

**SURAJ
SCHOOL
MANESAR**

**SURAJ
EDUCATION**

*Summer
Vacation*
**HOLIDAY
HOMEWORK**

SESSION 2026-27

Make your vacation
meaningful, fun-filled
and full of learning!

EXPLORE

LEARN

ENJOY

GROW

Name : _____

Class & Section : _____

Roll No. : _____

READ

LEARN

GROW

Chemistry

1. Make an investigatory project Roll no. wise on the following topics:

- a. Study of adulterants in food- Detection of adulteration in milk, sugar and spices using simple chemical test.
- b. Comparison of cleansing action of soap and detergents, effect of pH and effect of hard water on soaps and detergents
- c Study of Dyes- Prepare natural dyes from turmeric, beetroot, tea leaves and their fastness on clothes.
- d. Detection of artificial colours in food.
- e. Comparative study of water quality.
- f. Comparing Vitamin C in fruit juices
- g. Study the presence of oxalate ions in guava fruit at different stages of ripening.

2. Complete Lab Manual written work.

3. Prepare NCERT intext and exercise questions of the following chapters-

- i) Solutions
- ii) Electrochemistry
- iii) Chemical Kinetics
- iv) D and F Block elements
- v) Coordination Chemistry

Biology

Chapters: Sexual Reproduction in Flowering Plants & Principles of Inheritance and Variation

A. Multiple Choice Questions

The functional megaspore develops into:

- a) Endosperm
- b) Embryo sac
- c) Ovule
- d) Pollen grain

Mendel conducted experiments on:

- a) Rose
- b) Pea plant
- c) Mango
- d) Wheat

The law of segregation is also known as:

- a) Law of purity of gametes
- b) Law of dominance
- c) Law of linkage
- d) Law of variation

Double fertilisation is characteristic of:

- a) Gymnosperms
- b) Bryophytes
- c) Angiosperms
- d) Algae

B. Fill in the Blanks

The male gametes are produced inside * _ ** _ *.

The fusion of male and female gamete is called * _ ** _ *.

Mendel is known as the father of * _ ** _ *.

A cross involving two traits is called * _ ** _ * cross.

C. Very Short Answer Questions

What is pollination?

Define hybridisation.

What is codominance?

Name the scientist who proposed chromosomal theory of inheritance.

D. Short Answer Questions

Explain double fertilisation.

Differentiate between monohybrid and dihybrid cross.

State Mendel's laws of inheritance.

E. Diagram Practice

Draw and label:

Structure of ovule

Monohybrid cross

Dihybrid cross

F. Activity Work

Prepare pedigree charts for hereditary traits.

Make Punnett squares for monohybrid and dihybrid crosses.

G. Creative Task

Write a short note on:

"Applications of Genetics in Daily "

Physics

1. Make an investigatory project Roll no. Wise on following topics

- A. Construct and demonstrate half-wave and full-wave rectifier circuits using diodes.
- B. Find the refractive index of a given liquid using a convex lens and a plane mirror.
- C. Set up a model to demonstrate total internal reflection (TIR) in optical fibers.
- D. Determine the wavelength of a given laser beam using a diffraction grating.
- E. Study the factors that affect the efficiency of a solar panel (e.g., angle of incidence, temperature, or shading).
- F. Measure and determine how the internal resistance of a cell relates to its electromotive force (emf) under different temperatures or electrolyte concentrations.
- G. Build a step-up or step-down transformer and investigate the ratio of input/output voltage to the number of primary/secondary turns.
- H. Build an electromagnetic damping or jumping ring model to study the phenomenon of eddy currents

2. Practice all the numericals from chapter 1 to 5

- A. NCERT examples and exercise

3. Complete practical files written work.

English

As part of your **English Holiday Homework**, each student is required to prepare a **Portfolio Project** on the topic allotted according to their roll number. The objective of

this assignment is to develop research, analytical, and presentation skills while enhancing your knowledge of eminent authors and literary personalities.

Instructions for Portfolio Preparation:

1. Prepare the portfolio on **A4-sized sheets/file**.
2. The work should be **neat, creative, and well-presented**.
3. Include the following details in your portfolio:
 - **Brief Biography** of the author/personality
 - **Major Literary Contributions/Works**
 - **Writing Style and Themes**
 - **Interesting Facts/Achievements**
 - **Conclusion / Personal Learning from the Study**
4. Add **relevant pictures/illustrations** wherever required.
5. Write in **your own words**. Avoid direct copying from internet sources.
6. Submit the portfolio after the summer vacation as per school instructions.

Roll no	Topics
1	Alphonse Daudet
2	Anees Jung
3	William Douglas
4	Selma Lagerlöf
5	Louis Fischer
6	Asokamitran
7	Christopher Sylvester
8	Umberto Eco
9	A. R. Barton
10	Kamala Das
11	Pablo Neruda
12	John Keats
13	Robert Frost
14	Adrienne Rich
15	Jack Finney

- 16 Kalki
- 17 Tishani Doshi
- 18 Pearl S Buck
- 19 Susan Hill
- 20 Zitkala-sa
- 21 Mahatma Gandhi
- 22 Alphonse Daudet
- 23 Anees Jung
- 24 William Douglas
- 25 Selma Lagerlof
- 26 Louis Fischer
- 27 Asokamitran

Mathematics

CHAPTER 1: RELATION AND FUNCTIONS.

1. Consider a relation R on $N \times N$, defined by $(a,b)R(c,d) \iff a + d = b + c$. Show that the relation R is an equivalence relation.
2. Show that the relation R in the set $A = \{1, 2, 3, 4, 5\}$ given by $R = \{(a, b) : \}$ is an equivalence relation. Find the equivalence class of $[1]$.
3. Show that the relation on the set $A = \{x \in Z : 0 \leq x \leq 12\}$ given by $R = \{(a,b) : |a - b| \text{ is divisible by } 4\}$ is an equivalence relation. Find all elements related to 1, equivalence class $[1]$.
4. Let R be the relation on $N \times N$ defined by $(a, b) R (c, d)$ if and only if $ad(b + c) = bc(a + d)$. Prove that R is an equivalence relation.
5. Show that the relation R on $N \times N$ defined as $(a, b)R(c, d)$ if and only if $a^2 + d^2 = b^2 + c^2$ is an equivalence relation.
6. Let $A = \{1, 2, 3, \dots, 9\}$ and R be the relation in $A \times A$ defined by $(a, b) R (c, d)$ if $a + d = b + c$ for $(a, b), (c, d)$ in $A \times A$. Prove that R is an equivalence relation and also obtain the equivalent class $[(2, 5)]$.
7. Show that the relation S in the set R of real numbers defined as $S = \{(a, b) : a, b \in R \text{ and } a \leq b^3\}$ is neither reflexive nor symmetric nor transitive.

8. Show that the relation R in the set Z of integers given by $R = \{(a, b) : 2 \text{ divides } a - b\}$ is an equivalence relation.

9. Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$ given by $f(x) = x^3 + x$ is a bijection.

10. If $f : \mathbb{N} \rightarrow \mathbb{N}$ be a function defined by $f(x) = 9x^2 + 6x - 15$. Check whether f is one-one and onto or not.

11. Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^2 / (1 + x^2)$, $x \in \mathbb{R}$ is neither one-one nor onto function.

12. Show that the function $f : \mathbb{R} \rightarrow \{x \in \mathbb{R} : -1 < x < 1\}$ defined by $f(x) = 1 / (1 + |x|)$, $x \in \mathbb{R}$ is one-one and onto function.

CHAPTER 2: INVERSE TRIGONOMETRIC FUNCTIONS

1). Find the principal value of $\cos^{-1}(\cos(-680^\circ))$

2) Find the value of $\tan^2(\sec^{-1}2) + \cot^2(\operatorname{cosec}^{-1}3)$

3) If $\cos^{-1}x > \sin^{-1}x$, then find x

4) Find the domain of $\cos x + \sin^{-1}x$

5) If $\sin^{-1}x + \sin^{-1}y = \pi$, then find $x^{2023} + y^{2023}$

6) Find the value of $\cot(\sin^{-1}x)$

7) Find the value of $\sin(\cos^{-1}(-3/5))$

8) Find the value of $\sin^{-1}(\cos(\sin^{-1}1/2))$

9) Find the domain of $\sin^{-1}2x$

10) If $\tan^{-1}x = \pi/10$, then find the value of $\cot^{-1}x$

11) Write the value of $\tan^{-1}(2 \sin(2 \cos^{-1}(\sqrt{3}/2)))$

12) Prove that $\sec^2(\tan^{-1}2) + \operatorname{cosec}^2(\cot^{-1}3) = 15$

13) Express $\tan^{-1}((\sqrt{1+x^2} - 1)/x)$ in the simplest form

14) Write the simplest form of $\tan^{-1}((3x - x^3)/(1 - 3x^2))$

15) Write the simplest form of $\tan^{-1}(\cos x / (1 + \sin x))$

16) Find the value of $\cot(\cos^{-1}x)$

17) Find the value of $\cos^{-1}(\cos 10)$

18) If $\cos^{-1}(-5/12) = \tan^{-1}x$, then find the value of x

- 19) Find the domain of $\tan^{-1}(3x + 4)$
- 20) Find the principal value of $2\cos^{-1}(1) + \sin^{-1}(1/\sqrt{2})$
- 21) The solution set of $\sin^{-1}x \leq \cos^{-1}x$
- 22) Find the value of $\cos(\pi/3 + \cos^{-1}(-1))$
- 23) Find the value of $\sin^{-1}(\sin 5\pi/3)$
- 24) Find the value of $\cos(\tan^{-1}\{\cot(\sin^{-1}1/2)\})$
- 25) Write the value of $\sin(\pi/3 - \sin^{-1}(1/2))$

CHAPTER 5: continuity and differentiability

- 1) If $f(x) = \{ x^2 \text{ if } x \geq 1 ; x \text{ if } x < 1 \}$, then show that f is not differentiable at $x = 1$. (2 marks)
- 2) Find the points at which $f(x) = (x^2 + 4)/(4x - x^3)$ is discontinuous. (2 marks) Answer: 0, ± 2
- 3) If $y = \sin^{-1}(6x\sqrt{1 - 9x^2})$, $-1/(3\sqrt{2}) < x < 1/(3\sqrt{2})$, then find dy/dx . (2 marks) Answer: $6/\sqrt{1-9x^2}$
- 4) If $y = (x + \sqrt{x^2 - 1})^2$, then show that $(x^2 - 1)(dy/dx)^2 = 4y^2$. (2 marks)
- 5) If $y = \sqrt{ax + b}$, prove that $y(d^2y/dx^2) + (dy/dx)^2 = 0$. (2 marks)
- 6) If $f(x) = \{ ax + b ; 0 < x \leq 1 ; 2x^2 - x ; 1 < x < 2 \}$ is a differentiable function in $(0, 2)$, then find the values of a and b . (2 marks) Answer: $a = 3$, $b = -2$
- 7) If $e^x + e^y = e^{x \square y}$, prove that $dy/dx + e^y \square x = 0$. (3 marks)
- 8) If $\log(x^2 + y^2) = 2 \tan^{-1}(y/x)$, then show that $dy/dx = (x+y)/(x-y)$. (3 marks)
- 9) If $y = (\cos x)^x + \sin^{-1}\sqrt{3x}$, find dy/dx . (3 marks) Answer: $(\cos x)^x[-x \tan x + \log(\cos x)] + 3/(2\sqrt{3x}\sqrt{1-3x})$
- 10) If $x = ae^t(\sin t + \cos t)$ and $y = ae^t(\sin t - \cos t)$, then show that $dy/dx = (x+y)/(x-y)$. (3 marks)
- 11) Differentiate $\tan^{-1}((\sqrt{1+x^2} - 1)/x)$ with respect to $\sin^{-1}(2x/(1+x^2))$. (3 marks) Answer: $1/4$
- 12) Differentiate $\tan^{-1}((\sqrt{1+x^2} - \sqrt{1-x^2})/(\sqrt{1+x^2} + \sqrt{1-x^2}))$ with respect to $\cos^{-1}(x^2)$. (5 Marks) Answer: $-1/2$
- 13) If $y = (x + \sqrt{1+x^2})^n$, then show that $(1+x^2)d^2y/dx^2 + x(dy/dx) = n^2y$. (5 Marks)

CHAPTER 6: A.O.D.

CHAPTER 5: continuity and differentiability

7) Show that the function $f(x) = \tan^{-1}(\sin x + \cos x)$ is decreasing at all $x \in (\pi/4, \pi/2)$. (2 marks)

8) Find the absolute maximum value of the function $f(x) = 4x - (1/2)x^2$ in $[-2, 9/2]$.
Answer: 8 (2 marks)

9) Show that the function $f(x) = \cot^{-1}x + x$ increases in $(-\infty, \infty)$. (2 marks)

10) A particle moves along the curve $y = x^2 + 2x$. At what point(s) on the curve are the x and y coordinates of the particle changing at the same rate? Answer: $(-1/2, -3/4)$ (2 marks)

11) The total cost associated with the production of x units of an item is given by $C(x) = 0.007x^3 - 0.003x^2 + 15x + 4000$. Find the marginal cost when 5 units are produced.
Answer: Rs. 15.495 (3 marks)

12) A water tank has the shape of an inverted right circular cone with its axis vertical and vertex lower most. Its semi vertical angle is $\tan^{-1}(0.5)$. Water is poured into it at a constant rate of $5 \text{ cm}^3/\text{hr}$. Find the rate at which the level of the water is rising at the instant the depth of water in the tank is 4 m. Answer: $35/88 \text{ m/hr}$ (3 marks)

13) A man is moving away from a tower 41.6 m high at the rate of 2 m/s. Find the rate at which the angle of elevation of the top of tower is changing when he is at a distance of 30 m from the foot of the tower. Assume that the eye level of the man is 1.6 m from the ground. Answer: $4/25 \text{ radian/sec}$ (3 marks)

14) Find the intervals in which the function $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$ is strictly increasing or decreasing. Answer: Increasing on $(-1, 0) \cup (2, \infty)$, decreasing on $(-\infty, -1) \cup (0, 2)$ (5 marks)

15) A ladder 13 m long is leaning against a wall. The bottom of the ladder is being pulled away from the wall along the ground at the rate of 2 cm/sec. How fast is the height on the wall decreasing when the foot of the ladder is 5 m away from the wall? Answer: $5/6 \text{ cm/sec}$ (3 marks)

16) A tank with rectangular base and rectangular sides, open at the top is to be constructed so that its depth is 2 m and volume is 8 m^3 . If building of tank costs Rs 70 per square metre for the base and Rs 45 per square metre for sides. What is the cost of least expensive tank? Answer: Rs.1000/- (5 marks)

17) Find the intervals in which: $f(x) = \sin 3x - \cos 3x$, $0 < x < \pi$, is strictly increasing or strictly decreasing. Answer: strictly increasing for $(0, \pi/4) \cup (7\pi/12, 11\pi/12)$ and strictly decreasing for $(\pi/4, 7\pi/12) \cup (11\pi/12, \pi)$ (5 marks)

18) The sum of the perimeter of a circle and square is k , where k is some constant. Prove that the sum of their areas is least when the side of square is double the radius of the circle. (5 marks)

19) Mr. Suresh who is a popular businessman consulted a share market expert to know about the investment in a particular company. He predicted that the trend of the company would be governed by the function $f(x) = x^3 - 4x^2 + 15x + 8$ where x is the years of investment in the company. i) In the first ten years when will he get growth in his investment? ii) There is going to be a leap patch in the investment. When is it going to happen? When will the market pick up again?

21) To honour the scientists associated with the success of Chandrayaan-3, A school management decided to felicitate them. The students were asked to stand in a path governed by $y = x^2$. The scientists would be asked to move in a vehicle waving at the children along the path $y = x - 2$. i) A student nearest to their path was given an opportunity to garland the dignitaries. Where on the curve does the student stand? ii) What is the distance of the student from the line? Answer: (i) $(1/2, 1/4)$ (ii) $7/(4\sqrt{2})$ units

22) A company was given contract to manufacture two varieties of bulbs A & B which will be sold at profits of Rs. 60 & Rs. 80 respectively. There was a condition that sum of squares of

number of bulbs of each type is a constant k . i) What is the ratio of production of 2 bulbs for maximum profit? ii) What is the maximum profit if $k = 100$? Answer: (i) 3:4 (ii) Rs 1000/-

23) A store has been selling calculators at Rs. 350 each. A market survey indicates that a reduction in price (p) of calculator increases the number of units (x) sold. The relation between the price and quantity sold is given by demand function $p = 450 - x/2$. Based on the above information, answer the following questions: (i) Determine the number of units (x) that should be sold to maximise the revenue $R(x) = xp(x)$. Also verify the result. (ii) What rate in price of calculator should the store give to maximise the revenue? Answer: (i) $x = 450$ (ii) Rs.125 per calculator