



## Army Public School Meerut Cantt

### Class XII

### Holiday Homework

### Web Applications (803)

We hope that you are enjoying your well-deserved break and taking some time to recharge and relax. However, we also want to encourage you to continue your learning journey by completing the below mentioned assignment.

Continue working on your project you started in class XI.

Apply and Integrate:

1. Create clips using windows movie editor or Photos application.
2. Publish your clip for the computer.
3. Embed the audio file for your website in the background.
4. Embed the video using any player with editable parameters.

To help you structure your homework, we have provided the following rubrics:

1. Creativity Execution (5 Marks)
2. Technical Skills (5 Marks)
3. Documentation (5 Marks)
4. Communication (5 Marks)

Note:

1. Documentation in the form of doc file shall be uploaded on the following drive link:

[https://drive.google.com/drive/folders/1hPn\\_vDJadGKmyfsK58sxAkkyHMsP0jF?usp=share link](https://drive.google.com/drive/folders/1hPn_vDJadGKmyfsK58sxAkkyHMsP0jF?usp=share_link)

2. The file name should be the student's name with the admission number ex(ajay12345).
3. Type of assignment: Individual

# **ARMY PUBLIC SCHOOL MEERUT**

## **Holiday Homework**

### **XII Physics (042)**

1. Revise the topics taught.
2. Do the Worksheet given in Homework Notebook
3. Make the investigatory project on one of the topic given below and submit it after the Summer break.
  - i. To study various factors on which the internal resistance/EMF of a cell depends.
  - ii. To investigate the relation between the ratio of (i) output and input voltage and (ii) number of turns in the secondary coil and primary coil of a self-designed transformer
  - iii. To investigate the dependence of the angle of deviation on the angle of incidence using a hollow prism filled one by one, with different transparent fluids
  - iv. To study the earth's magnetic field using a compass needle -bar magnet by plotting magnetic field lines and tangent galvanometer

NOTE : RUBRICS FOR ASSESSMENT ARE

- I. Content
- II. Creativity and presentation
- III. Strategic approach
- IV. Efforts and accuracy



# ARMY PUBLIC SCHOOL MEERUT CANTT

[Affiliated to CBSE up to Sr. Sec. Level]

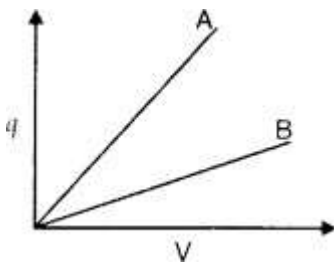
Class: XII

Subject: PHYSICS

Worksheet

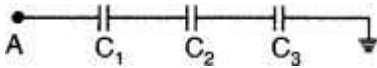
## Chapter: 1,2and 3

1. What is the angle between the directions of electric field at any (i) axial point and (ii) equatorial point due to an electric dipole?
2. Two point charges  $q_1$  and  $q_2$  are placed close to each other. What is the nature of the force between them when: (i)  $q_1q_2 < 0$  and (ii)  $q_1q_2 > 0$ ?
3. Name the quantity with unit J/C. Is it a scalar or vector quantity
4. Two point charges placed at a distance  $r$  in air exert a force  $F$  on each other. At what distance will these charges experience the same force  $F$  in a medium of dielectric constant  $K$ ?
5. Two charges  $+10\mu\text{C}$  and  $-20\mu\text{C}$  are placed 15 cm apart. At what point on the line joining the two charges is the electric potential zero?
6. A proton is placed in a uniform electric field directed along the positive X-axis. In which direction will it tend to move?
7. If the radius of the Gaussian surface enclosing a charge is halved, how does the electric flux through the Gaussian surface change?
8. What is the work done in moving a test charge  $q$  through a distance of 1 cm along the equatorial axis of an electric dipole?
9. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. What is the potential at the centre of the sphere?
10. Two charges  $2\mu\text{C}$  and  $-2\mu\text{C}$  are placed at points A and B 5 cm apart. Depict an equipotential surface of the system.
11. The given graph shows variation of charge 'q' versus potential difference 'V' for two capacitors C1 and C2. Both the capacitors have same plate separation but plate area of C2 is greater than that of C1. Which line (A or B) corresponds to C1 and why?

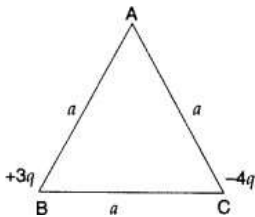


12. Derive the expression for the electric potential at any point along the axial line of an electric dipole
13. Two point charges  $4Q$ ,  $Q$  are separated by 1m in air. At what point on the line joining the charges is the electric field intensity zero?
14. A slab of material of dielectric constant  $K$  has the same area as that of the plates of a parallel plate capacitor but has the thickness  $d/2$ , where  $d$  is the separation between the plates. Find out the expression for its capacitance when the slab is inserted between the plates of the capacitor.

15. Calculate the potential difference and the energy stored in the capacitor  $C_2$  in the circuit shown in the figure. Given potential at A is 90 V,  $C_1 = 20 \mu\text{F}$ ,  $C_2 = 30 \mu\text{F}$  and  $C_3 = 15 \mu\text{F}$ .

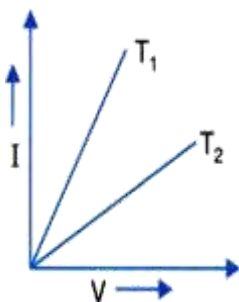


16. Draw a plot showing variation of electric field with distance from the centre of a solid conducting sphere of radius  $R$ , having a charge of  $+Q$  on its surface.
17. A thin straight infinitely long conducting wire having charge density  $X$  is enclosed by a cylindrical surface of radius  $r$  and length  $l$ , its axis coinciding with the length of the wire. Find the expression for the electric flux through the surface of the cylinder.
18. Two point charges  $+3q$  and  $-4q$  are placed at the vertices 'B' and 'C' of an equilateral triangle ABC of side 'a' as given in the figure. Obtain the expression for

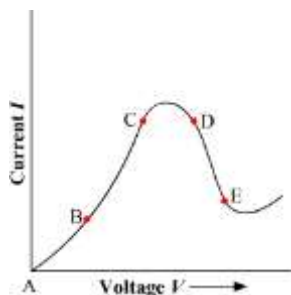


the magnitude resultant electric field at the vertex A due to these two charges.

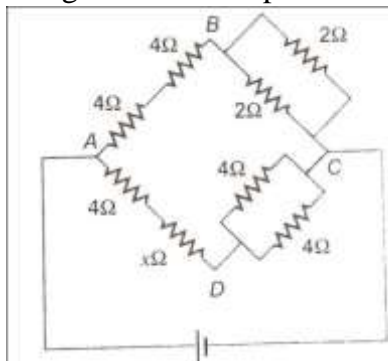
19. An electric dipole of dipole moment  $p$  is placed in a uniform electric field. Write the expression for the torque experienced by the dipole. Identify two pairs of perpendicular vectors in the expression. Show diagrammatically the orientation of the dipole in the field for which the torque is (i) Maximum (ii) Half the maximum value (iii) Zero
20. Two charged conducting spheres of radii  $a$  and  $b$  are connected to each other by a wire. What is the ratio of electric fields at the surfaces of the two spheres? Use the result obtained to explain why charge density on the sharp and pointed ends of a conductor is higher than on its flatter portions.
21. Consider the charges  $q$ ,  $q$ , and  $-q$  placed at the vertices of an equilateral triangle. What is the force on each charge?
22. Plot a graph showing the variation of coulomb force ( $F$ ) versus  $1/r^2$ , where,  $r$  is the distance between the two charges of each pair of charges ( $1 \mu\text{C}$ ,  $2 \mu\text{C}$ ) and ( $1 \mu\text{C}$ ,  $-3 \mu\text{C}$ ). Interpret the graphs obtained.
23. I-V graph for a metallic wire at two different temperatures  $T_1$  and  $T_2$  is as shown in the figure below. Which of the two temperature is lower and why?



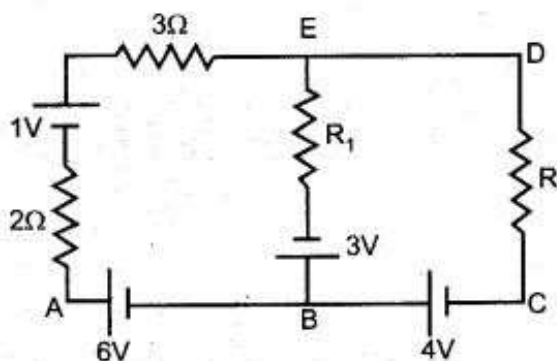
24. When a straight wire of resistance  $R$  is bent into U-shape, does its resistance change?
25. First a set of  $n$  equal resistors of  $R$  each are connected in series to a battery of emf  $E$  and internal resistance  $R$ , A current  $I$  is observed to flow. Then, the resistors are connected in parallel to the same battery. It is observed that the current is increased 10 times. What is 'n'?
26. Graph showing the variation of current versus voltage for a material GaAs is shown in the figure. Identify the region of
- Negative resistance
  - Where Ohm's law is obeyed.



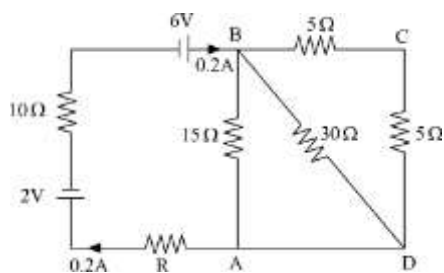
27. The given circuit represents a balanced Wheatstone's bridge. Calculate the value of resistance  $x$ .



28. Use Kirchhoff's rules to determine the potential difference between the points A and D. When no current flows in the arm BE of the electric network shown in the figure below:



29. Calculate the value of the resistance  $R$  in the circuit shown in the figure, so that the current in the circuit is  $0.2\text{ A}$ . What would be the potential difference between points A and B?



Following questions are having two statements one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true but R is NOT the correct explanation of A
- (c) A is true but R is false
- (d) A is false and R is also false

30. Assertion (A): In a non-uniform electric field, a dipole will have translatory as well as rotatory motion.

Reason (R): In a non-uniform electric field, a dipole experiences a force as well as torque

31. Assertion (A): Electric lines of force cross each other.

Reason (R): The resultant electric field at a point is the superimposition of the electric fields at that point.

32. Assertion : In a simple battery circuit, the point of the lowest potential is positive terminal of the battery.

Reason : The current flows towards the point of the higher potential, as it does in such a circuit from the negative to the positive terminal.

33. Assertion : Voltmeter is connected in parallel with the circuit.

Reason : Resistance of a voltmeter is very large.

34. Assertion : Ohm's law is applicable for all conducting elements.

Reason : Ohm's law is a fundamental law.

35. Assertion : If the distance between parallel plates of a capacitor is halved and dielectric constant is three times, then the capacitance becomes 6 times.

Reason : Capacity of the capacitor does not depend upon the nature of the material.

36. Assertion : The total charge stored in a capacitor is zero.

Reason : The field just outside the capacitor is  $\sigma/\epsilon_0$  . ( $\sigma$  is the charge density).

37. Assertion : Two equipotential surfaces cannot cut each other.

Reason : Two equipotential surfaces are parallel to each other.

38. Assertion : Electric field inside a conductor is zero.

Reason: The potential at all the points inside a conductor is same.

39. Assertion : Work done in moving a charge between any two points in an electric field is independent of the path followed by the charge, between these points.

Reason: Electrostatic force is a non conservative force.

40. Assertion : Polar molecules have permanent dipole moment.

Reason : In polar molecules, the centres of positive and negative charges coincide even when there is no external field.

## Holiday Homework for class XII

### BIOLOGY

1. Make the Biology investigatory project on the selected topic of your interest and submit it after the Summer break.
2. Written work of practical files to be completed as per instructions given in the class.
3. Assignment of chapter 1 (SEXUAL REPRODUCTION IN FLOWERING PLANT & 2 (HUMAN REPRODUCTION) to be completed and submit it after summer break

## HOLIDAY HOME WORK

Class XII (2023-24)

CHEMISTRY (043)

Q1. Define mole fraction

Q2. What type of intermolecular attractive interaction exists in the pair of methanol and acetone?

Q3. What do you understand by “colligative properties”?

Q4. Why is the vapour pressure of a solution of glucose in water lower than that of water?

Q5. State any two characteristics of ideal solutions.

Q6. Some liquids on mixing form “azeotropes”. What are azeotropes?

Q7. Define molal elevation constant or ebullioscopy constant.

Q8. What is “reverse osmosis” ?

Q9. Derive an equation to express that relative lowering of vapour pressure for a solution is equal to the mole fraction of the solute in it when the solvent alone is volatile.

Q10. State Raoult's law for the solution containing volatile components. What is the similarity between Raoult's law and Henry's law?

Q11. Boiling point of water at 750 mm Hg is 99.63°C. How much sucrose is to be added to 500g of water such that it boils at 100 degrees Celsius?

Q12. 18g of glucose,  $C_6H_{12}O_6$  (Molar Mass=180g mol<sup>-1</sup>) is dissolved in 1kg of water in a saucepan. At what temperature will this solution boil? ( $K_b$  for water=0.52K kg mol<sup>-1</sup>, boiling point of pure water = 373.15 K )

Q13. After removing the outer shell of the two eggs in dil. HCl, one is placed in distilled water and the other in a saturated solution of NaCl . What will you observe and why ?

Q14 Heptane and octane forms an ideal solution at 373K the vapour pressure of the two liquid components are 105.2 kPa and 46.8 kPa, respectively. What will be the vapour pressure of a mixture of 26.0g of heptane and 35.0 g of octane ?

(MULTIPLE CHOICE QUESTION) MCQ

1. Which of the following units is useful in relating concentration of solution with its vapour pressure?

(i) mole fraction

(ii) parts per million

(iii) mass percentage

(iv) molality



2. On dissolving sugar in water at room temperature solution feels cool to touch. Under which of the following cases dissolution of sugar will be most rapid?

- (i) Sugar crystals in cold water.           (ii) Sugar crystals in hot water.  
(iii) Powdered sugar in cold water.   (iv) Powdered sugar in hot water.

3. At equilibrium the rate of dissolution of a solid solute in a volatile liquid solvent is \_\_\_\_\_.

- (i) less than the rate of crystallisation (ii) greater than the rate of crystallisation  
(iii) equal to the rate of crystallisation (iv) zero

4. A beaker contains a solution of substance 'A'. Precipitation of substance 'A' takes place when small amount of 'A' is added to the solution. The solution is \_\_\_\_\_.

- (i) saturated                                   (ii) supersaturated  
(iii) unsaturated                           (iv) concentrated

5. Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon \_\_\_\_\_.

- (i) Temperature                           (ii) Nature of solute  
(iii) Pressure                               (iv) Nature of solvent

6. Low concentration of oxygen in the blood and tissues of people living at high altitude is due to \_\_\_\_\_.

- (i) low temperature                       (ii) low atmospheric pressure  
(iii) high atmospheric pressure       (iv) both low temperature and high atmospheric pressure

7. Considering the formation, breaking and strength of hydrogen bond, predict which of the following mixtures will show a positive deviation from Raoult's law?

- (i) Methanol and acetone.               (ii) Chloroform and acetone.  
(iii) Nitric acid and water.              (iv) Phenol and aniline.

8. Colligative properties depend on \_\_\_\_\_.

- (i) the nature of the solute particles dissolved in solution.  
(ii) the number of solute particles in solution.  
(iii) the physical properties of the solute particles dissolved in solution.  
(iv) the nature of solvent particles.

9. Which of the following aqueous solutions should have the highest boiling point?

(i) 1.0 M NaOH

(ii) 1.0 M Na<sub>2</sub>SO<sub>4</sub>

(iii) 1.0 M NH<sub>4</sub>NO<sub>3</sub>

(iv) 1.0 M KNO<sub>3</sub>

10. The unit of ebullioscopic constant is \_\_\_\_\_.

(i) K kg /mol or K (molality)<sup>-1</sup>      (ii) mol kg/ K or K<sup>-1</sup>(molality)

(iii) kg mol<sup>-1</sup> K<sup>-1</sup> or K<sup>-1</sup>(molality)<sup>-1</sup> (iv) K mol kg<sup>-1</sup> or K (molality)

11. In comparison to a 0.01 M solution of glucose, the depression in freezing point of a 0.01 M MgCl<sub>2</sub> solution is \_\_\_\_\_.

(i) the same      (ii) about twice

(iii) about three times      (iv) about six times

12. An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because \_\_\_\_\_.

(i) it gains water due to osmosis.      (ii) it loses water due to reverse osmosis.

(iii) it gains water due to reverse osmosis. (iv) it loses water due to osmosis.

13. At a given temperature, osmotic pressure of a concentrated solution of a substance \_\_\_\_\_.

(i) is higher than that at a dilute solution.

(ii) is lower than that of a dilute solution.

(iii) is same as that of a dilute solution.

(iv) cannot be compared with osmotic pressure of dilute solution.

14. Which of the following statements is false?

(i) Two different solutions of sucrose of same molality prepared in different solvents will have the same depression in freezing point.

(ii) The osmotic pressure of a solution is given by the equation  $\Pi = CRT$  ( where C is the molarity of the solution).

(iii) Decreasing order of osmotic pressure for 0.01 M aqueous solutions of barium chloride, potassium chloride, acetic acid and sucrose is BaCl<sub>2</sub> > KCl > CH<sub>3</sub>COOH > sucrose.

(iv) According to Raoult's law, the vapour pressure exerted by a volatile component of a solution is directly proportional to its mole fraction in the solution.

15. The values of Van't Hoff factors for KCl, NaCl and K<sub>2</sub>SO<sub>4</sub>, respectively, are \_\_\_\_\_.

(i) 2, 2 and 2

(ii) 2, 2 and 3

(iii) 1, 1 and 2

(iv) 1, 1 and 1

16. Which of the following statements is false?

(i) Units of atmospheric pressure and osmotic pressure are the same.

(ii) In reverse osmosis, solvent molecules move through a semipermeable membrane from a region of lower concentration of solute to a region of higher concentration.

(iii) The value of molal depression constant depends on nature of solvent.

(iv) Relative lowering of vapour pressure, is a dimensionless quantity.

17. Value of Henry's constant  $K_H$ \_\_\_\_\_.

(i) increases with increase in temperature.      (ii) decreases with increase in temperature.

(iii) remains constant.      (iv) first increases then decreases.

18. The value of Henry's constant  $K_H$  is\_\_\_\_\_.

(i) greater for gases with higher solubility.      (ii) greater for gases with lower solubility.

(iii) constant for all gases.      (iv) not related to the solubility of gases.

19. If two liquids A and B form minimum boiling azeotrope at some specific composition then \_\_\_\_\_.

(i) A–B interactions are stronger than those between A–A or B–B.

(ii) vapour pressure of solution increases because more number of molecules of liquids A and B can escape from the solution.

(iii) vapour pressure of solution decreases because less number of molecules of only one of the liquids escape from the solution.

(iv) A–B interactions are weaker than those between A–A or B–B.

20. We have three aqueous solutions of NaCl labeled as 'A', 'B' and 'C' with concentrations 0.1M, 0.01M and 0.001M, respectively. The value of van't Hoff factor for these solutions will be in the order\_\_\_\_\_.

(i)  $i_A < i_B < i_C$

(ii)  $i_A > i_B > i_C$

(iii)  $i_A = i_B = i_C$

(iv)  $i_A < i_B > i_C$

21. A cathode and an anode are the most common components of an electrochemical cell. Which of the following claims about the cathode is correct?

i) Oxidation occurs at the cathode

ii) Electrons move into the cathode

iii) Usually denoted by a negative sign

iv) Is usually made up of insulating material

22. Which of the following claims about electrochemical cells is true?

- i) Cell potential is an extensive property
- ii) Cell potential is an intensive property
- iii) The Gibbs free energy of an electrochemical cell is an intensive property
- iv) Gibbs free energy is undefined for an electrochemical cell

23. Which of the following does not belong in the category of electrochemical cells?

- i) Voltaic cell
- ii) Photovoltaic cell
- iii) Electrolytic cell
- iv) Fuel Cell

24. Which of the following assertions about the main cell is correct?

- i) An example of a primary cell is a mercury cell
- ii) An example of a primary cell is a nickel-cadmium storage cell
- iii) The electrode reactions can be reversed
- iv) It can be recharged

25. In a dry cell, which of the following is the electrolyte?

- i) Potassium hydroxide
- ii) Sulphuric acid
- iii) Ammonium chloride
- iv) Manganese dioxide

26. Which of the following statements about a lead storage cell (or a lead-acid battery) is false?

- i) It is a primary cell
- ii) The cathode is made up of lead(IV) oxide
- iii) The anode is made up of lead
- iv) The electrolyte used is an aqueous solution of sulphuric acid

27. The conductivity of electrolytic conductors is due to \_\_\_\_\_

- i) Flow of free mobile electrons
- ii) Movement of ions
- iii) Either movement of electrons or ions
- iv) Cannot be said

28. The process of transmitting electric current through an electrolyte's solution to decompose it is known as \_\_\_\_\_

i) Electrolyte

ii) Electrode

iii) Electrolysis

iv) Electrochemical cell

29. In a fuel cell, which of the following can be utilized as a fuel?

i) Nitrogen

ii) Argon

iii) Hydrogen

iv) Helium

30. Which of the following is given to a fuel cell's cathode?

i) Hydrogen

ii) Nitrogen

iii) Oxygen

iv) Chlorine

**HOLIDAY HOMEWORK**  
**ARMY PUBLIC SCHOOL, MEERUT CANTT**  
**CLASS XII**  
**MATHEMATICS**  
**SESSION 2023-24**

**INSTRUCTIONS:**

1. For activity make a 2 ring binder file clip folder and attach the activity record in it.
2. For the assignment make a separate A4 size register and complete the work in it.
3. Submit your HHW immediately after reopening of school.

**ACTIVITY TO BE PERFORMED AT HOME:**

1. Finding the coordinates of different points identified in your HOME using the concepts of three dimensional geometry and also find the distances between the identified points.

**Tasks to be done**

1. Choose any corner of your room as the origin.
2. Take three perpendicular edges of walls as x-, y- and z-axes.
3. Find the coordinates of each corner of the room, corners of windows, doors, etc.
4. Find the coordinate of the tips of ceiling fan, bulbs and all other possible points in the space of the room.
5. Find the distances between different points by measurement as well as by using distance formula.
6. Find the coordinates of the diagonals of the room and length of the diagonals by distance formula.

**RELATION AND FUNCTION**

Q1. Let  $N$  be the set of natural numbers and  $R$  be the relation on  $N \times N$  defined by  $(a,b) R (c,d)$  if  $a + ab = bc + d$  for all  $a,b,c,d \in N$ . Show that  $R$  is an equivalence relation.

Q2. Let  $R$  be the relation on  $N \times N$  defined by  $(a,b) R (c,d) \Leftrightarrow ad(b+c) = bc(a+d)$  check whether  $R$  is an equivalence relation on  $N \times N$ .

Q3. Determine whether the relation  $R$  defined on set  $R$  of all real numbers as  $R = \{(a,b) : a,b \in R \text{ and } a-b + \sqrt{3} \in S\}$  where  $S$  is the set of all irrational numbers is reflexive, symmetric and transitive.

Q4. Show that the relation  $R$  defined on set  $A$  of all triangles in a plane as  $R = \{(T_1, T_2) : T_1 \text{ is similar to } T_2\}$  is an equivalence relation. Consider three right angled triangles  $T_1$  with sides 3,4,5,  $T_2$  with side 5,12,13 and  $T_3$  with sides 6,8,10. Which triangles  $T_1, T_2, T_3$  are related to each other.

Q5. Find the number of all one-one functions from set  $A = \{1,2,3\}$  to itself.

Q6. Find the number of all onto function from set  $A = \{1,2,3 \dots n\}$  to itself.

**INVERSE TRIGONOMETRIC FUNCTIONS**

Q7. Simplify  $\sin^{-1} \left[ \frac{\sin x + \cos x}{\sqrt{2}} \right]$

Q8. Simplify  $\cos^{-1} \left[ \frac{3\cos x}{5} + \frac{4\sin x}{5} \right]$

Q9. If  $\sec^{-1}x = \operatorname{cosec}^{-1}y$ , show that  $\frac{1}{x^2} + \frac{1}{y^2} = 1$

Q10. Solve  $\tan(\cos^{-1}x) = \frac{2}{\sqrt{5}}$

## MATRICES

### SOME IMPORTANT RESULTS/CONCEPTS

A matrix is a rectangular array of  $m \times n$  numbers arranged in  $m$  rows and  $n$  columns.

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} \quad \text{OR } A = [a_{ij}]_{m \times n}, \text{ where } i = 1, 2, \dots, m; j = 1, 2, \dots, n.$$

\* **Row Matrix:** A matrix which has one row is called row matrix.  $A = [a_{ij}]_{1 \times n}$

\* **Column Matrix:** A matrix which has one column is called column matrix.  $A = [a_{ij}]_{m \times 1}$ .

\* **Square Matrix:** A matrix in which number of rows are equal to number of columns, is called a square matrix  $A = [a_{ij}]_{m \times m}$

\* **Diagonal Matrix:** A square matrix is called a Diagonal Matrix if all the elements, except the diagonal elements are zero.  $A = [a_{ij}]_{n \times n}$ , where  $a_{ij} = 0, i \neq j$ .

$$a_{ij} \neq 0, i = j.$$

\* **Scalar Matrix:** A square matrix is called scalar matrix if all the elements, except diagonal elements are zero and diagonal elements are same non-zero quantity.

$$A = [a_{ij}]_{n \times n}, \text{ where } a_{ij} = 0, i \neq j.$$

$$a_{ij} \neq \alpha, i = j.$$

\* **Identity or Unit Matrix:** A square matrix in which all the non diagonal elements are zero and diagonal elements are unity is called identity or unit matrix.

\* **Null Matrices:** A matrices in which all element are zero.

\* **Equal Matrices:** Two matrices are said to be equal if they have same order and all their corresponding elements are equal.

\* **Transpose of matrix:** If  $A$  is the given matrix, then the matrix obtained by interchanging the rows and columns is called the transpose of a matrix.

\* **Properties of Transpose:**

If  $A$  &  $B$  are matrices such that their sum & product are defined, then

$$(i). (A^T)^T = A \quad (ii). (A+B)^T = A^T + B^T \quad (iii). (KA^T) = K.A^T \text{ where } K \text{ is a scalar.}$$

$$(iv). (AB)^T = B^T A^T \quad (v). (ABC)^T = C^T B^T A^T.$$

\* **Symmetric Matrix:** A square matrix is said to be symmetric if  $A = A^T$  i.e. If  $A = [a_{ij}]_{m \times m}$ , then  $a_{ij} = a_{ji}$  for all  $i, j$ . Also elements of the symmetric matrix are symmetric about the main diagonal

\* **Skew symmetric Matrix:** A square matrix is said to be skew symmetric if  $A^T = -A$ .

If  $A = [a_{ij}]_{m \times m}$ , then  $a_{ij} = -a_{ji}$  for all  $i, j$ .

\* **Singular matrix:** A square matrix 'A' of order 'n' is said to be singular, if  $|A| = 0$ .

\* **Non -Singular matrix:** A square matrix 'A' of order 'n' is said to be non-singular, if  $|A| \neq 0$ .

**\*Product of matrices:**

- (i) If A & B are two matrices, then product AB is defined, if  
Number of column of A = number of rows of B.  
i.e.  $A = [a_{ij}]_{m \times n}$ ,  $B = [b_{jk}]_{n \times p}$  then  $AB = [C_{ik}]_{m \times p}$ .
- (ii) Product of matrices is not commutative. i.e.  $AB \neq BA$ .
- (iii) Product of matrices is associative. i.e.  $A(BC) = (AB)C$
- (iv) Product of matrices is distributive over addition.

**\*Adjoint of matrix :**

If  $A = [a_{ij}]$  be a n-square matrix then transpose of a matrix  $[A_{ij}]$ ,  
where  $A_{ij}$  is the cofactor of  $A_{ij}$  element of matrix A, is called the adjoint of A.

$$\text{Adjoint of A} = \text{Adj. A} = [A_{ij}]^T.$$

$$A(\text{Adj. A}) = (\text{Adj. A})A = |A| \mathbf{I}.$$

**\*Inverse of a matrix :** Inverse of a square matrix A exists, if A is non-singular or square matrix

$$A \text{ is said to be invertible and } A^{-1} = \frac{1}{|A|} \text{Adj. A}$$

**\*System of Linear Equations :**

$$a_1x + b_1y + c_1z = d_1.$$

$$a_2x + b_2y + c_2z = d_2.$$

$$a_3x + b_3y + c_3z = d_3.$$

$$\begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} d_1 \\ d_2 \\ d_3 \end{bmatrix} \Rightarrow A X = B \Rightarrow X = A^{-1}B \quad ; \{ |A| \neq 0 \}.$$

**\*Criteria of Consistency.**

- (i) If  $|A| \neq 0$ , then the system of equations is said to be consistent & has a unique solution.
- (ii) If  $|A| = 0$  and  $(\text{adj. A})B = 0$ , then the system of equations is consistent and has infinitely many solutions.
- (iii) If  $|A| = 0$  and  $(\text{adj. A})B \neq 0$ , then the system of equations is inconsistent and has no solution.

**\* Determinant :**

To every square matrix we can assign a number called determinant

$$\text{If } A = [a_{11}], \quad \det. A = |A| = a_{11}.$$

$$\text{If } A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}, \quad |A| = a_{11}a_{22} - a_{21}a_{12}.$$

**\* Properties :**

- (i) The determinant of the square matrix A is unchanged when its rows and columns are interchanged.
- (ii) The determinant of a square matrix obtained by interchanging two rows(or two columns) is negative of given determinant.
- (iii) If two rows or two columns of a determinant are identical, value of the determinant is zero.
- (iv) If all the elements of a row or column of a square matrix A are multiplied by a non-zero number k, then determinant of the new matrix is k times the determinant of A.

If elements of any one column(or row) are expressed as sum of two elements each, then determinant can be written as sum of two determinants.

Any two or more rows(or column) can be added or subtracted proportionally.

$$\text{If } A \text{ \& } B \text{ are square matrices of same order, then } |AB| = |A| |B|$$



## ASSIGNMENTS

(i). Order, Addition, Multiplication and transpose of matrices:

### LEVEL I

1. If a matrix has 5 elements, what are the possible orders it can have? [CBSE 2011]
2. Construct a  $3 \times 2$  matrix whose elements are given by  $a_{ij} = \frac{1}{2}|i - 3j|$
3. If  $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 3 \end{bmatrix}$ ,  $B = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 0 & 2 \end{bmatrix}$ , then find  $A - 2B$ .
4. If  $A = \begin{bmatrix} 2 & 1 & 4 \\ 4 & 1 & 5 \end{bmatrix}$  and  $B = \begin{bmatrix} 3 & -1 \\ 2 & 2 \\ 1 & 3 \end{bmatrix}$ , write the order of  $AB$  and  $BA$ .

### LEVEL II

1. For the following matrices  $A$  and  $B$ , verify  $(AB)^T = B^T A^T$ ,  
where  $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}$ ,  $B = [-1 \ 2 \ 1]$
2. Give example of matrices  $A$  &  $B$  such that  $AB = O$ , but  $BA \neq O$ , where  $O$  is a zero matrix and  $A, B$  are both non zero matrices.
3. If  $B$  is skew symmetric matrix, write whether the matrix  $(ABA^T)$  is Symmetric or skew symmetric.
4. If  $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$  and  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , find  $a$  and  $b$  so that  $A^2 + aI = bA$

### LEVEL III

1. If  $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ , then find the value of  $A^2 - 3A + 2I$
2. Express the matrix  $A$  as the sum of a symmetric and a skew symmetric matrix, where:  
 $A = \begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix}$
3. If  $A = \begin{bmatrix} a & b \\ 0 & 1 \end{bmatrix}$ , prove that  $A^n = \begin{bmatrix} a^n & \frac{b(a^n - 1)}{a - 1} \\ 0 & 1 \end{bmatrix}$ ,  $n \in \mathbb{N}$

(ii) Cofactors & Adjoint of a matrix

### LEVEL I

1. Find the co-factor of  $a_{12}$  in  $A = \begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{bmatrix}$
2. Find the adjoint of the matrix  $A = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$

### LEVEL II

Verify  $A(\text{adj}A) = (\text{adj}A)A = |A|I$  if

1.  $A = \begin{bmatrix} 2 & 3 \\ -4 & -6 \end{bmatrix}$
2.  $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}$

(iii) Inverse of a Matrix & Applications

LEVEL I

1. If  $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ , write  $A^{-1}$  in terms of  $A$  **CBSE 2011**
2. If  $A$  is square matrix satisfying  $A^2 = I$ , then what is the inverse of  $A$ ?
3. For what value of  $k$ , the matrix  $A = \begin{bmatrix} 2-k & 3 \\ -5 & 1 \end{bmatrix}$  is not invertible?

LEVEL II

1. If  $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$ , show that  $A^2 - 5A - 14I = 0$ . Hence find  $A^{-1}$
2. If  $A, B, C$  are three non zero square matrices of same order, find the condition on  $A$  such that  $AB = AC \Rightarrow B = C$ .
3. Find the number of all possible matrices  $A$  of order  $3 \times 3$  with each entry 0 or 1 and for which  $A \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$  has exactly two distinct solutions.

LEVEL III

1. If  $A = \begin{bmatrix} 2 & 3 & 1 \\ -3 & 2 & 1 \\ 5 & -4 & -2 \end{bmatrix}$ , find  $A^{-1}$  and hence solve the following system of equations:  
 $2x - 3y + 5z = 11, \quad 3x + 2y - 4z = -5, \quad x + y - 2z = -3$
2. Using matrices, solve the following system of equations:
  - a.  $x + 2y - 3z = -4$   
 $2x + 3y + 2z = 2$   
 $3x - 3y - 4z = 11$  **[CBSE 2011]**
  - b.  $4x + 3y + 2z = 60$   
 $x + 2y + 3z = 45$   
 $6x + 2y + 3z = 70$  **[CBSE 2011]**

3. Find the product  $AB$ , where  $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}, B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$  and use it to solve the equations  $x - y = 3, 2x + 3y + 4z = 17, y + 2z = 7$

4. Using matrices, solve the following system of equations:

$$\begin{aligned} \frac{1}{x} - \frac{1}{y} + \frac{1}{z} &= 4 \\ \frac{2}{x} + \frac{1}{y} - \frac{3}{z} &= 0 \\ \frac{1}{x} + \frac{1}{y} + \frac{1}{z} &= 2 \end{aligned}$$

5. Using elementary transformations, find the inverse of the matrix

$$\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$$

(iv) To Find The Difference Between  $|A|, |adjA|, |kA|$

LEVEL I

1. Evaluate  $\begin{bmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{bmatrix}$  **[CBSE 2011]**
2. What is the value of  $|3I|$ , where  $I$  is identity matrix of order 3?
3. If  $A$  is non singular matrix of order 3 and  $|A| = 3$ , then find  $|2A|$
4. For what value of  $a$ ,  $\begin{bmatrix} 2a & -1 \\ -8 & 3 \end{bmatrix}$  is a singular matrix?

LEVEL II

1. If  $A$  is a square matrix of order 3 such that  $|adjA| = 64$ , find  $|A|$
2. If  $A$  is a non singular matrix of order 3 and  $|A| = 7$ , then find  $|adjA|$

### LEVEL III

1. If  $A = \begin{bmatrix} a & 2 \\ 2 & a \end{bmatrix}$  and  $|A|^3 = 125$ , then find a.
2. A square matrix A, of order 3, has  $|A| = 5$ , find  $|A \cdot adj A|$

## Determinants

### Important points to remember

- **Determinant** : To every square matrix  $A = [A_{ij}]$  of order  $n \times n$ , we can associate a number (real or complex) called determinant of A . It is denoted by  $\det A$  or  $|A|$ .

#### Properties:

(1)  $|AB| = |A||B|$

(2)  $|kA|_{n \times n} = k^n |A|_{n \times n}$ , where k is a scalar.

(3) Area of a triangle with vertices  $(x_1, y_1)$ ,  $(x_2, y_2)$ ,  $(x_3, y_3)$  is given by

$$\Delta = \frac{1}{2} \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

(4) If the points  $(x_1, y_1)$ ,  $(x_2, y_2)$ ,  $(x_3, y_3)$  are collinear then

$$\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = 0$$

**Adjoint** of square matrix A is the transpose of the matrix whose elements have been replaced by their co-factors and is denoted as  $\text{adj. } A$  .

Let  $A = [a_{ij}]_{n \times n}$

$\text{adj } A = [A_{ij}]_{n \times n}$

#### Properties:

(i)  $A (\text{adj } A) = (\text{adj } A)A = |A|I$

(ii) If A is a square matrix of order n then  $|\text{adj } A| = |A|^{n-1}$  .

(iii)  $\text{adj } (AB) = (\text{adj } B)(\text{adj } A)$ .

**singular Matrix**: A square matrix is called singular if  $|A| = 0$  , otherwise it will be called a non - singular matrix.

**Inverse of a matrix** :A square matrix whose inverse exists, is called invertible matrix. inverse of a non-invertible matrix exists.

Inverse of a matrix A is denoted by  $A^{-1}$  and is given by

$$A^{-1} = \frac{1}{|A|} \cdot \text{adj } A$$

### Properties

(i)  $A A^{-1} = A^{-1} A = I$

(ii)  $(A^{-1})^{-1} = A$

(iii)  $(AB)^{-1} = B^{-1} A^{-1}$

(iv)  $(A^T)^{-1} = (A^{-1})^T$

### Solution of system of equations using matrix :

If  $AX = B$  is a matrix equation then its solution is  $x = A^{-1}B$ .

(i) If  $|A| \neq 0$ , system is consistent and has a unique solution.

(ii) If  $|A| = 0$  and  $(\text{adj } A)B \neq 0$ , system is inconsistent and has no solution.

(iii) If  $|A| = 0$  and  $(\text{adj } A)B = 0$ , system is consistent and has infinite solution.

### ASSIGNMENT

1. If  $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 3 & 2 \\ 3 & -3 & -4 \end{bmatrix}$ , Find  $A^{-1}$  and hence solve system of equation

$$x + 2y - 3z = -4$$

$$2x + 3y + 2z = 2$$

$$3x - 3y - 4z = 11$$

2. If  $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ ,  $B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$  Find  $AB$  & hence solve

$$x - y = 3,$$

$$2x + 3y + 4z = 17$$

$$y + 2z = 7.$$

4. Determine the product  $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & 1 \end{bmatrix} \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$  and use it to solve the system of equations.

$$x - y + z = 4, x - 2y - 2z = 9, 2x + y + 3z = 1$$

8. Determine the product  $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix} \begin{bmatrix} -3 & 4 & 5 \\ 9 & -1 & -4 \\ 5 & -3 & -1 \end{bmatrix}$  and use it to solve the system of equations.

$$x + y + z = 0, x + 2y - 3z = -14, 2x - y + 3z = 9$$

11. If  $A$  &  $B$  are square matrices of order 3 such that  $|A| = -1$  &  $|B| = 3$ , then find the value of  $|3AB|$ .

16. Find the area of triangle using the determinants if three of its vertices are (5,2), (-3,-1),(6,0).

17. If the points (a ,b),(c , d),and (a+c, b+d) are collinear, show that  $a d = b c$ .

18. Find the value of  $\alpha$  so that the points (1,-5), (-4,5),and ( $\alpha$ ,7) are collinear.

19.If a, b, & c are distinct real no. and the system of equations

$$a x + a^2 y + (a^3+1)z = 0$$

$$b x + b^2 y + (b^3+1)z = 0$$

$$c x + c^2 y + (c^3+1)z = 0 \text{ has a non trivial solution show that } abc = -1.$$

20. Find the minor of element 5,  $\begin{vmatrix} -3 & 6 & 5 \\ 2 & 1 & 0 \\ -1 & 6 & 5 \end{vmatrix}$

21. Find the co- factor of element  $a_{23}$ ,  $\begin{vmatrix} -8 & 6 & 0 \\ 6 & 1 & 0 \\ -1 & 6 & 5 \end{vmatrix}$

22.Using the co-factor of the second row of determinant

$$\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} \text{ find the value of } \Delta.$$

23.Find  $A^{-1}$  where  $\begin{bmatrix} 6 & 4 & 2 \\ -12 & 15 & 18 \\ 25 & -20 & 15 \end{bmatrix}$  and solve the following

$$6x - 12y + 25z = 4$$

$$4x + 15y - 20z = 3$$

$$2x + 18y + 15z = 10$$

24. .Find  $A^{-1}$  where  $\begin{bmatrix} 3 & 2 & 1 \\ 4 & -1 & 2 \\ 7 & 3 & -3 \end{bmatrix}$  and solve the following

$$3x + 4y + 7z = 14$$

$$2x - y + 3z = 4$$

$$x + 2y - 3z = 0$$

25. solve the following system of equations using matrices:

$$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4$$

$$\frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1$$

$$\frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2 \quad x, y, z \neq 0.$$

## HOLIDAY HOMEWORK FOR CLASS XII

### COMPUTER SCIENCE

1. Write a Python program to get the largest number from a list.
2. Write a Python program to count the number of strings where the string length is 2 or more and the first and last character are same from a given list of strings.

Sample List : ['abc', 'xyz', 'aba', '1221']

3. Write a Python program to remove duplicates from a list.
4. Write a Python program to count the number of characters (character frequency) in a string.

Sample String : 'google.com'

Expected Result : {'o': 3, 'g': 2, '.': 1, 'e': 1, 'l': 1, 'm': 1, 'c': 1}

5. Write a Python program to get a string from a given string where all occurrences of its first char have been changed to '\$', except the first char itself.

Sample String : 'restart'

Expected Result : 'resta\$t'

6. Write a method in python to display the elements of a list twice if it is a number and display the element terminated with '\*' if it is not a number.
7. Write a user defined function findname(name) where name is an argument in python to delete phone number from a dictionary phonebook on the basis of the name ,where name is the key.
8. Write a program to input employee number and name for N employees and display all employees' information in ascending order of their employee number.

**9.** Write an interactive menu driven program with the following four functions:

- (a) To create a text file called “Nation.txt”
- (b) Display the file
- (c) Append relevant content to the file
- (d) Make a copy of the file
- (e) Count the total number of “the” in the file

**10.** A blood bank maintains data file “Blood.dat” that contains following information for every donor: donor name, donor date of birth, donor address, donor phone number and donor blood group. Write a complete program to do the following:

- a) Create a file of the donor
- b) Append a record in the file
- c) Display the records
- d) Given the blood group display name, address of the donor
- e) Modify the existing information of the donor

**Holiday Homework**  
**Home Science**  
**Session 2023-2024**  
**Class XII**

1. Project - Know your Millets

Prepare a file on the said topic mentioning about -

- What are Millets(Introduction)
- Types of Millets
- Benefits (health and environment)
- Millet grown in the State you belong to, along with its nutritive value and one recipe.

Assessment will be done on the basis of Creativity, Presentation and Content.

2. Complete written practical 1, 2 and 3 in your practical file according to the instructions given in the class.

3. Revise Chapter 1,2,3 and 5.

4. Processed foods can be classified on the basis of extent and type of processing. Write one line each to explain the following and paste 2 pictures or wrappers of the examples of the same.

- Preserved foods
- Manufactured goods
- Medical foods
- Formulated foods
- Functional foods

(Activity to be done in notebook)



2023-24

Students are instructed to complete the following Holiday Home Work during Summer Break:

Class:XI

- Make a proper chart illustrating Career Options in Physical Education
- Prepare a Project File of one Game /Sport of your choice covering the following points:
  - a. Dimension / Measurements
  - b. Updated Rules and Regulations
  - c. Terminologies used
  - d. Famous personalities ( National / International )of your sports / Games
  - e. Famous Tournaments ( National / International )of your Sports / Games
  - f. Related Awards / Trophies ( National / International)

Class:XII

- Calculate the BMI of your family on plain chart
- Draw the Knock Out Fixture of 19 Teams on plain white chart describing the all steps involved
- Draw any Four Asanas as a Corrective measure of Asthma, Obesity, Hypertension
- Diabetes

Dr. Amit Kumar Singh  
(HOD , Dept. Of Phy.Ed. )

**Army Public School , Meerut Cantt**  
**Holiday Home work**  
**Class - XII**  
**Subject - English Core**

1. Revise the work done in class for UT1
2. Prepare the Project as per CBSE guidelines discussed in class.

**SUGGESTED TOPICS FOR ENGLISH PROJECT**  
**(survey/essay)**

1. Phobias Among Students (Deep Water)
2. Report on a famous person who overcame phobia/disability.(Deep water)
3. TIME TRAVEL : A Possibility in future.(Third Level) [ Inter Disciplinary]
4. Life and challenges of slum children.
5. OLD AGE :Challenges and Opportunities (My Mother at sixty-six)
6. Changing face of women in 21<sup>st</sup> century(Aunt Jennifer's Tigers)
7. Materialistic Pleasures : A distraction for Youth (Rattrap)
8. Healing power of Yoga and Meditation (Keeping Quiet)
9. Futility of war (Last Lesson) [ Inter Disciplinary]
10. Paradise of North-East : Arunachal Pradesh (A Thing of Beauty) [ Art-Integrated Project]