying three marks.

Students will have to attempt any 2 out of the given 3 sub-questions.

(B) This Question will have 3 sub-questions, each carrying four marks.

Students will have to attempt any 2 out of the given 3 sub-questions.

## Distribution of Marks According to Type of Questions

Type of Questions	Marks	Marks with option	Percentage (%)
Short Answers	24	32	30
Brief Answers	24	36	30
Detailed Answers	32	48	40
<b>Total</b>	<b>80</b>	<b>116</b>	<b>100</b>





### Maths – I

Sr. No.	Unit	Marks With Option
1	Mathematical Logic	08
2	Matrices	06
3	Trigonometric Functions	10
4	Pair of Straight Lines	07
5	Vectors	08
6	Three Dimensional Geometry	04
7	Line	05
8	Plane	06
9	Linear Programming	04
	<b>Total</b>	<b>58</b>

### Maths – II

Sr. No.	Unit	Marks With Option
1	Continuity	06
2	Differentiation	08
3	Applications of Derivatives	08
4	Integration	09
5	Definite Integral	08
6	Applications of Definite Integral	
7	Differential Equations	08
8	Probability Distribution	06
9	Binomial Distribution	05
	<b>Total</b>	<b>58</b>



## BIOLOGY : MARKING SCHEME

- There will be one written paper of 70 Marks in Biology.
- Duration of the paper will be 3 hours.
- Biology paper will have two parts viz: Part I of 35 marks and Part II of 35 marks
- There will be two separate answer sheets for both the parts.
- In the same question paper, each part will have 4 Questions.
- Sequence of answering the questions can be determined by the students.
- The paper pattern for Part I and Part II will be as follows:

**Question 1:** (7 Marks)

There will be 7 multiple choice Questions (MCQs), each carrying one mark.  
Total marks = 7

**Question 2:** (12 Marks)

This will have Questions as 'A', 'B' and 'C'.  
In that,

**Q.A** will be based on : Answer in one sentence.  
There will be 6 Questions each carrying 1 mark  
Total marks = 6

**Q.B** will have one Question based on diagrams  
Total Marks = 2

**Q.C** will have 4 Questions, each carrying 2 marks  
Students will have to answer any 2 out of given 4 Questions  
Total marks = 4

**Total Marks (A + B + C) = 12**

**Question 3:** (9 Marks)

This will have Questions as 'A' and 'B'

**Q.A** will have 3 Questions each carrying 3 marks  
Students will have to answer any 2 out of given 3 Questions  
Total Marks = 6

**Q.B** will have one Question based on diagrams  
Total Marks = 3

**Total Marks (A + B) = 9**

**Question 4:** (7 Marks)

In this Question, 2 Questions will be asked each carrying 7 marks.  
Students will have to answer any one out of given 2 Questions  
Total Marks = 7

### Distribution of Marks According to Type of Questions

Type of Questions	Marks	Marks with option	Percentage (%)
Objectives	14	14	20
Short Answers	42	56	60
Brief Answers	14	28	20
<b>Total</b>	<b>70</b>	<b>98</b>	<b>100</b>



No.	Topic Name	Marks Without Option	Marks With Option
1	Genetic Basis of Inheritance	08	12
2	Gene : It's Nature, Expression and Regulation		
3	Biotechnology: Process and Application	07	09
4	Enhancement in Food Production		
5	Microbes in Human Welfare	03	05
6	Photosynthesis	07	09
7	Respiration		
8	Reproduction in Plants	07	09
9	Organisms and Environment – I	03	05
10	Origin and Evolution of Life	07	09
11	Chromosomal Basis of Inheritance		
12	Genetic Engineering and Genomics	03	05
13	Human Health and Diseases	05	07
14	Animal Husbandry		
15	Circulation	10	14
16	Excretion and Osmoregulation		
17	Control and Co-ordination		
18	Human Reproduction	07	09
19	Organisms and Environment – II	03	05



# MODEL QUESTION PAPER SET – I

## PHYSICS

**Time: 3 Hours****Total Marks: 70****Note:**

- i. All questions are compulsory
- ii. Neat diagrams must be drawn wherever necessary.
- iii. Figure to the right indicate full marks.
- iv. Use of logarithmic table is allowed.
- v. All symbols have their usual meaning unless otherwise stated.

**SECTION – I**

**Q.1. Select and write the most appropriate answer from the given alternatives for each sub-question:**

[7]

- i. If a wave enters from air to water, then what remains unchanged?  
(A) Frequency (B) Amplitude  
(C) Velocity (D) Wavelength
- ii. If the earth stops rotating, the value of 'g' at the equator will \_\_\_\_\_.  
(A) increase (B) decrease  
(C) remain same (D) become zero
- iii. On being churned the butter separates out of milk due to \_\_\_\_\_.  
(A) centrifugal force (B) adhesive force  
(C) cohesive force (D) frictional force
- iv. The average kinetic energy of a gas molecule is \_\_\_\_\_.  
(A) proportional to pressure of gas  
(B) inversely proportional to volume of gas  
(C) inversely proportional to absolute temperature of gas  
(D) proportional to absolute temperature of gas
- v. Speed of sound in air is 300 m/s. The distance between two successive nodes of a stationary wave of frequency 1000 Hz is \_\_\_\_\_.  
(A) 10 cm (B) 20 cm (C) 15 cm (D) 30 cm
- vi. The time period of a spring of force constant k loaded with mass m is \_\_\_\_\_.  
(A)  $T \propto m$  and  $T \propto k$  (B)  $T \propto \sqrt{m}$  and  $T \propto \frac{1}{\sqrt{k}}$   
(C)  $T \propto \left(\frac{1}{m}\right)$  and  $T \propto k$  (D)  $T \propto \left(\frac{1}{m}\right)$  and  $T \propto \frac{1}{\sqrt{k}}$
- vii. If a person, sitting on a rotating table, with his arms outstretched and holding heavy dumb bells in each hand, suddenly lowers his hands, then \_\_\_\_\_.  
(A) his angular velocity decreases (B) his angular velocity does not change  
(C) his angular momentum increases (D) his moment of inertia decreases

**Q.2. Attempt any SIX:**

[12]

- i. Distinguish between deforming force and stress.
- ii. A simple harmonic progressive wave of frequency 5 Hz is travelling along the positive X direction with a velocity of 40 m/s. Calculate the phase difference between two points separated by a distance of 0.8 m.



- iii. State Wien's displacement law. State its significance.
- iv. Obtain an expression for time period of a satellite orbiting very close to earth's surface in terms of mean density.

Show that,  $T = \sqrt{\frac{3\pi}{G\rho}}$ , where  $\rho$  = mean density of earth

- v. Define frequency of S.H.M. Discuss its unit and dimension.
- vi. A bullet of mass 10 g and speed 500 m/s is fired into a door and gets embedded exactly at the centre of the door. The door is 1.0 m wide and weighs 9 kg. It rotates about a vertical axis practically without friction. Find the angular speed of the door just after the bullet embeds into it.
- vii. A uniform wire under tension is fixed at its ends. If the ratio of tensions in the wire to the square of its length is 320 dyne/cm<sup>2</sup> and fundamental frequency of vibration of wire is 400 Hz, find its linear density.
- viii. A mass of 4 kg is tied at the end of a string 1.2 m long, revolving in a horizontal circle. If the breaking tension in the string is 200 N, find the maximum number of revolutions per minute the mass can make.

**Q.3. Attempt any THREE:**

[9]

- i. A cyclist speeding at 18 km/hr on a level road takes a sharp circular turn of radius 4 m without reducing the speed. The coefficient of static friction between the tyres and the road is 0.2. Will the cyclist slip while taking the turn? Calculate maximum safety speed. Will it be constant always?
- ii. A brass wire of radius 2 mm is loaded by a mass of 32.8 kg. What would be the decrease in its radius?  
( $Y = 9 \times 10^{10}$  N/m<sup>2</sup>, Poisson's ratio  $\sigma = 0.36$ )
- iii. State and prove law of conservation of angular momentum. Give two examples.
- iv. What is a heat engine? Explain working and efficiency of heat engine.

**Q.4. Discuss analytically the composition of two S.H.M's of same period and parallel to each other. Obtain their resultant amplitude. Also find the resultant amplitude when phase difference of two S.H.M's is a. 0 b.  $\pi$**

Find the height of a geostationary satellite (communication satellite) from the surface of the earth. (Mass of the earth =  $6 \times 10^{24}$  kg, radius of the earth = 6400 km,  $G = 6.67 \times 10^{-11}$  N.m<sup>2</sup>/kg<sup>2</sup>)

[7]

**OR**

**Q.4. Derive an expression for the kinetic energy of a body rotating with uniform angular velocity.**

A body describes S.H.M in a path 0.16 m long. Its velocity at the centre of the line is 0.12 m/s. Find the period and magnitude of velocity at a distance  $1.7 \times 10^{-2}$  m from the mean position.

[7]

**SECTION - II**

**Q.5. Select and write the most appropriate answer from the given alternatives for each sub-question:**

[7]

- i. Velocity of light in air is 'c'. Its velocity in a medium of refractive index 1.5 will be \_\_\_\_\_.  
(A) c      (B)  $\frac{c}{1.5}$       (C)  $c \times 1.5$       (D)  $c + 1.5$
- ii. For what value of velocity of electrons, the stopping potential will be able to stop them?  
(A)  $10^3$  m/s      (B) Very high speeds      (C) Very low speeds      (D) All speeds
- iii. If the lengths of two wires of same material are in the ratio 2 : 1, then the ratio of their specific resistances will be \_\_\_\_\_.  
(A) 1 : 2      (B) 2 : 1      (C) 4 : 1      (D) 1 : 1



- iv. If 'R' and 'L' stand for the resistance and inductance respectively, then among the following the one having the dimensions of frequency is \_\_\_\_\_.
- (A)  $\frac{R}{L}$       (B)  $\frac{L}{R}$       (C)  $\frac{\sqrt{R}}{L}$       (D)  $\frac{\sqrt{L}}{R}$
- v. The phenomenon of paramagnetism is a consequence of \_\_\_\_\_.
- (A) distortion effect      (B) orientation effect  
(C) both (A) and (B)      (D) neither (A) nor (B)
- vi. In an amplitude modulated wave, the power content of the carrier is maximum for which value of 'm'?
- (A) zero      (B) 1      (C) 0.1      (D) 0.4
- vii. In Boolean algebra,  $\overline{\overline{A+B}}$  = \_\_\_\_\_.
- (A)  $A \cdot B$       (B)  $A + B$       (C)  $\overline{A+B}$       (D)  $\overline{A} \cdot \overline{B}$

**Q.6. Attempt any SIX:**

[12]

- i. A solenoid of 100 turns per unit length and cross-sectional area  $2 \times 10^{-4} \text{ m}^2$  carries a current of 6 A. It is placed in horizontal axis at  $30^\circ$  with direction of uniform magnetic field of 0.3 T. Calculate magnetic moment of solenoid and torque experienced by solenoid due to the field.
- ii. Four resistances  $5 \Omega$ ,  $5 \Omega$ ,  $5 \Omega$  and  $15 \Omega$  form a Wheatstone's network. Find the resistance which when connected across the  $15 \Omega$  resistance, will balance the network.
- iii. Define cut off potential. Show graphically variation of photoelectric current with collector plate potential for different intensity of incident radiation.
- iv. Explain why microscopes of high magnifying power have oil-immersion objectives.
- v. Explain I – V characteristics of zener diode with suitable graph.
- vi. Calculate the de Broglie wavelength of proton if it is moving with speed of  $8 \times 10^6 \text{ m/s}$ . ( $m_p = 1.67 \times 10^{-27} \text{ kg}$ ).
- vii. An alternating emf  $E = 250 \sin \omega t \text{ V}$  is connected to a  $1250 \Omega$  resistor. Calculate the rms current through the resistor and the average power dissipated in one cycle.
- viii. Write any two points of difference between amplitude modulation and frequency modulation.

**Q.7. Attempt any THREE**

[9]

- i. An alternating e.m.f is applied to a circuit containing resistance. Discuss the behaviour of current in the circuit.
- ii. With the help of a neat circuit diagram, explain working of P-N junction diode as a half-wave rectifier.
- iii. A resistance of  $5 \Omega$  is connected in parallel to a galvanometer of resistance  $495 \Omega$ . Find the fraction of the total current, passing through galvanometer.
- iv. Two parallel plate air capacitors have their plate areas  $100 \text{ cm}^2$  and  $400 \text{ cm}^2$  respectively. If they have the same charge and potential and the distance between the plates of the first capacitor is 0.4 mm, what is the distance between the plates of the second capacitor?

**Q.8. Explain origin of spectral line and obtain Bohr's formula.**

If the difference in velocities of light in glass and water is  $0.24 \times 10^8 \text{ m/s}$ , find the velocity of light in air (Given :  $\mu_g = \frac{3}{2}$ ,  $\mu_w = 4/3$ )

[7]

OR

- Q.8.** Explain principle, construction and working of transformer. Also, derive equation of transformer. When a surface is irradiated with light of wavelength  $4950 \text{ \AA}$ , a photocurrent appears which vanishes if a retarding potential greater than 0.6 V is applied across the phototube. When different source of light is used, it is found that the critical retarding potential is changed to 1.1 V. Find the work function of the emitting surface and the wavelength of the second source.

[7]