

DAV VEDANTA INTERNATIONAL SCHOOL, LANJIGARH
HOLIDAY HOMEWORK (2020-21)
Class XII SUB-ENGLISH

- 1) Question + Answer of all the Chapters taught.
- 2) Solve any ten unseen passages.
- 3) Article writing on the following topics-
 - *Look within.
 - * A parallel world (Can be story based)

SUB: - PHYSICS

CHAPTER -1

ELECTROSTATICS CHARGES, FORCES AND FIELDS

1.1.ELECTRIC CHARGE:

1:1: A: Following questions are carrying 1 mark each.

1. Give the electric charges of positron and photon in units of electronic charge.
2. What kind of charges is produced on each (i) when a glass rod is rubbed with silk and (ii) when an ebonite rod is rubbed with wool?
3. A polythene piece rubbed with wool is found to have a negative charge of 3.2×10^{-7} C. Calculate the number of electrons transferred.
4. Name any two basic properties of electric charge.
5. What does $q_1 + q_2 = 0$ signify in electrostatics?

1.2.COULOMB'S FORCE:

1.2.A: Following questions are carrying 1 mark each.

1. The dielectric constant of a medium is unity. What will be its permittivity?
2. Define dielectric constant of a medium in terms of force between electric charges.
3. In a medium the force of attraction between two point charges, d distance apart, is F . What distance apart should these be kept in the same medium so that the force between them becomes $F/3$?
4. Two point charges $10\mu\text{C}$ and $20\mu\text{C}$ are separated by a distance r in air. If an additional charge of $-8\mu\text{C}$ is given to each, by what factor does the force between the charges change?
5. Two point charges q_1 and q_2 are placed close to each other in air. What is the nature of

the force between them when (i) $q_1 q_2 > 0$ and (ii) $q_1 q_2 < 0$?

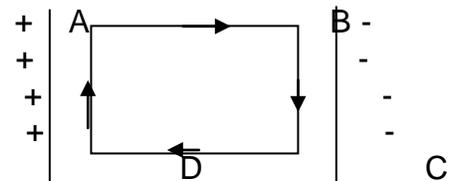
1.2.B: Following questions carry 2 or 3 marks each.

- Two extremely small charged copper spheres have their centres separated by a distance of 50cm in vacuum. (a) What is the mutual force of electrostatic repulsion if the charge on each is 6.5×10^{-7} C? (b) What will the force of repulsion if (i) the charge on each sphere is doubled and their separation is halved (ii) Two spheres are placed in water (dielectric constant of water is 80)?
- Calculate the Coulomb force between a proton and an electron separated by a distance of 0.8×10^{-15} m.
- Define the coulomb. How many electrons will have a total charge of 1C?
- Calculate the Coulomb force between two protons separated by a distance of 1.6×10^{-15} m
- Calculate the Coulomb force between an alpha particle and a proton separated by a distance of 5.12×10^{-15} m.

1.3.ELECTRIC FIELD:

1.3. A: Following questions carry one mark each.

- Define Electric Field Intensity at a point.
- Why electric lines of force do not intersect with each other?
- If an oil drop of weight 3.2×10^{-13} N is balanced in an electric field of 5×10^5 V/m, find the charge on the oil drop.
- A uniform electric field E exists between two Charged plates as shown in the figure. What would be the work done in moving a charge q along the closed rectangular path ABCDA?



1.3. B: Following questions carry 2 or 3 marks each.

- Define electric field intensity at a point. An electron moves a distance of 6cm when accelerated from rest by an electric field of strength 2×10^4 N/c. Calculate the time of travel.
- An electron and a proton are free to move in a given electric field. Will the acceleration experienced by them be equal or different?
- Two point charges of $+3 \times 10^{-19}$ C and $+12 \times 10^{-19}$ C are separated by distance of 2.5m. Find the point on the line joining them at which the electric field intensity is zero.
- Two point charges $q_A = +3 \mu\text{C}$ and $q_B = -3 \mu\text{C}$ are located 20 cm apart in vacuum. (i) Find the electric field at the mid point of the line AB joining the two charges. (ii) If a negative test charge of magnitude 1.5×10^{-9} C is placed at the center, find the force experienced by the test charge.
- Two equal charges of $+2 \times 10^{-16}$ C are placed 20 cm apart in air. At a point midway between them find the force acting on a charge of $+2 \times 10^{-16}$ C.

1.4:ELECTRIC DIPOLE:

1.4.A: Following questions carry one mark each.

1. Give the SI unit of electric moment of a dipole.
2. Define the term Electric-Dipole Moment.
3. What is the net force on an electric dipole placed in a uniform electric field?
4. Two charges one 5microC and -5microC are placed 1mm apart. Calculate the dipole moment.
5. What orientation of an electric dipole in a uniform electric field corresponds to its stable equilibrium?

1.4.B: Following questions carry 2 or 3 marks each..

1. An electric dipole, when held at 30° with respect to a uniform electric field of 10^4 N/C, experiences a torque of 9×10^{-26} N-m. Calculate the dipole moment of the dipole.
2. An electric dipole is held in a uniform electric field. (I) Show that no translatory force acts on it. (ii) Derive the expression for the torque acting on it.
3. An electric dipole of length 2 cm is placed with its axis making an angle 60° to a uniform electric field of 10^5 N/C. If it experiences a torque of $8 \times 3^{1/2}$ Nm, calculate the (I) magnitude of the charge on the dipole and (ii) potential energy of the dipole.

1.4.C: Following questions carry 5 marks each.

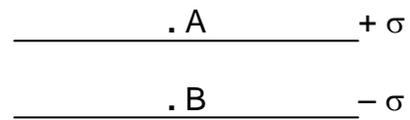
1. Define electric field at a point. Two point charges +q and -q are placed at a distance 2a apart. Calculate the electric field intensity at a point P situated at a distance r along the perpendicular bisector of the line joining the charges. What is the field when $r \gg a$?
2. Define the terms Electric dipole and Dipole moment. Derive the expression for the electric field intensity at a point on equatorial line of a dipole.
3. An electric dipole is held in a uniform electric field. (I) Show that no translatory force acts on it. (ii) Derive the expression for the torque acting on it. (iii) The dipole is aligned parallel to the field. Calculate the work done in rotating it through 180° . **1:**

5:GAUSS'S LAW:

5.1.A: Following questions carry one mark each.

1. If Coulomb's Law has $1/r^3$ dependence on distance instead of $1/r^2$, will Gauss' Law still hold?

2. Two plane sheets of charge densities $+\sigma$ and $-\sigma$ are kept in air as shown in the figure. What is the electric field intensities at points A and B?



5.1.B: Following questions carry 2 or 3 marks each.

1. A point charge causes an electric flux of $-1.0 \times 10^3 \text{ Nm}^2/\text{C}$ to pass through a spherical Gaussian surface of 10.0 cm radius centered on the charge. (a) If the radius is doubled, how much flux would pass through the surface? (b) What is the value of the point charge?
2. Drive, using Gauss' Law, an expression for the electric field of an infinitely long line of charge having uniform density on $\lambda \text{ C/m}$.
3. Using Gauss' Law of Electrostatics derive the expression for the electric field due to a uniformly charged spherical shell at a point (i) inside and (ii) outside the shell.

C: Following questions carry 5 marks each.

1. State Gauss's Theorem in electrostatics and use it to derive the expression for the electric field intensity due to an isolated charged sphere at a point (i) inside the sphere and (ii) outside the sphere.
2. State Gauss's Theorem. Give its mathematical expression. Derive an expression for the electric field intensity at any point due to an infinite plane sheet of charge of charge density $\sigma \text{ C/m}^2$.

CHAPTER 2

ELECTROSTATIC POTENTIALS, CAPACITANCES AND DIELECTRICS

2.1: ELECTROSTATIC POTENTIAL:

2.1.A: Following questions are very short answer type and carry one mark each.

- Q1. If a charge $+Q$ is revolved once around another charge $+q$ in a circle of radius R , how much work is done?
- Q2. Define electric potential at a point. Is it a scalar or a vector?
- Q3. An alpha particle and a proton are accelerated through the same potential difference. Calculate the ratio of linear momenta acquired by the two.
- Q4. Sketch the two equipotential surfaces for a point charge.
- Q5. Mention one contrasting feature of electric potential at a point due to an electric dipole as compared to that due a single point charge.

2.1.B: Following questions carry two or three marks each.

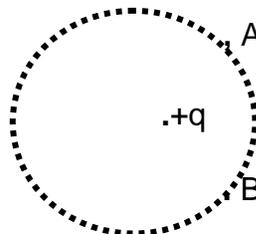
- Q1. A charge of 12micro-f is given to a hollow metallic sphere of radius 0.1m. Find the potential at (i) the surface of the sphere and (ii) the centre of the sphere.
- Q2. The electric potential at 0.9m from a point charge is +50V. Find the magnitude and nature of the charge.
- Q3. A metal wire is bent in a circle of radius 10 cm. It is given a charge of 200 μf , which spreads on it uniformly. Calculate the electric potential at its centre.
- Q4. Two point charges, +4 μf C at a distance of 20 cm in air separates -6 μf C. At what point on the line joining the two charges is the electric potential zero.
- Q5. (i) Calculate the electric potential at a point X due to a point charge of 0.5 μC located at 10cm distance. (ii) Also calculate the work done in bringing a charge of $3 \times 10^{-9}\text{C}$ from infinity to the point X.

20 cm

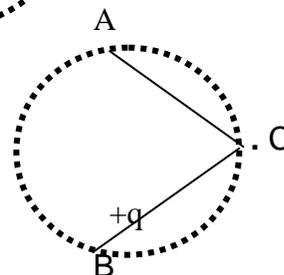
2:2:ELECTRIC FIELD & POTENTIAL:

2.2.A: Following questions are very short answer type and carry one mark each.

- Q1. An infinite plane sheet of charge density 10^{-8}C/m^2 , is held in air. In this situation how far apart are two equipotential surfaces, whose p.d. is 5 V?
- Q2. Draw an euipotential surface in a uniform electric field.
- Q3. What would be the work done if a point charge $+q_1$ is taken from a point A to the point B on the circumference of a circle drawn with another point charge $+q$ at the centre?



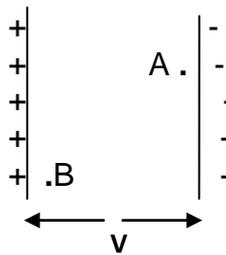
- Q4.** *If a point charge $+q_1$ is taken from A to C and then from C to B of a circle drawn with another point charge $+q$ as center, then along which path more work will be done?*



2.2.B: Following questions carry two or three marks each.

- Q1. Calculate voltage needed to balance an oil drop carrying 10 electrons when located between the plates of a capacitor, which are 5mm apart. $g=10\text{m/s}^2$. The mass of the oil drop is $3 \times 10^{-16}\text{Kg}$.
- Q2. The electric field at a point due to a point charge is 20 N/C and the potential at that point is 10 J/C. Calculate the distance of the point from the charge and magnitude of the charge.

- Q3. Two protons A and B are placed between two parallel plates having a potential difference V as shown in the figure. Will these protons experience equal or unequal force ?



- Q4. A proton, placed in uniform electric field of magnitude $2 \times 10^3 \text{ N/C}$, moves from a point A to B in the direction of electric field. If $AB = 0.05 \text{ m}$, calculate (i) potential difference between A and B, (ii) work done in moving the proton from A to B.
- Q5. A charge of $+10 \mu\text{C}$ is given to a hollow metallic sphere of radius 0.1 m . Find the potential at the (i) outer surface, and (ii) centre of the sphere.

2:3:ELECTROSTATIC POTENTIAL ENERGY:

2.3.A: Following questions are very short answer type and carry one mark each.

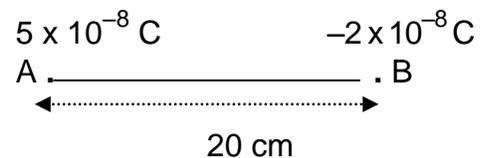
Q1. What is the velocity of an electron whose energy is 5.7eV?

- Q2. The amount of energy that would be imparted to an electron on being accelerated through a potential difference of 1 volt is called _____.
- Q3. Obtain the energy in Joules acquired by an electron beam when accelerated through a pd of 200V.

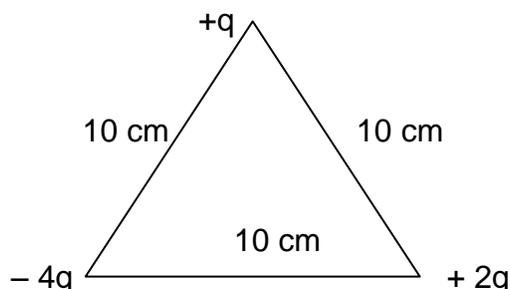
2.3. Following questions carry two or three marks.

- Q1. Two positive charges 0.2 micro-C and 0.01 micro-C are placed 10 cm apart. Calculate the work done reducing their distance to 5 cm .
- Q2. Two point charges A and B of value $+5 \times 10^{-9} \text{ C}$ and $+3 \times 10^{-9} \text{ C}$ are kept 6 cm apart. Calculate the work done when charge B is moved by 1 cm towards charge A.
- Q3. A point charge $+2 \mu\text{C}$ is kept fixed at the origin. Another point charge $+4 \mu\text{C}$ is brought from a far off point to a point distant 50 cm from the origin. Calculate the electrostatic potential energy of this two charge system. Another charge of $+1 \mu\text{C}$ brought to a point distant 100 cm from each of these two charges (assumed to be kept fixed). What is the work done?

- Q4. Two point charges $5 \times 10^{-8} \text{ C}$ and $-2 \times 10^{-8} \text{ C}$ are separated by a distance of 20 cm in air as shown in the figure. Calculate the potential energy of the system.



- Q5. Calculate the work done to dissociate the system of three charges placed on the vertices of a triangle as shown in the below given diagram. Here $q = 1.6 \times 10^{-10} \text{ C}$.



2.3.C: Following questions are long answer type and carry five marks each.

- Q1. Derive an expression for the electric potential at a point along the axial line of an electric dipole. At a point due to a point charge, the value of electric field and potential are 32 N/C and 16 J/C respectively. Calculate (i) the magnitude of the charge and (ii) distance of the charge from the point of observation.

2:4:CAPACITANCES:

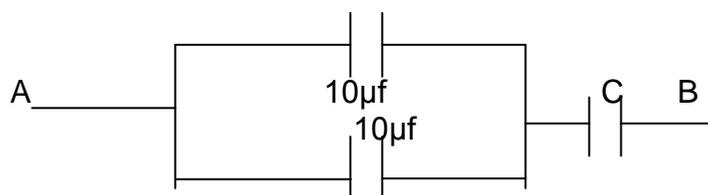
2.4.A: Following questions are very short answer type and carry 1 mark each.

- Q1. What are the factors on which capacitance of a parallel capacitor depends?
- Q2. A 100 V battery charges a 900pf capacitor. How much energy is stored in it?
- Q3. Define SI unit of Capacitance.
- Q4. How much energy will be stored by a capacitor of 470 microfarad when charged by a battery of 20 V?
- Q5. Name the physical quantity whose SI unit is Coulomb/volt.

2:4:B: Following questions carry two or three marks each.

- Q1. What is the capacitance of (a) a series combination, and (b) a parallel combination of n capacitors with capacitances C_1, C_2, C_3, \dots ?
- Q2. What is the area of the plate of a parallel plate capacitor of capacity 2F and with separation between the plates 0.5 cm? Why do the ordinary capacitor have the capacitance of the order of micro-farad?
- Q3. Derive the expression for the energy stored in a capacitor.
- Q4. Derive an expression for the capacitance of a parallel plate capacitor.

- Q5. Calculate the capacitance C in the figure if the equivalent capacitance of the combination between A and B is $15\mu\text{f}$.



- Q6. A 80micro-f capacitor is charged by a 50V battery. The capacitor is disconnected from the battery and then connected across another uncharged 320 µf capacitor. Calculate the charge on the second capacitor.

CHAPTER-3

CURRENT ELECTRICITY

3.1: CURRENT, RESISTANCE & RESISTIVITY:

3.1.A: Following questions are very short answer type. They are to be answered in one or two sentences. They may carry one mark each.

1. Define electrical resistivity of a material. Does it depend on temperature?
2. Two wires of equal length, one of copper and the other of manganin, have the same resistance. Which wire is thicker?
3. State Ohm's Law.
4. How does conductivity of a semi-conductor vary with temperature?
5. On a given resistor the colour bands are in the sequence Green, Violet and Red. What is its resistance?
6. A carbon resistor of 47K ohms is to be marked with rings of different colours for its identification, Write the sequence of colours.
7. Manganin is used for making standard resistors. Why?
8. A wire of resistivity ρ is stretched to double its length. What will be its resistivity?
9. Of metals and alloys, which has greater value of temperature co-efficient of resistivity?
10. A copper wire of resistivity ρ is stretched to reduce its diameter to half of its previous value. What will be its new resistivity?
11. Why is a voltmeter always connected in parallel with a circuit element across which voltage is to be measured?
12. Two wires are of same metal, have the same cross sectional area and their lengths are in the ratio 2:1. What will be the ratio of currents flowing through them respectively when the same potential difference is applied across length of each of them?
13. A carbon resistor is marked in green, red, and orange bands. What is the approximate resistance of the resistor?
14. If the temperature of a good conductor increases, how does the relaxation time of electrons in the conductor change?
15. State the condition in which the terminal voltage across a secondary cell is equal to its emf?

3.1. B: The following questions are of short answer type. Each of them may carry 2 or 3 marks.

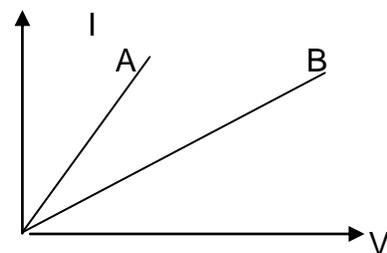
16. Explain the difference in the temperature variation of resistivity of metals and semi-conductors?
17. The sequence of bands marked on a carbon resistor is Brown, Black, Brown and Gold. What is the resistance? Also give the tolerance.
18. State Ohm's Law. A carbon resistor has the coloured ring in the sequence Yellow, Violet, Brown and Gold. What is its resistance? Also give the tolerance.
19. Assuming that electrons are free inside a solid, sketch graphically the distribution $n(v)$ of electron with velocity v .
20. The sequence of marked rings on a carbon resistor is Red, Red, Red and Silver. What is the resistance? Also give the tolerance.
21. When a battery of emf E and internal resistance r is connected to a resistance R , a current I flows through it. Derive the relation between E , I , r and R .
22. Define Conductivity of material. Give its SI unit.
23. State the conditions under which Ohm's Law is not obeyed in a conductor?
24. Three resistances P , Q and R are connected in parallel. Derive their equivalent resistance.
25. Define Conductance of a material. Give its SI unit.

3. 2: COMBINATION OF RESISTANCES

3. 2.A: Following questions are very short answer type. They are to be answered in one or two sentences. They may carry one mark each.

1. Why does the resistance increase in series combination?
2. Why does the resistance decrease in parallel combination?

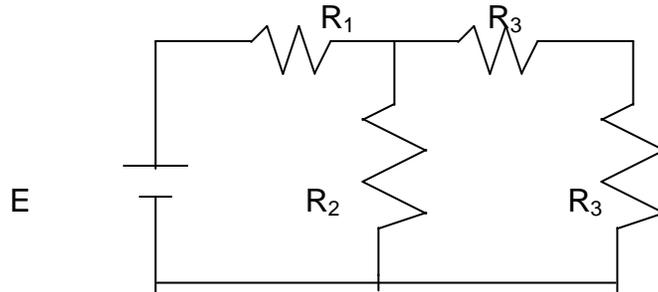
3. Two resistors are connected in series. The equivalent resistance is R_1 . When connected in parallel, equivalent resistance is R_2 . V - I graphs for R_1 and R_2 are as shown in figure. State which graph is for R_1 and which is for R_2 .



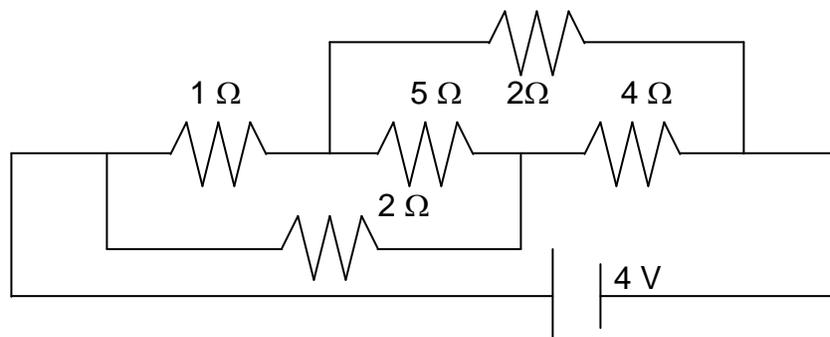
4. A uniform wire of resistance 20Ω is cut into two equal parts. These parts are now connected in parallel. What will be the resistance of the combination?

3. 2.B: The following questions are of short answer type. Each of them may carry 2 or 3 marks.

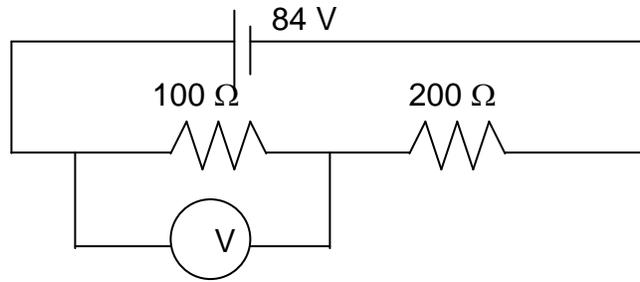
- Three identical cells, each of EMF 2V and internal resistance 0.2 ohm are connected in series to an external resistor of 7.4 ohms. Calculate the current in the circuit..
- A dry cell of EMF 1.6 V and internal resistance 0.1 ohm is connected to a resistor of resistance R ohms. If the current from the cell is 2 A, what is the p.d. across R?
- Determine the voltage drop across the resistance R₁ in the circuit given with E = 65 V. R₁ = 100 ohms, R₂ = 100 ohms, R₃ = 100 ohms, R₄ = 300 ohms.



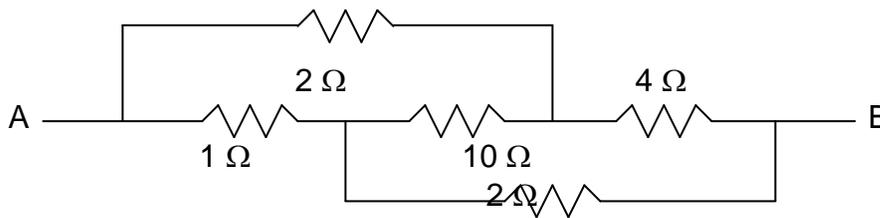
- A battery of EMF 3V and internal resistance r is connected in series with a resistor of 55 ohms through an ammeter of resistance 1 ohm. Draw the circuit diagram and calculate the value of r if the ammeter reads 50 mA.
- Two identical cells of EMF 1.5 V each joined in parallel to provide supply to an external circuit consisting of two resistances of 17 ohms each joined in parallel. A very high resistance voltmeter reads the terminal voltage of cells to be 1.4 V. Calculate the internal resistance of each cell.
- A set of n resistors, each of resistance R ohms, when connected in series have the effective resistance X and when connected in parallel have the effective resistance Y ohms. Find the relation between R, X, and Y.
- A student obtains resistances of 3, 4, 12 and 16 ohms using only two metallic resistances wires either separately or joined together. What is the value of each of these wires?
- A wire of uniform cross-section and length l has a resistance of 16 ohms. It is cut into four equal parts. Each part is stretched to length l and all the four stretched parts are connected in parallel. Calculate the total resistance of the combination so formed. Assume that stretching of the wire does not cause any change in the density of its material.
- Calculate the current drawn from the battery in the given network sketched here.



12. A voltmeter V of resistance $400\ \Omega$ is used to measure the potential difference across a $100\ \Omega$ resistor in the circuit shown here. (a) What will be the reading on the voltmeter? (b) Calculate the potential difference across $100\ \Omega$ resistor before the voltmeter is connected.

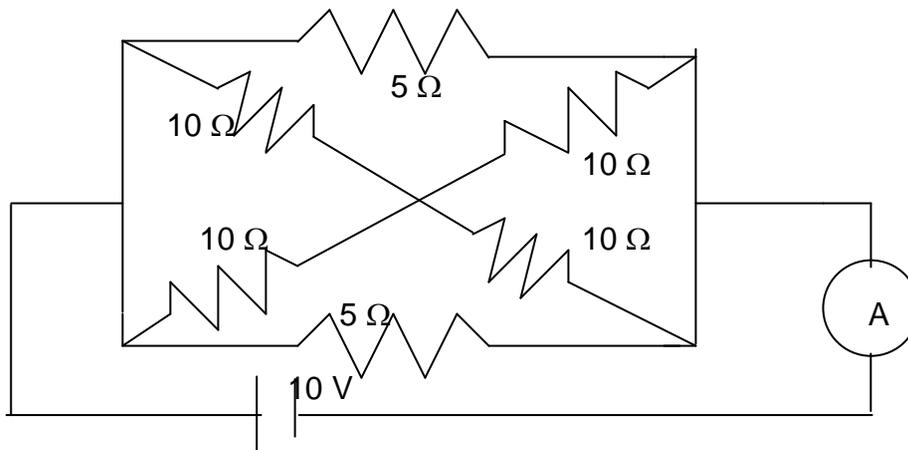


13. Calculate the resistance between A and B of the given network.

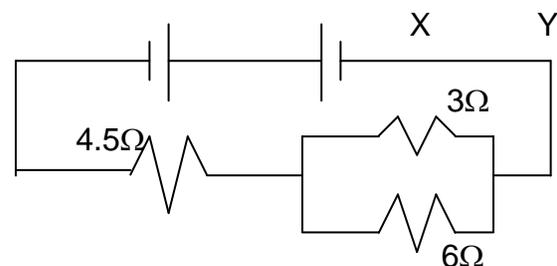


14. Three identical cells each of EMF $2\ \text{V}$ and unknown internal resistance are connected in parallel. This combination is connected to a $5\ \Omega$ resistor. If the terminal voltage across the cells is $1.5\ \text{Volts}$, what is the internal resistance of each cell?

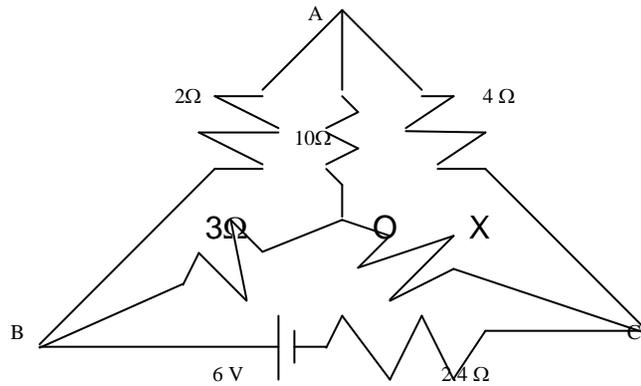
15. Calculate the current shown by the ammeter A in the circuit diagram given below.



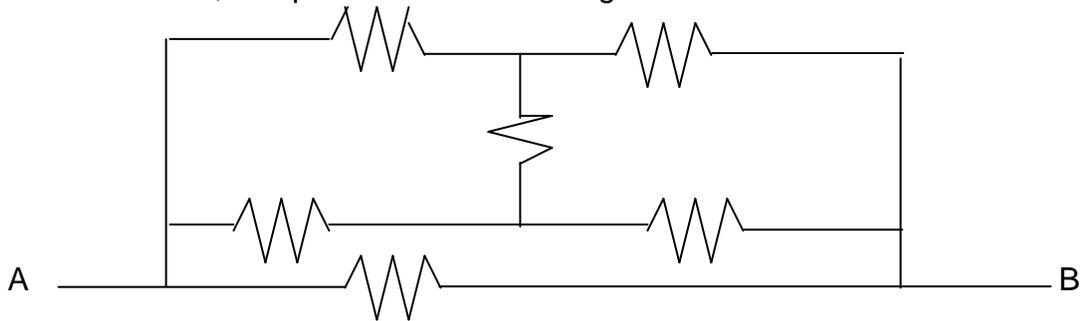
16. Calculate the terminal voltage across The cell X and Y in the given circuit. The cell X has an emf of $4\ \text{V}$, internal Resistance $0.5\ \Omega$ and cell Y has an Emf of $8\ \text{V}$ and internal resistance $1\ \Omega$.



18. Find the value of the unknown resistance X in the following circuit, if no current flows through the section AO. Also calculate the current drawn by the circuit from the battery of emf 6 V and negligible internal resistance.



22. Six resistors, each of value $8\ \Omega$ are joined together in a circuit as shown in the figure. Calculate equivalent resistance across the points A and B. If a cell of emf 4 V is connected across AB, compute the current through the arms AB and DF of the circuit.



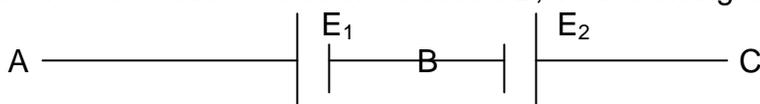
3. 3: POTENTIOMETER:

3.3.A: *Following questions are very short answer type. They are to be answered in one or two sentences. They may carry one mark each.*

1. Name the device used for measuring the internal resistance of a secondary cell.

3. 3.B: *The following questions are of short answer type. Each of them may carry 2 or 3 marks.*

1. Describe with the help of a circuit diagram how a potentiometer can be used to compare EMF's of two cells?
2. Two cells of EMF E_1 and E_2 ($E_1 > E_2$) are connected as shown in the fig. When a potentiometer is connected between A and B, the balancing length of the potentiometer is



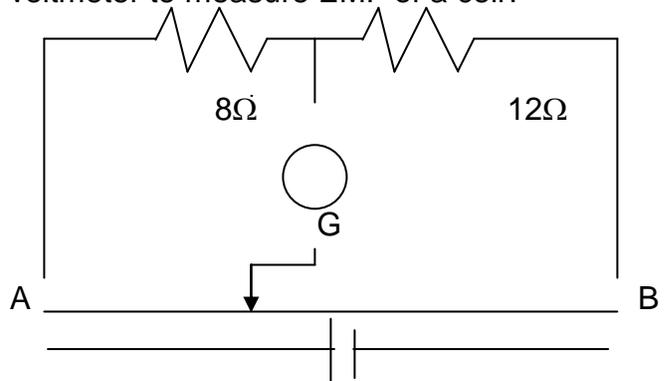
300 cm. On connecting the same potentiometer between A and C, the balancing length is found to be 100cm. Calculate the ratio of E_1 and E_2 .

3. Explain the working principle of a potentiometer. How will you find the value of the EMF of an electric cell using a potentiometer?
4. You are required to find the internal resistance of a primary cell in the laboratory. Draw the circuit diagram of the circuit you will use to determine it. Explain the principle of the experiment. Give the formula used.

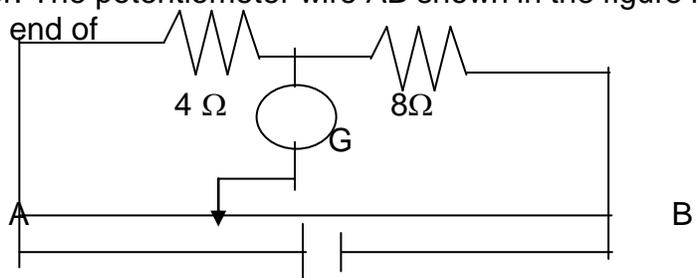
5. Why is a potentiometer preferred over a voltmeter to measure EMF of a cell?

The potentiometer wire AB shown in the figure is 400 cm long.

Where should the free end of the galvanometer be connected so that deflection in the galvanometer is zero?



6. State the principle of a potentiometer. The potentiometer wire AB shown in the figure is 600 cm long. Where should the free end of the galvanometer be connected so that the galvanometer shows zero deflection?



SUB-BIO

CHAPTER-1

1. Name the organism which has internal fertilization and external fertilization. Mention the advantage of internal fertilization and disadvantage of external fertilization.
2. (a) Why sexual mode of reproduction is better than asexual mode of reproduction? (b) Diagrammatically show the fertilization in Isogametes and Heterogametes
3. a) Explain the three major phases in the lifecycle of an organism. b) Why in Whiptail lizards only females are born generation after generation .There are no males.

CHAPTER-2

1. Draw the embryo sac of a flowering plants and label :

(a) (i) Central Cell (ii) Chalazal end (iii) Synergids

(b) Name the cell that develops into embryo sac and explain how this cell leads to formation of embryo sac.

(c) Mention the role played by various cells of embryo sac.

(d) Give the role of filiform apparatus.

2. a) Draw a labeled diagram of L. S of “albuminous seed”

b) How are seeds advantageous to flowering plants?

3. Name the cell that developed into embryo sac and explain how this cell leads to formation of embryo sac and also show it diagrammatically.

4. a) Explain the events of post fertilization in sequential order leading to seed formation in a typical dicotyledonous plant.

b) Draw a labeled diagram of dicot embryo.

5. a) Explain the process of double fertilization in angiosperms.

b) List the changes each parts of fertilized ovule undergo to develop into a seed.

6. Explain with the help of a diagram the development of a mature embryo sac from a megaspore mother cell in angiosperm

7. What will be the fate of following structures in the angiospermic plant?

Ovary wall, Ovule, zygote, outer integument, Inner integument and primary endosperm nucleus. .

8. Differentiate between microsporogenesis and megasporogenesis. What type of cell division occurs during these events. Name the structure formed at the end of these two events.

9. Continued self-pollination lead to inbreeding depression. List four devices, which flowering plant have developed to discourage self-pollination?

10. How does the pollen mother cell develop into a mature pollen grain? Show diagrammatically.

11. a) An anther has 100 microspore mother cell per microsporangium. How many male gametophytes produced by this anther?

b) A moss plant produced a large number of antherozoids but relatively only a few egg cells, why?

- 12.a) An anther with manufacturing tapetum often fails to produce viable male gametophytes. Give one reason.
- b) How many haploid cells are present in a mature female gametophyte of a flowering plant? Name them.
13. Draw a labeled diagram of the structure of mature monocot embryo.
14. Name the cell from which the endosperm of coconut develops. Give the characteristic feature of endosperm.
15. Describe any two devices in a flowering plant which prevent both autogamy and geitonogamy. Explain the events up to double fertilization after the pollen tube enters one of the synergids in an ovule of an angiosperm. (2018)
16. Explain the internal structure of anther with diagram. Mention the different layers of microsporangium and its function.
17. Explain the following:
- Autogamy
 - Chasmogamous
 - Cleistogamous
 - Geitonogamy
 - Xenogamy
19. Explain formation of embryo in monocot and dicot with diagram.

CHAPTER-3

- Draw a labelled diagram of male reproductive system.
- Explain the diagrammatic sectional view of human female reproductive system.
- Draw a menstrual graph and explain the ovarian and uterine events.
- Explain the role of male accessory glands and ducts.
- Draw the labelled sectional view of human ovary.
- Draw a labelled sectional view of seminiferous tubule of human male.
- Give the schematic presentation of spermatogenesis. (NCERT EXEMPLAR)
- Give the schematic presentation of oogenesis.
- Draw a labelled diagram of sectional view of mammary gland.
- Write a brief account of structure and functions of placenta.
- Trace the events that the fertilized egg will undergo up to the implantation of blastocyst in the uterus.
- Draw a labelled diagram of Graafian follicle.

CHAPTER-4

- Enlist any three causes of infertility in men and women.
- State the consequences of over population.
- Differentiate between natality rate and mortality rate.
- Explain any one natural method of birth control.

5. Give three differences between tubectomy and vasectomy.
6. Describe the three natural methods in which fertilization of human ovum by sperm can be prevented?
7. Suggest various methods to assist infertile couples to have children?
8. Explain various methods of ART to have children to issueless couple.

CHAPTER-5

1. Define Incomplete Dominance. Explain it with cross.
2. How is modified allele responsible for determination of character?
3. What is co-dominance? Explain with an example.
4. Define multiplealleles. Explain with an example.
5. Define pleiotropy. Explain with an example.
6. What are the postulates of chromosomal theory of inheritance?
7. Explain the 3 mechanism of sex determination in animals.
8. Define mutation. Differentiate between chromosomal mutation and point mutation.
9. What are Mendelian Disorders? How is it different from chromosomal disorder?
10. How can we differentiate between Autosomal dominant and sex chromosomal dominant diseases?
11. What is Downs syndrome? Write its four symptoms.
12. What is Klinefelters syndrome? Write its four symptoms.
13. What is Turners syndrome? Write four symptoms of it.
14. What is Dihybrid cross? Explain it with an example.
15. What is Monohybrid cross? Explain it with an example.

CHAPTER-5

1. Explain the Nucleosome concept with example.
2. Explain Griffith experiment to prove DNA as the genetic material.
3. Explain the Hershey-Chase experiment to prove DNA as the genetic material.
4. Explain the Meselson and Stahl experiment to prove semiconservative method of replication.
5. Explain the method of replication in prokaryotes.
6. Explain the method of Prokaryotic transcription with diagram.
7. Explain the steps involve in translation process with diagram.
8. Explain LAC operon with diagram. Why is it a negative regulation?(NCERT EXEMPLAR)
9. What are salient features of HGP?
10. What is VNTR? Explain the steps involve in DNA fingerprinting.

SUB: CHEMISTRY

- (a) Differentiate between molarity and molality for a solution. How does a change in temperature influence their values?

(b) Calculate the freezing point of an aqueous solution containing 10.50 g of MgBr_2 in 200 g of water. (Molar mass of $\text{MgBr}_2 = 184 \text{ g}$) (K_f for water = $1.86 \text{ K kg mol}^{-1}$)
- (a) Define the terms osmosis and osmotic pressure. Is the osmotic pressure of a solution a colligative property? Explain.

(b) Calculate the boiling point of a solution prepared by adding 15.00 g of NaCl to 250.00 g of water. (K_b for water = $0.512 \text{ kg mol}^{-1}$), (Molar mass of $\text{NaCl} = 58.44 \text{ g}$)
- (a) Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and how are they caused?

(b) What mass of NaCl (molar mass = 58.5 g mol^{-1}) must be dissolved in 65g of water to lower the freezing point by 7.50°C ? The freezing point depression constant, K_f for water is $1.86 \text{ K kg mol}^{-1}$. Assume van't Hoff factor for NaCl is 1.87.
- (a) Define the terms osmosis and osmotic pressure. What is the advantage of using osmotic pressure as compared to other colligative properties for the determination of molar masses of solutes in solution?

(b) A solution prepared from 1.25 g of oil of wintergreen (methyl salicylate) in 99.0 g of benzene has a boiling point of 80.31°C . Determine the molar mass of this compound. (Boiling point of pure benzene = 80.10°C and K_b for benzene = $2.53^\circ\text{C kg mol}^{-1}$).
- What is meant by:

(i) Colligative properties (ii) Molality of a solution.

(b) What concentration of nitrogen should be present in a glass of water at room temperature? Assume a temperature of 25°C , total pressure of 1 atmosphere and mole fraction of nitrogen in air of 0.78. [K_H for nitrogen = $8.42 \times 10^{-7} \text{ M/mm Hg}$]
- (a) Explain why a solution of chloroform and acetone shows negative deviation from Raoult's law.

(b) Phenol associates in benzene to certain extent to form a dimer. A solution containing 20g of phenol in 1.0 kg of benzene has its freezing point lowered by 0.69 K. Calculate the fraction of phenol that has dimerised. [Given K_f for benzene = 5.1 K m^{-1}]
- Explain the following :

 - Freezing point depression constant for a solvent.
 - Effect of pressure on solubility of gas in liquid.
 - Maximum boiling azeotropes.
- Define ebullioscopic constant..
 - What are isotonic solutions? Give one example.
 - Why should intravenous injections be isotonic with body fluids ?
- What is the effect of temperature on vapor pressure of a liquid ?
 - Calculate the molal lowering of vapour pressure of water at 100°C . Vapour pressure of pure water is 760 mm Hg.
- Calculate the amount of benzoic acid required for preparing 250 ml of 0.15 m solution in methanol.
- Given reason for the following :-(a) Aquatic species are more comfortable in cold waters than in warm waters.
(b) To avoid bends scuba divers use air diluted with helium.
(c) Cold drinks bottles are sealed under high pressure of CO_2 .

12. Account for the following :-
- (a) CaCl_2 is used to clear snow from roads in hill stations.
 - (b) Ethylene glycol is used as antifreeze solution in radiators of vehicles in cold countries.
 - (c) The freezing point depression of 0.01 m NaCl is nearly twice that of 0.01 m glucose solution.
13. 2 g of benzoic acid ($\text{C}_6\text{H}_5\text{COOH}$) dissolved in 25 g of benzene shows a depression in freezing point equal to 1.62 K. Molal depression constant for benzene is $4.9 \text{ K kg mol}^{-1}$. What is the percentage association of acid if it forms dimer in solution ?
14. A 5% solution (by mass) of cane sugar in water has a freezing point of 271 k. Calculate the freezing point of a 5% glucose in water if the freezing point of pure water is 273.15 k
15. Give two examples each of a solution :
- (a) Showing positive deviation from Raoult's Law.
 - (b) Showing negative deviation from Raoult's Law.
16. Draw vapor pressure vs composition (in terms of mole fraction) diagram for an ideal solution.
17. Define azeotropes with one example of each type.

ELECTROCHEMISTRY

1. What is the EMF of the cell when the cell reaction attains equilibrium?
 2. What is the electrolyte used in a dry cell?
 3. How is cell constant calculated from conductance values?
 4. How can you increase the reduction potential of an electrode?
- For the reaction
- $$\text{M}^{n+}_{(\text{aq})} + n\text{e}^- \rightarrow \text{M}(\text{s})$$
5. Electrolysis of $\text{KBr}(\text{aq})$ gives Br_2 at anode but $\text{KF}(\text{aq})$ does not give F_2 . Give reason.
 6. What happens when a piece of copper is added to
 - (a) an aq solution of FeSO_4
 - (b) an Aq solution of FeCl_3 ?
 7. Three electrolytic cells A, B and C containing solutions of zinc sulphate, silver nitrate and copper sulphate respectively are connected in series. A steady current of 1.5 ampere was passed through them until 1.45 g of silver were deposited at the Cathode of cell B. How long did the current flow? What mass of copper and what mass of zinc were deposited in the concerned cells? (Atomic masses of Ag = 108, Zn = 65.4, Cu = 63.5)
 8. (a) Calculate $\Delta_r G^\circ$ for the reaction

$$\text{Mg}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{Cu}(\text{s})$$
 Given: $E_{\text{cell}}^\circ = 2.71 \text{ V}$, $1 \text{ F} = 96500 \text{ C mol}^{-1}$
 (b) Name the type of cell which was used in Apollo space program for providing electrical Power.
 9. (a) State Kohlrausch law of independent migration of ions. Write an expression for the molar Conductivity of acetic acid at infinite dilution according to Kohlrausch law.
 (b) Calculate λ_m for acetic acid. Given that $\lambda_m(\text{HCl}) = 426 \text{ S cm}^2 \text{ mol}^{-1}$
 $\lambda_m(\text{NaCl}) = 126 \text{ S cm}^2 \text{ mol}^{-1}$ $\lambda_m(\text{CH}_3\text{COONa}) = 91 \text{ S cm}^2 \text{ mol}^{-1}$
 10. What type of battery is lead storage battery ? Write the anode and cathode reactions and overall cell reaction occurring in the operation of a lead storage battery.
 11. What type of cell is a lead storage battery? Write the anode and the cathode reactions and the overall cell reaction occurring in the use of a lead storage battery.
 12. Corrosion is essentially an electrochemical phenomenon. With the help of a diagram explain the reactions occurring during the corrosion of iron kept in open atmosphere.
 13. Define the term molar conductivity and indicate how molar conductivity of a substance changes with change in concentration of a weak electrolyte and a strong electrolyte in its solution.

14. How many moles of mercury will be produced by electrolyzing 1.0 M. Hg (NO₃)₂ solution with a current of 2.00 A for 3 hours?
15. Write the anode and cathode reactions occurring in a commonly used mercury cell. How is the overall Reaction represented?
16. Determine the values of equilibrium constant (K_C) and ΔG° for the following reaction:

$$\text{Ni}(s) + 2\text{Ag}^+(aq) \rightarrow \text{Ni}^{2+}(aq) + 2\text{Ag}(s), E^\circ = 1.05 \text{ V}$$
 (1 F = 96500 C mol⁻¹)

CHEMICAL KINETICS

1. The conversion of molecules X to Y follows the second order of kinetics. If concentration of X is increased 3 times, how will it affect the rate of formation of Y?
2. Define the term 'order of reaction' for chemical reactions.
3. Identify the order of reaction for which the rate constant is expressed in units of L⁻¹ mol s⁻¹.
4. Write the difference between order and molecularity of reaction.
5. A first order decomposition reaction takes 40 minutes for 30% decomposition. Calculate its $t_{1/2}$ value.

6. A reaction is of second order with respect to a reactant. How will the rate of reaction be affected if the concentration of this reactant is (i) doubled (ii) reduced to half?
7. The rate constant for first order reaction is 60/s. How much time will it take to reduce the concentration of the reaction to 1/10 of its initial value.
8. The rate of most of reaction double when their temperature is raised from 298k to 308k. Calculate the activation energy of such a reaction.
9. (a) Derive the general form of the expression for the half-life of a first order reaction.
 (b) The decomposition of NH₃ on platinum surface is a zero order reaction. What are the rates of production of N₂ and H₂ if $k = 2.5 \times 10^{-4} \text{ mol}^{-1} \text{ L s}^{-1}$?

10. (a) For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction.
 (b) Rate constant 'k' of a reaction varies with temperature 'T' according to the equation:

$$\log k = \log A - \frac{E_a}{2.303R} \left(\frac{1}{T} \right)$$
 Where E_a is the activation energy. When a graph is plotted for log k vs. 1/T, a straight line with a slope of - 4250 K is obtained. Calculate 'E_a' for the reaction. (R = 8.314 JK⁻¹ mol⁻¹)
 (Given log 1.428 = 0.1548).

SUB: MATHS

CHAPTER: RELATIONS AND FUNCTIONS

- Let $f, g: R \rightarrow R$ be two functions defined as $f(x) = |x| + x$ and $g(x) = |x| - x$ then find $f \circ g$.
- Let N be the set of natural numbers and a relation R is defined over N as $R = \{(2,4): x, y \in N, x + 2y = 10\}$. Check for Symmetry and Transitivity of R .
- Do you think $f: R \rightarrow [0, \infty)$, defined as $f(x) = |x|$ is bijective? Justify your answer.
- Find f^{-1} for $f: R \rightarrow R$ defined as $f(x) = 4x + 5$.
- If $f(x) = x + 7$ and $g(x) = x - 7, x \in R$, find $(f \circ g)(7)$.
- Is the function $f: N \rightarrow N$, defined by $f(x) = 4 + 3x$ one-one? Give reasons.
- Is the function $f: N \rightarrow N$, defined by $f(x) = 4$ onto? Give reasons.
- Let $A = \{a, b, c\}$ and R is a relation in A given by $R = \{(a, a), (a, b), (a, c), (b, a), (c, c)\}$. Is R symmetric? Give reasons.
- Let $f: A \rightarrow B$, where set $A = \{1, 2, 3\}$ and set $B = \{a, c\}$ defined as $f(1) = a, f(2) = c, f(3) = a$. Find f^{-1} .
- Write the number of all one-one functions from the set $A = \{a, b, c\}$ to itself.
- Give an example of a relation which is reflexive, symmetric, but not transitive.
- Write the number of equivalence relations in the set $\{1, 2, 3\}$ containing $(1, 2)$ and $(2, 1)$.
- Let $f, g: R \rightarrow R$ be two functions defined as $f(x) = |x| + x$ and $g(x) = |x| - x$ then find $f \circ g$.

- $f(x) = \sin x + \cos x$, Find its domain and range.
- if $f(x) = (x^2 - 1)$ and $g(x) = 2x + 3$ then find $(g \circ f)(x) = ?$

FOUR/ SIX MARKS QUESTIONS

- Show that the relation R in set $A = \{x \in Z : 0 \leq x \leq 12\}$ given by $R = \{(a, b) : |a - b| \text{ is a multiple of } 4\}$ is an equivalence relation. Find the set of all elements related to 1.
- Let N be the set of all natural numbers and R be the relation on $N \times N$ defined by $(a, b) R (c, d)$ iff $ad(b + c) = bc(a + d)$. Examine whether R is an equivalence relation on $N \times N$? (HOTS)
- Check whether the relation R in real numbers set defined by $R = \{(a, b) : a \leq b^3\}$ is reflexive, symmetric or transitive.
- Let a relation R on the set A of real numbers be defined as $(a, b) \in R \Leftrightarrow 1 + ab > 0 \forall a, b \in A$. Check if R is an equivalence relation or not.
- Show that the function $f: R \rightarrow \{x \in R : -1 < x < 1\}$ defined by $f(x) = \frac{x}{1+|x|}$, $x \in R$ is one - one and onto function.
- Consider $f: R_+ \rightarrow [-9, \infty)$ given by $f(x) = 5x^2 + 6x - 9$ where R_+ is the set of all non negative real numbers. Prove that f is invertible and find f^{-1} .
- If $f: R \rightarrow R, f(x) = x^2 - 5x + 4$ and $g: R \rightarrow R, g(x) = \log x$, then find the value of $(g \circ f)(2)$.
- If $f(x) = \frac{4x+3}{6x-4}, x \neq \frac{2}{3}$, show that $f \circ f(x) = x$ for all $x \neq \frac{2}{3}$. What is the inverse of f ?
- Show that the function $f: R \rightarrow R$ defined by $f(x) = 2x^3 - 7$ for $x \in R$ is a bijective function.

25. Consider $f : \mathbb{R} \rightarrow [-5, \infty)$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible with $f^{-1}(y) = \left(\frac{\sqrt{(y+6)}-1}{3}\right)$.
26. Prove that the relation R in the set $A = \{5, 6, 7, 8, 9\}$ given by $R = \{(a, b) : |a - b| \text{ is divisible by } 2\}$, is an equivalence relation. Find all elements related to the element 6.
27. Show that the function $f: \mathbb{R} \rightarrow (-1, 1)$ defined as $f(x) = \frac{x}{1+|x|}$ is one – one and onto function. Do you think it is invertible? If so then find f^{-1}
28. If $f(x) = \frac{4x+3}{6x-4}$, $x \neq \frac{2}{3}$, show that $f \circ f(x) = x$ for all $x \neq \frac{2}{3}$. What is the inverse of f ?

INVERSE TRIGONOMETRIC FUNCTIONS

1. Write the principal value of $\cos^{-1}(\cos 680^\circ)$
2. Find the value of $\sin^{-1}\left\{\cos\left(\frac{33\pi}{5}\right)\right\}$
3. Write the value of $\tan(2 \tan^{-1}(1/5))$.
4. Write the principal value of: $\tan^{-1}\left(\tan \frac{3\pi}{4}\right)$.
5. Write the principal value of: $\sin^{-1}\left(-\frac{1}{2}\right) + \cos^{-1}\left(-\frac{1}{2}\right)$
6. Write the principal value of: $\cos^{-1}\left(\frac{1}{2}\right) - 2\sin^{-1}\left(-\frac{1}{2}\right)$.
7. Solve for x : $\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2} \tan^{-1} x, x > 0$.
8. Find the value of $\tan^{-1}[2\cos(2 \sin^{-1} 1/2)]$.
9. Write the value of $\cot^{-1}\left(\frac{\pi}{4} - 2\cot^{-1} 3\right)$.
10. Solve for x , $\tan^{-1}(x+1) + \tan^{-1}(x-1) = 8/11$
11. Solve for x , $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \pi/4$
12. Prove that $\tan^{-1}\left[\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}}\right] = \frac{\pi}{4} - \frac{1}{2} \cos^{-1} x, -\frac{1}{\sqrt{2}} \leq x \leq 1$
13. Prove that $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{8}\right) = \frac{\pi}{4}$
14. If $y = \cot^{-1}(\sqrt{\cos x}) - \tan^{-1}(\sqrt{\cos x})$, then prove that $\sin y = \tan^2\left(\frac{x}{2}\right)$
15. Solve for x : (a) $\cos(\tan^{-1} x) = \sin(\cot^{-1} \frac{3}{4})$
 (b) $\sin^{-1} x + \sin^{-1}(1-x) = \cos^{-1} x$.
 (c) $\tan^{-1}(x+1) + \tan^{-1}(x-1) = \tan^{-1}\left(\frac{9}{31}\right)$
16. $\sin^{-1} x + \sin^{-1} 2x = \pi/3$
17. Prove that $2 \tan^{-1} 1/5 + \sec^{-1} \frac{5\sqrt{2}}{7} + 2 \tan^{-1} 1/8 = \pi/4$.
18. Prove that: $\frac{9\pi}{8} - \frac{9}{4} \sin^{-1}(1/3) = \frac{9}{4} \sin^{-1} \frac{2\sqrt{2}}{3}$

MATRICES AND DETERMINANTS

1. If $\begin{bmatrix} 1 & x \\ 3 & 4 \end{bmatrix}$ is a singular matrix then find value of x . (Ans-4/3)
2. If A is a square matrix of order 3×3 then find the value of $|2A|$. (Ans. $8|A|$)
3. If A is an invertible square matrix of order n then $|\text{adj } A|$ is equal to (Ans. $|A|^{n-1}$)
4. Let A is a square matrix of order 3 and $|A| = 10$, then find $|\text{adj } A|$ (Ans. 100)
5. A matrix has 18 elements. Write the possible orders of a matrix.
6. For what value of k , the matrix $\begin{bmatrix} k & 2 \\ 3 & 4 \end{bmatrix}$ has no inverse.
7. If $A = \begin{pmatrix} 1 & 2 \\ 4 & 2 \end{pmatrix}$, then find the value of k if $|2A| = k|A|$.

8. Using the properties of the determinants, prove that:

$$\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^2$$

9. Using matrices solve the following system of linear equation:

$$\frac{2}{x} - \frac{3}{y} + \frac{3}{z} = 10; \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 10 \text{ and } \frac{3}{x} - \frac{1}{y} + \frac{2}{z} = 13$$

10. If A is a square matrix of order 3 such that $|\text{adj } A| = 64$, find $|A|$.

11. Two schools A and B decided to award prizes to their students for three values Honesty (x), punctuality (y) and obedience (z). School A decided to award a total of Rs 15,000 for the three values to 4, 3 and 2 students respectively, while school B decided to award Rs 19,000 for the three values to 5, 4 and 3 students respectively. If all the three prizes together amount to Rs 5,000, then
- (i) Represent the above situation by a matrix equation and form linear equation using matrix multiplication.
 - (ii) Which value you prefer to be rewarded most and why?

12.6. A store in a mall has three dozen shirts with SAVE ENVIROMENT printed two dozen shirts SAVE TIGER printed and five dozen shirts with GROW PLANTS printed. The cost of each shirt is Rs 595, Rs 610 and Rs 795 respectively. All these items were sold in a day. Find total collection of the store using matrix method. Which shirt you would like to buy and why

13. Find the value of p, such that the matrix $\begin{bmatrix} -1 & 2 \\ 4 & p \end{bmatrix}$ is singular .

14. Prove that $\begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix} = (ab+bc+ca)^2$.

15. Prove that $\begin{vmatrix} b^2+c^2 & a^2 & a^2 \\ b^2 & c^2+a^2 & b^2 \\ c^2 & c^2 & a^2+b^2 \end{vmatrix} = 4a^2 b^2 c^2$.

16. Using properties of determinates,

a. Prove that $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & cb & c^2+1 \end{vmatrix} = (1+a^2+b^2+c^2)$

17. Using properties determinants. Prove that

$$\begin{vmatrix} (b+c)^2 & ab & ca \\ ab & (a+c)^2 & bc \\ ac & bc & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

18. $\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = (1+a^2+b^2)^3$

19. A school wants to award its students for the value of honesty, regularity, and hard work with a total cash award of Rs. 6,000 .Three times the award money for hard work added to that given for honesty amounts to Rs 11,000. The award money given for honesty and hard work together is double the one f=given for regularity. Represent the above situation algebraically and find the award money for each value, using matrix method. Apart from these values ,namely, honesty, regularity and hard work, suggest one more value which the school must include for awards.

20. The management committee of a residential colony decided to award some of its members (say x) for honesty, some (say y) for helping others and some others (say z) for supervising the workers to keep the colony neat and clean. The sum of all the awardees is 12. Three times the sum of awardees for cooperation and supervision added to two times the number of awardees for honesty is 33. If the sum of the number of awardees for honesty and supervision is twice the number of awardees for helping others, using matrix method find the number of awardees of each category. Apart from these values, namely, honesty, cooperation and supervision, suggest one more values which the management of the colony must include for awards.
21. Two schools A and B decided to award prizes to their students for three values honesty(x), punctuality(y) and obedience (z). School A decided to award a total of Rs. 11,000 for the three values to 5,4, and 3 students respectively, while school B decided to award Rs. 10,700 for the three values to 4,3, and 5 students respectively. If all the three prizes together amount to Rs. 2700, then using matrix method find the values of x,y, and z. Which value you prefer to be rewarded most and why.

CONTINUITY AND DIFFERENTIABILITY

- If $f(x) = \tan^{-1} x$, then find $f''(2)$.
- The function $f(x) = \frac{k \cos x}{\pi - 2x}$, if $x \neq \frac{\pi}{2}$
- if $x = \frac{\pi}{2}$, is continuous at $x = \frac{\pi}{2}$, then find k.
- Find $\frac{dy}{dx}$, if $\sqrt{x} + \sqrt{y} = 1$,
- If $f(x)$ defined by the following, is continuous at $x = 0$, find the values of a, b and c.

$$f(x) = \begin{cases} \frac{\sin(a+1)x + \sin x}{x}, & \text{if } x < 0 \\ c, & \text{if } x = 0 \\ \frac{\sqrt{x+bx^2} - \sqrt{x}}{bx^2}, & \text{if } x > 0 \end{cases} \quad [\text{ans. } a = -3/2, b \in \mathbb{R} - \{0\}, c = 1/2]$$
- Verify Lagrange's Mean value theorem for the following: $f(x) = x^2 + 2x + 3$, $x \in [4,6]$
- Find the value of a for which the function f defined as:

$$f(x) = \begin{cases} a \sin \frac{\pi}{2}(x+1), & x \leq 0 \\ \frac{\tan x - \sin x}{x^3}, & x > 0, \end{cases} \text{ is continuous at } x=0. \quad [\text{ans. } a = 1/2]$$
- If $Y = (\sin x^{\tan x}) + (\cos x^{\sec x})$ Find $\frac{dy}{dx}$.
- $(\cos x^{\sec x})(\sec x \cdot \tan x \cdot \log \cos x - \sec x \cdot \tan x)$
- If $x = a(\theta - \sin \theta)$, $y = a(1 + \cos \theta)$, find $\frac{d^2x}{dx^2}$.
- Differentiate w.r.t. x, $\sin^{-1} \left[\frac{2^{x+1} \cdot 3^x}{1 + (36)^x} \right]$
- If $y = x^x$, then prove that $\frac{d^2y}{dx^2} \cdot \frac{1}{y} - \left(\frac{dy}{dx} \right)^2 \cdot \frac{y}{x} = 0$.
- Verify mean value theorem for the function $f(x) = \sin x - \sin 2x$ in $[0, \pi]$.
- $\sqrt{(1-x^6)} + \sqrt{(1-y^6)} = a(x^3 - y^3)$ Then prove that $\frac{dy}{dx} = \frac{x^2}{y^2} \sqrt{\frac{1-y^6}{1-x^6}}$
- For what value of k, is the function continuous at $x = 0$:

$$f(x) = \begin{cases} \frac{1 - \cos 4x}{8x^2}, & x \neq 0 \\ k, & x = 0 \end{cases}$$
- Discuss the continuity of the function $f(x) = |x| + |x-1|$ at $x = 1$.
- The function $f(x) = \begin{cases} 3ax + b, & \text{if } x > 1 \\ 11, & \text{if } x = 1 \\ 5ax - 2b, & \text{if } x < 1 \end{cases}$ is continuous at $x=1$, find the values of a and b.
- If $y^x = e^{y-x}$, prove that $dy/dx = (1 + \log y)^2 / \log y$.
- If $x^p y^q = (x+y)^{p+q}$, prove that (i) $dy/dx = y/x$ and (ii) d^2y/dx^2 .

19. $f(x) = \sin x - \sin 2x$ in $[0, \pi]$.

20. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, then show that $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$.

21. Find 'k' so that the function $f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x}, & \text{if } x \neq \pi/2 \\ 3, & \text{if } x = \pi/2 \end{cases}$ is continuous at $x = \pi/2$

22. Find k, so that the function

$$f(x) = \begin{cases} \frac{x^2-25}{x-5}, & \text{if } x \neq 5 \\ k, & \text{if } x = 5 \end{cases}$$
 is continuous at $x = 5$.

23. Find $\frac{dy}{dx}$ of the function $y = (x)^{\cos x} + (\cos x)^{\sin x}$.

24. Find $\frac{dy}{dx}$ of the function $y = \tan^{-1}\left(\frac{1-x}{1+x}\right) - \tan^{-1}\left(\frac{x+2}{1-2x}\right)$.

25. If $x = 3 \sin t - \sin 3t, y = 3 \cos t - \cos 3t$, find $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{3}$.

26. If $y = e^{a \cos^{-1} x}, -1 \leq x \leq 1$, show that $(1-x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - a^2 y = 0$.

SUB- PHYSICALEDUCATION

1. a) What do you mean by planning in sports ?

b) What is the responsibility of technical committee?

c) Write the formula for giving a Bye.

d) What do you mean by consolation tournaments?

e) Give the benefits of knock-out tournament.

f) What is the main objective of intramural activities?

g) Enlist two non- nutritive components of diet.

h) What is a food myth?

i) Write any two benefit of Hastasana.

j) What are the causes of diabetes?

2 a) State the duties of any four committees for organising a successful sports tournament.

b) Explain the advantages of intramural activities.

C) Mention five pitfalls of dieting .

d) Enlist various methods of maintaining healthy weight.

e) Discuss the procedure & benefits of trikonasana.

3 a) Draw a fixture of 6 team on league basic following the cyclic method & staircase method.

b) What is the meaning of tournament ? Draw knockout fixture for 19 teams.

c) Discuss the need of extramural in detail.

d) What do you mean by Asthma ? Explain the procedure benefits contraindications of chakrasana.

e) What do you mean by Backpain? Discuss the procedure & benefits of shalabhasana .