



DAV POLICE PUBLIC SCHOOL
New Police Lines, Panipat
SUMMER VACATION WORK (2026-27)
CLASS – XII (SCIENCE)



ENGLISH CORE (301)

Instructions:

- Complete the given Assignment neatly in your English notebook.
- Follow the word limit and format guidelines strictly.
- Submit the homework on the first day after the vacation.
- Originality will be appreciated. Avoid plagiarism.
- Use your creativity where required.
- Revise the entire syllabus done in class.

Project Work:

Each student should prepare and submit his/her Project Work Report. Following essentials need to be fulfilled for its preparation and submission.

The following parameters will be applicable for the topic:

- The entire project should be in file format.
- The project should be handwritten in blue/ black pen (Highlighters can be used).
- The project report should be developed in the following sequence-
- Cover page: School Name, Title Statement, Name of the student and year / Session.
- Index (List of contents)
- Acknowledgement
- Certificate
- Introduction Statement (The purpose of the project)
- Detailed project report
- Learning outcomes/experiences
- Use A4 size sheets

Project work should be well illustrated with relevant / related / supportive photos/pictures there of

- Total pages: 10-15

Topics are allotted section wise which are mentioned below:

- A1- THE LAST LESSON
- A2- LOST SPRING
- A3- MY MOTHER AT SIXTY-SIX
- B1- KEEPING QUIET
- C1- THE THIRD LEVEL
- C2- THE TIGER KING

PHYSICS (042)

Solve the assignment in fair notebook of chapters :-

Chapter -1 Electric charge and field

Chapter -2 Electric potential and capacitance and

Chapter -3 Current Electricity

Solve the Test series -I and II both sets A and B in notebook.

Prepare **A working model** and **a project report** based on the following:-

1. Simple & Compound Microscope

Roll No. 1,8,15,22,29,36,43,50,57,64

2. Astronomical telescope

Roll No. 2, 9,16,23,30,37,44,51,58,65

3. Transformer

Roll No. 3, 10, 17,24,31,38,45,52,59

4. Optical fibres

Roll No. 4,11,18,25,32,39,46,52,60

5. Half wave rectifier

Roll No. 5,12,19,26,33,40,47,54,61

6. Full Wave rectifier

Roll No. 6,13,20,27,34,41,48,55

7. Moving coil galvanometer

Roll no. 7,14,21,28,35,42,49,56,63

8. Photoelectric effect

Roll No. 8,15,22,29, 36,43,50,57,64

CHEMISTRY(043)

1. Revise the following chapters:-

Chapter 1- Solutions

Chapter 2 - Electrochemistry and

Chapter 3 - Chemical kinetics with the help of notes and also solve NCERT back exercise in fair notebook.

2. Solve the given assignment in fair notebook

3. Prepare an investigatory project based on following instructions

Roll no. 1 to 5 - Solutions

Roll no. 6- 10 - Electrochemistry

Roll no. 11-15 Chemical kinetics

Roll no. 16-20 d and f block elements

Roll no. 21-25 Coordination compounds

Roll no. 26-30 Haloalkanes and Haloarenes
Roll no 31-35 Alcohals, Phenol and ethers
Roll no 36-40 Aldehydes, ketones and carboxylic acid
Roll no 41-45 Amines
Roll no. 46-48 Biomolecules

BIOLOGY (044)

- Revise the following chapters and complete notes in the notebook.
Chapter 1 – Sexual reproduction in flowering plants
Chapter 2 – Human reproduction
Chapter 3 – Reproductive health
Chapter 4 – Principles of inheritance and variations
- Solve the Test series -I and II both sets A and B in notebook.
- Prepare a project report on the assigned topic.

MATHEMATICS (041)

- Revise:
Chapter 2 - Inverse Trigonometric Functions
Chapter 3 - Matrices
Chapter 4 - Determinants
- Do Assignment Questions in separate notebook.
- Do lab Manual activity 1 (Types of Relations) and 5 (Inverse Trig. Functions)

PSYCHOLOGY(037)

Complete both practicals in File and submit on 2nd July

1. Intelligence Quotient
2. Emotional Quotient

Also complete the Assignments given for ch-1 and 3

PAINTING (049)

Complete your 10 page in art file (05 with pencil shading and 5 with colour.

One student submit one project.

Project work (Note Canvas board size 15 inch/18 inch)

- Buddha painting on Canvas board with acrylic color.
- Mandala painting on canvas board with acrylic color.
- Lippan art painting on MDF board and canvas with acrylic color and mirror work.
- African painting on MDF board and canvas with acrylic color.
- Warli art painting on canvas board with color and permanent marker

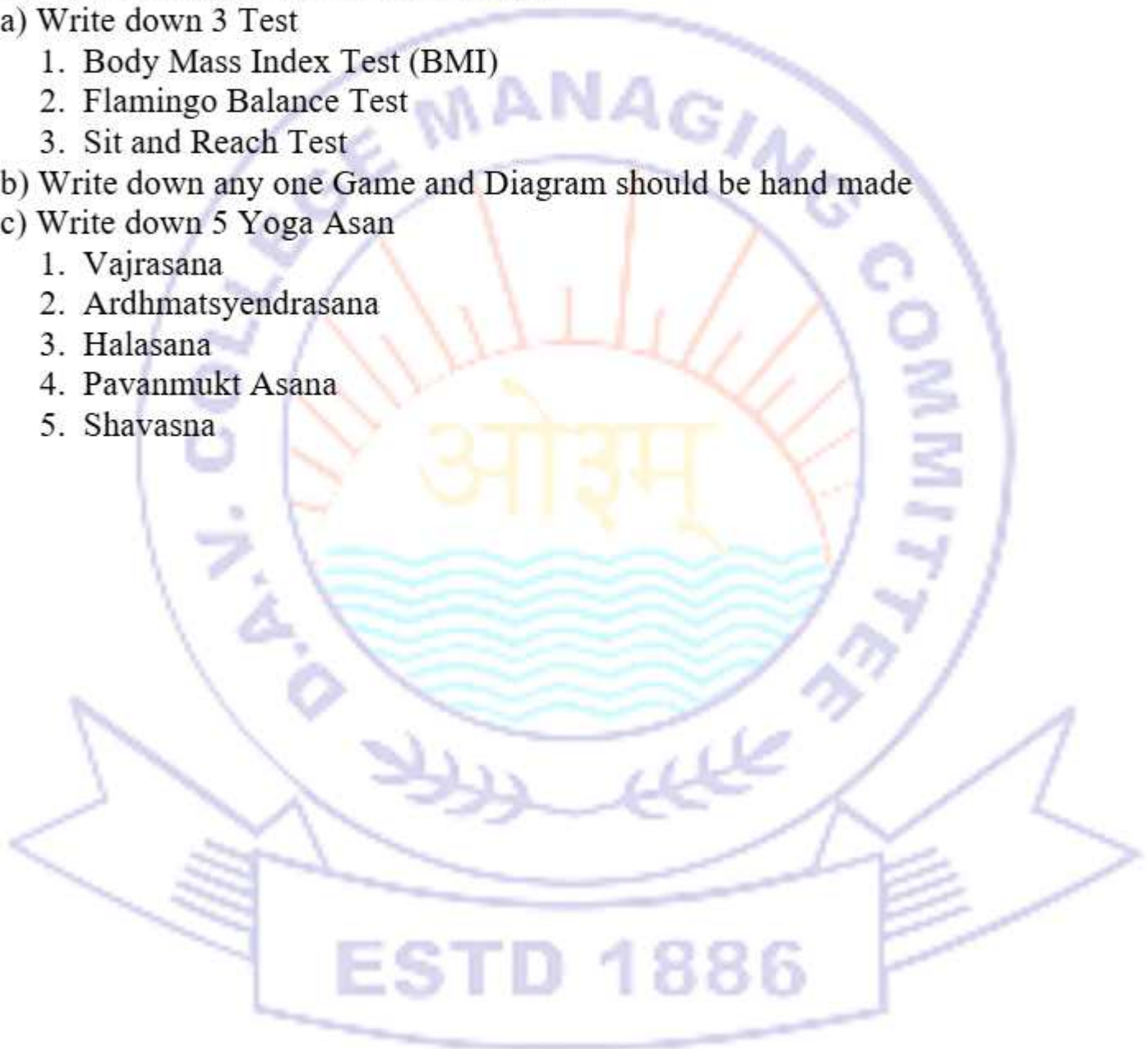
INFORMATICS PRACTICES / ARTIFICIAL INTELLIGENCE

- Write 10 programs of creating series with different elements such as Integer, String, Decimal, NumPy Array, List, Dictionary in Lab Manual and practice.

PHYSICAL EDUCATION (048)

Do all the assigned work in lab manual:

- a) Write down 3 Test
 1. Body Mass Index Test (BMI)
 2. Flamingo Balance Test
 3. Sit and Reach Test
- b) Write down any one Game and Diagram should be hand made
- c) Write down 5 Yoga Asana
 1. Vajrasana
 2. Ardhmatsyendrasana
 3. Halasana
 4. Pavanmukt Asana
 5. Shavasna





DAV POLICE PUBLIC SCHOOL
New Police Lines, Panipat
Holidays' Assignment (2026-27) Class- XII
(SCIENCES)



ENGLISH CORE (301)

Q.1. You are Karan/Simran, a student of Class 12B. You have lost your Physics Practical file in the school library. Draft a notice for the notice board.

Instructions:

- Describe the item briefly.
- Mention when and where it was lost.
- Request the finder to return it.

Q 2. You are the Head Boy/Head Girl of City International School. Draft a notice informing prefects about a meeting to plan the Annual Sports Day.

Instructions:

- Mention the purpose of the meeting.
- Give date, time, and venue.
- Make it formal and concise.

Q 3. You are the Secretary of the History Club of Vidya Mandir School. Draft a notice in not more than 50 words informing students of a proposed visit to some important historical sites in your city.

Instructions:

- Mention the purpose of the meeting.
- Give date, time, and venue.
- Make it formal and concise.

Q4. Your school is organizing a trip to Jaipur for Class 12 students. As the Tour In-Charge, draft a notice to be put up on the school board.

Instructions:

- Mention dates, charges, and teacher in charge.
- Include a deadline for consent form submission.

Q 5. You are Riya/Arjun, Secretary of the Red Cross Society Unit of your school. Write a notice informing students about a blood donation camp being organized in the school auditorium.

Instructions:

Provide necessary details like time, date, and eligibility
Motivate students to participate

Q 6. You are Saurabh/Saumya, a resident of 15, Mall Road, Pune. You have seen an advertisement in The Times of India for the post of Software Engineer in a reputed company. Write an application in response to the advertisement applying for the post.
(Word limit: 120-150 words)

Q 7. You are Sanjay/Sanjana, a resident of 14, Laxmi Nagar, New Delhi. You have seen an advertisement in The Hindustan Times for the post of a Marketing Executive in a company. Write an application with a résumé to the Manager of the company. (Word limit: 120-150 words).

Q 8. How does 'The Last Lesson' highlight the importance of language and education in preserving one's identity and culture?" (Word limit: 120-150 words)

Q 9. How does poverty deprive children of their childhood in 'Lost Spring'?" (Word limit: 120-150 words)

Q 10. How does the poet capture the emotional conflict of separation and fear of losing her aging mother in 'My Mother at Sixty-Six'?" (Word limit: 120-150 words)

Q 11. "How does the story 'The Third Level' explore the theme of escapism and the conflict between illusion and reality?" (Word limit: 120-150 words)

Q 12. "How does Kalki use satire in 'The Tiger King' to criticize the abuse of power and superstitions in society?" (Word limit: 120-150 words).

CHEMISTRY(043)

Chapter: Solutions

1. Define molarity and molality. How are they different from each other?
2. Calculate the molarity of a solution prepared by dissolving 20 grams of NaOH in enough water to make 500 mL of solution. (Given: Molar mass of NaOH = 40 g/mol)
3. What is the effect of temperature on the solubility of gases in liquids? Explain with an example.
4. Define Henry's law and give its mathematical expression.
5. Calculate the boiling point elevation of a solution containing 1.5 moles of glucose (C₆H₁₂O₆) in 1 kg of water. (Given: K_b for water = 0.52 K kg/mol)
6. What is Raoult's Law? How is it applicable to ideal solutions?
7. Differentiate between ideal and non-ideal solutions with suitable examples.
8. Explain the concept of colligative properties and list four such properties.
9. Describe the process of osmosis and osmotic pressure. How is osmotic pressure related to molarity?
10. A solution contains 2 moles of a non-volatile solute in 1 kg of solvent. If the boiling point of the pure solvent is 373 K, calculate the boiling point of the solution. (Given: K_b for the solvent = 0.52 K kg/mol)

Chapter: Electrochemistry

11. Define electrolysis and describe the process with an example.
12. What is a galvanic cell? Describe its working with a neat diagram and label all parts.
13. Differentiate between electrolytic and galvanic cells.
14. Explain the significance of the standard electrode potential (E°) and its role in determining

the spontaneity of a reaction.

15. What is the Faraday's first law of electrolysis? Derive its mathematical expression.

16. Calculate the quantity of electricity (in coulombs) required to deposit 1.5 grams of copper from a CuSO_4 solution. (Given: Molar mass of $\text{Cu} = 63.5 \text{ g/mol}$, $1 \text{ F} = 96500 \text{ C}$)

17. Describe the process of corrosion and the electrochemical theory of rusting of iron.

18. What is a salt bridge? Explain its function in an electrochemical cell.

19. Determine the EMF of the cell constructed with the following half-cells at 298 K:

[$\text{Mg(s)} \mid \text{Mg}^{2+}(0.1 \text{ M}) \parallel \text{Cu}^{2+}(0.01 \text{ M}) \mid \text{Cu(s)}]$

(Given: $E^\circ_{\text{Mg}^{2+}/\text{Mg}} = -2.37 \text{ V}$, $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}$)

PSYCHOLOGY(037)

ASSIGNMENT - Chapter 1 Section B (2marks each)

- Tripti is a psychologist. She administers a test that requires the subject to manipulate objects and other materials to perform a task. Name the type of intelligence test and state its importance.
- Explain the term 'assessment'.
- 'Intelligence by itself does not ensure creativity.' Do you agree with this statement? Give reasons and examples in support of your answer.
- What are the characteristics of the information processing approach to understanding intelligence?
- State the features of a normal curve with respect to intelligence quotient.
- There are individual differences in the level of creativity. How can we explain this variation in the potential for creativity?
- Is intelligence an interplay of nurture and nature? Support your answer with one evidence for each.
- Priya is very smart at solving any problem that she encounters. She refers to similar problems that she has faced in the past and uses her experience to solve the present ones. Which type of intelligence is she using and what theory is this based on?
- Angel, a psychologist, is analysing the intelligence scores of the children. She notices that the children from rural areas scored significantly lower than the children from urban areas. What do you think would have influenced the result of intelligence tests? Explain how she can overcome it.
- Briefly summarise the concept of situationism by giving an example.
- How is experiential intelligence seen in real life situations?
- Aditya has to interview a famous politician on a live TV show. Which is the most appropriate type of interview he can use?

Section C(3 marks each)

- Mohit understands the motives, feelings and behaviours of other people and can develop a comfortable relationship with them. He also likes to travel as he recognizes the beauty of different species of flora and fauna Identify the types of intelligence that Mohit possesses in accordance with Gardner's theory. From the information provided about Mohit, explain any two other types of intelligence that Mohit may not be possessing

- 'J.P. Guilford's structure-of-intellect model is a representation of a psychometric approach to understand intelligence.' Do you agree with this statement? State the reasons for the same and the characteristics of his theory.
- Akram loved his job but he was unhappy with his team leader. When Akram was approached with a better job offer, he recommended the name of his team leader who willingly accepted it. According to Sternberg, explain the type of intelligence Akram used to modify the environment.
- Dia wants to choose subjects in Grade XI in order to pursue a successful career later in life. Which psychological attributes will be assessed by the counsellor in order to help Dia make an informed choice? Give reasons for your answer.
- Kirti is of average intelligence but is high on ability to appraise, express and regulate her emotions. Identify the intelligence that she exhibits and why it is receiving so much attention these days. Suggest some ways to enhance this kind of intelligence of students in schools.
- Ryan and Shireen are siblings brought up in the same environment. Ryan knows all the formulae in mathematics and can recall them as they are but cannot solve problems based on those formulae, whereas Shireen can use formulae to solve any kind of problem that are based on them. Explain the intelligence they both exhibit. Which approach is this theory based on?
- Distinguish between psychometric approach and information-processing approach.
- Differentiate among verbal, non-verbal and performance tests.
- You have assessed twenty peers of your class for mathematical comprehension/knowledge. Create a distribution for the results that you are most likely to expect. What is the shape of the distribution?
- Explain the advantages and disadvantages of observation.
- Angad has been a topper in class. He went to the topmost college, where he was neither sensitive to his own self or to others. This led to problems in interpersonal relationships with reference to his condition. Explain the importance of emotional intelligence in his life.

Section D(4 marks each)

- Vimal is brought up in a society which is technologically advanced. Explain the intelligence that is adopted by him. Is it likely to be tuned by the cultural factors? Give reasons for your answer.
- Sonam's intelligence tests reveal that she has exceptional general ability. Identify this variation of intelligence and its characteristics. How can the school help her reach her full potential?
- Explain the role of assessment in understanding psychological attributes. Describe the key features of any two methods used for psychological assessment.
- The cultural environment provides a context for intelligence to develop. How does the role of culture influence our understanding of intelligence? Explain.

- If we look around in our environment, we find that success is not associated with marks at school. There are many other types of intelligences. How will Gardner's theory of intelligences explain this. Describe his theory of multiple intelligences.
- Abira integrates different experiences in an original way to suggest novel solutions. According to Sternberg, she is high on which type of intelligence?
- Intelligence is the interdependent functioning of three neurological systems. Explain this theory.
- Explain the relationship between creativity and intelligence. State the important features of creativity tests.
- Shanta has an IQ of 140. She has recently won an award for the 'Best Author' as well. Will she be gifted or talented? Elaborate on giftedness and its characteristics.

Section E(6 marks each)

- Explain briefly the multiple intelligences identified by Howard Gardner with the help of examples.
- Discuss the cultural differences in the conceptualisation of intelligence.
- Differentiate between information processing and psychometric approach to understand intelligence. Explain any four theories of psychometric approach.
- What is the relationship between creativity and intelligence? Differentiate between creativity tests and intelligence tests.
- What role does culture play in the conceptualisation of intelligence? Explain in the context of western and Indian cultures with the help of suitable examples.
- What is assessment? Explain any three methods of psychological assessment.

ASSIGNMENT – CHAPTER – 3

Section B(2 marks each)

- Fatima communicates her feelings and views clearly with confidence. She could say 'no' to a request or state an opinion without being self-conscious. Which life skill is she using? Suggest two more life skills that can help Fatima meet the challenges of life successfully.
- Resham has been overwhelmed by the quantum of work in her office. She has been advised some stress management techniques by her counsellor. What are the two techniques that you think would be helpful for her to manage stress?
- 'An individual's response to a stressful situation largely depends upon the perceived events and how they are interpreted or appraised.' Do you agree with this statement with reference to Lazarus' theory? State a reason for your answer.
- Ranjan has faced a lot of mishaps in his life. However, he shows low levels of illness despite high levels of stress. What makes people like Ranjan resistant to stress?
- Neerav's parents have recently shifted to Bengaluru and have been busy settling him in the new city. Neerav misses his friends back in Nagpur and this has impacted his academic performance. What is the source of this stress? State the other sources of stress as well.
- Latika worked for a multinational company. She was shifting houses due to frequent transfers. During this time, she also lost her father to a major heart ailment. This caused a lot of stress. Explain this particular source of stress that Latika faced.

- Tahir is unable to decide whether to study dance or music as he likes both. Is he frustrated or facing a conflict? Explain very briefly.
- Explain the physiological effects of stress.
- What do you understand by creative visualization?
- What is burnout? Explain any one cause of burnout.
- Maninder is confident in saying 'no' to a request that he cannot fulfil. He is also able to organise his work and not procrastinate it. Explain the life skills exhibited by him.

Section C(3 marks each)

- Explain any three major effects of stress on psychological functioning.
- Describe any three life skills that can help a person meet life's challenges.
- How does an individual with a stress resistant personality cope with demands of everyday life? Give examples to support your viewpoint.
- Explain the relationship between stress and the immune system.
- What are cognitive behavioural techniques in the management of stress?
- Explain how life skills can help meet life challenges.
- Explain any four stress management techniques.

Section D(4 marks each)

- Mukesh encounters a snake while on a hike. Referring to the General Adaptation Syndrome (GAS), what is the pattern of his bodily response? State one criticism of Selye's theory.
- Individuals differ in the coping strategies that they use to deal with stressful situations. Justify this statement highlighting various coping strategies.
- Explain the effect of stress on the psychological functioning of an individual.
- To deal effectively with environment, the individuals must possess the right life skills. Explain any four of these life skills.
- Many ailments like hypertension, ulcers, etc. could be stress related. To prevent this from happening, we need to be aware about stress management techniques. Explain any four of these techniques. Explain the relationship between stress and illness. How does stress affect the immune system? Explain.
- Describe any four factors that facilitate positive health and act as stress buffers too.
- Explain the GAS model given by Selye. State the criticisms of this model.
- Explain the theory of cognitive appraisal as given by Lazarus.
- Explain the various sources of psychological stress giving suitable examples.
- Explain any four life skills that will enable students to deal effectively with the demands and challenges of everyday life.

Biology(044)

Assignment Chapters 1, 2 & 3

Chapter 1 – Sexual Reproduction in Flowering Plants(2 Marks Questions)

1. What is double fertilisation? Explain briefly.
2. Differentiate between autogamy and geitonogamy
3. Mention any two functions of tapetum.
4. What is apomixis? State its importance.
5. Define polyembryony with one example.

3 Marks Questions

6. Explain the structure of a mature embryo sac.
7. Describe the process of artificial hybridization
8. Explain the outbreeding devices in flowering plants.
9. Describe post-fertilisation changes in a flower.
10. Explain the stages of pollen germination.

5 Marks Questions

11. Explain double fertilisation and mention its significance.
12. Describe the development of male gametophyte in flowering plants.
13. Explain the process of fertilisation in flowering plants with suitable diagram.
14. Describe the development of dicot embryo.
15. Explain different agents of pollination with suitable examples.

Chapter 2 – Human Reproduction

2 Marks Questions

16. Differentiate between spermatogenesis and oogenesis.
17. Define implantation.
18. Mention any two functions of placenta.
19. What is menstrual cycle?
20. Define parturition.

3 Marks Questions

21. Describe the structure of sperm.
22. Explain the phases of menstrual cycle.
23. Describe cleavage and blastulation.
24. Explain the functions of testes.
25. Describe the process of fertilisation in humans.

5 Marks Questions

26. Describe the male reproductive system with labelled diagram.
27. Explain oogenesis with suitable diagram.
28. Describe the menstrual cycle and hormonal control.
29. Explain the events of fertilisation and implantation.
30. Describe pregnancy and embryonic development in humans

.Chapter 3 – Reproductive Health

2 Marks Questions

31. Define reproductive health.
32. What are sexually transmitted diseases (STDs)? Give two examples.
33. Name any two barrier methods of contraception.
34. Define infertility.
35. What is medical termination of pregnancy (MTP)?

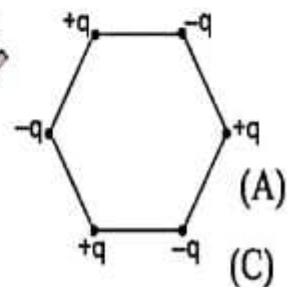
3 Marks Questions

36. Explain the importance of reproductive health.
37. Describe natural methods of contraception.
38. Explain the causes of infertility.
39. Describe barrier methods of contraception
40. Explain the symptoms and prevention of AIDS.

PHYSICS(042)

UNIT 1,2 ASSIGNMENT

- Three charges $+4q$, Q and q are placed in a straight line of length l at points at distance 0 , $l/2$ and l respectively from one end of line. What should be the value of Q in order to make the net force on q to be zero?
(A) $-q$ (B) $-2q$ (C) $-q/2$ (D) $4q$
- Two point charges placed at a distance r in air exert a force F on each other. The value of distance R at which they experience force $4F$ when placed in a medium of dielectric constant $K = 16$ is :
(A) r (B) $r/4$ (C) $r/8$ (D) $2r$
- Six charges of magnitude $+q$ and $-q$ are fixed at the corners of a regular hexagon of edge length a as shown in the figure. The electrostatic potential energy of the system of charged particles is



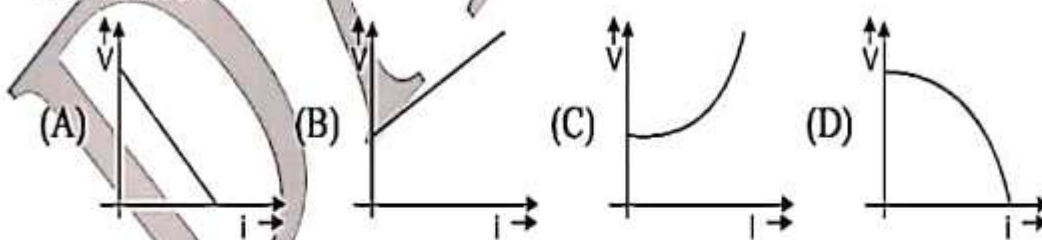
(A) $\frac{q^2}{\pi \epsilon_0 a} \left[\frac{\sqrt{3}}{8} - \frac{15}{4} \right]$

(B) $\frac{q^2}{\pi \epsilon_0 a} \left[\frac{\sqrt{3}}{2} - \frac{9}{4} \right]$

(C) $\frac{q^2}{\pi \epsilon_0 a} \left[\frac{\sqrt{3}}{4} - \frac{15}{2} \right]$

(D) $\frac{q^2}{\pi \epsilon_0 a} \left[\frac{\sqrt{3}}{2} - \frac{15}{8} \right]$

- If internal resistance of a cell is proportional to current drawn from the cell. Then the best representation of terminal potential difference of a cell with current drawn from cell will be :



-
-
-
-
-
- A square of side 'a' is lying in xy plane such that two of its sides are lying on the axis. If an electric field $\vec{E} = E_0 x \hat{k}$ is applied on the square. The flux passing through the square is :

(A) $E_0 a^3$

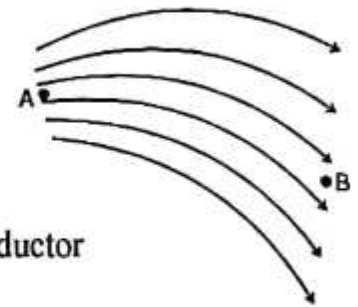
(B) $\frac{E_0 a^3}{2}$

(C) $\frac{E_0 a^3}{3}$

(D) $\frac{E_0 a^2}{2}$

7. The figure shows the electric lines of force emerging from a charged body. If the electric fields at A and B are E_A and E_B respectively and if the distance between A and B is r , then

- (A) $E_A < E_B$ (B) $E_A > E_B$ (C) $E_A = \frac{E_B}{r}$ (D) $E_A = \frac{E_B}{r^2}$



8. In the presence of an applied electric field (\vec{E}) in a metallic conductor

A) The electrons move in the direction of \vec{E}

(B) The electrons move in a direction opposite to \vec{E}

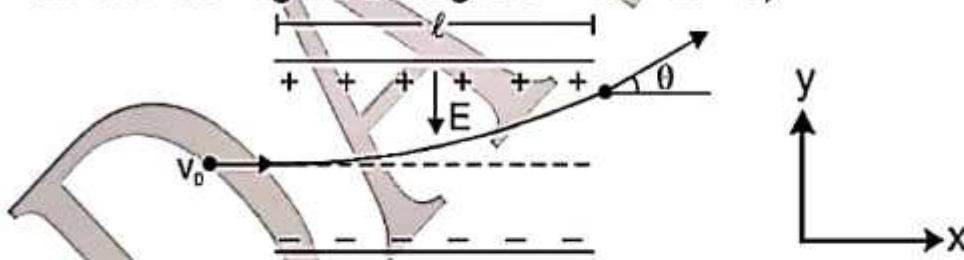
(C) The electrons may move in any direction randomly, but slowly drift in the direction of \vec{E} .

(D) The electrons move randomly but slowly drift in a direction opposite to \vec{E}

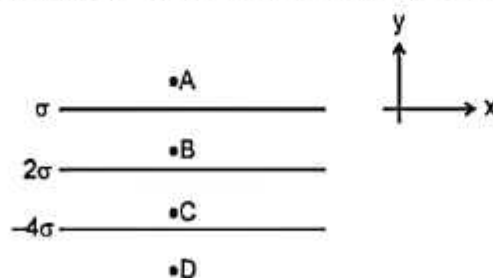
9. Two point charges $q_1 = 2 \times 10^{-3} \text{ C}$ and $q_2 = -3 \times 10^{-6} \text{ C}$ are separated by a distance $x = 10 \text{ cm}$. Find the magnitude and nature of the force between the two charges.

10. The distance between two fixed positive charges $4e$ and e is \square . How should a third charge ' q ' be arranged for it to be in equilibrium? Under what condition will equilibrium of the charge ' q ' be stable (for displacement on the line joining $4e$ and e) or will it be unstable?

11. A uniform electric field $E = 91 \times 10^{-6} \text{ V/m}$ is created between two parallel, charged plates as shown in figure. An electron enters the field symmetrically between the plates with a speed $v_0 = 4 \times 10^3 \text{ m/s}$. The length of each plate is $\square = 1 \text{ m}$. Find the angle of deviation of the path of the electron as it comes out of the field. (Mass of the electron is $m = 9.1 \times 10^{-31} \text{ kg}$ and its charge is $e = -1.6 \times 10^{-19} \text{ C}$).

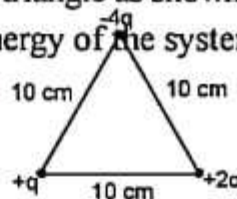


12. If three infinite charged sheets of uniform surface charge densities σ , 2σ and -4σ are placed as shown in figure, then find out electric field intensities at points A, B, C and D.



13. Two particles A and B having charges of $4 \times 10^{-6} \text{ C}$ and $-8 \times 10^{-6} \text{ C}$ respectively, are held fixed at a separation of 60 cm. Locate the point(s) on the line AB where the electric potential is zero.
14. A charge of 8 mC is located at the origin. Calculate the work done by external agent in taking a small charge of $-2 \times 10^{-9} \text{ C}$ from a point A(0, 0, 0.03 m) to a point B(0, 0.04 m, 0) via a point C(0, 0.06 m, 0.09 m).
15. A uniform field of 8 N/C exists in space in positive x-direction.
- Taking the potential at the origin to be zero, write an expression for the potential at a general point (x, y, z).
 - At which points, the potential is 160 V?
 - If the potential at the origin is taken to be 80V, what will be the expression for the potential at a general point?
 - What will be the potential at the origin if the potential at $x = \text{infinity}$ is taken to be zero ?
16. An \square particle is placed in an electric field at a point having electric potential 5V. Find its potential energy ?

17. Three point charges are arranged at the three vertices of a triangle as shown in Figure. Given: $q = 10^{-7} \text{ C}$, calculate the electrostatic potential energy of the system



18. (i) If $\vec{E} = 2y\hat{i} + 2x\hat{j}$, then find $V(x, y, z)$ (ii) If $V = x^2y + y^2z$ then find $\vec{E}(x, y, z)$
19. Find out the electric flux through an area 10 m^2 lying in XY plane due to an electric field $\vec{E} = 2\hat{i} - 10\hat{j} + 5\hat{k}$.
20. Two identical conducting spheres (of negligible radius), having charges of opposite sign, attract each other with a force of 0.108 N when separated by 0.5 meter. The spheres are connected by a conducting wire, which is then removed (when charge stops flowing), and thereafter repel each other with a force of 0.036 N keeping the distance same. What were the initial charges on the spheres?
21. Three point charges q_0 are placed at three corners of square of side a . Find out electric field intensity at the fourth corner.
22. Eight equal point charges each of charge ' q ' and mass ' m ' are placed at eight corners of a cube of side ' a '
- Find out potential energy of charge system
 - Find out work done by external agent against electrostatic forces and by electrostatic forces to increase all sides of cube from a to $2a$.

(iii) If all the charges are released at rest, then find out their speed when they are at the corners of cube of side $2a$.

(iv) If keeping all other charges fixed, charge of corner 'A' is released then find out its speed when it is at infinite distance?

(v) If all charges are released simultaneously from rest then find out their speed when they are at a very large distance from each other

23. Current I is flowing through a copper wire of radius ' r ' with drift velocity of electrons v_d . If this current is passed through another copper wire of same length and double the radius, what will be the drift velocity of free electrons in it?

24. A potential difference V is applied across a conductor of length l . How is the drift velocity affected when V is doubled and l is halved?

25. Write the nature of path of free electrons in the (i) presence of electric field (ii) absence of the electric field.

26. Estimate the average drift speed of conduction electrons in a copper wire of cross-sectional area $1.0 \times 10^{-7} \text{ m}^2$ carrying a current of 1.5 A . Assume that each copper atom contributes roughly one conduction electron. The density of copper is $9.0 \times 10^3 \text{ kg m}^{-3}$ and its atomic mass is 63.5 amu

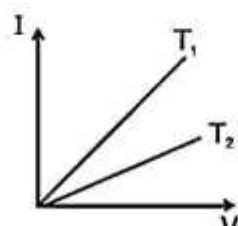
27. (i) A potential difference of 200 volt is applied to a coil at a temperature of 15°C and the current is

10 A . What will be the temperature of the coil when the current has fallen to 9 A , the applied voltage being the same as before? Temperature coefficient of resistance $\square\square\square$

$$= \frac{1}{234} ^\circ\text{C}^{-1}$$

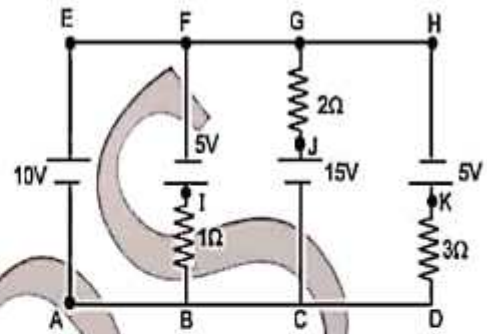
(ii) A platinum wire has resistance of 10 ohm at 0°C and 20 ohm at 273°C . Find the value of temperature coefficient of resistance

28. The current-voltage graphs for a given metallic wire at two different temperature T_1 and T_2 are shown in the figure. Which one is higher, T_1 or T_2



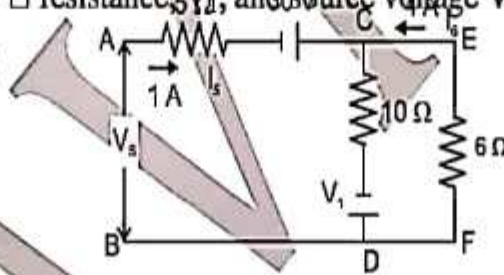
29. In following circuit potential at point 'A' is zero then determine

- Potential at each point
- Potential difference across each resistance
- Identify the batteries which act as a source
- Current in each battery
- Which resistance consumes maximum power
- Which battery consume or gives maximum power.

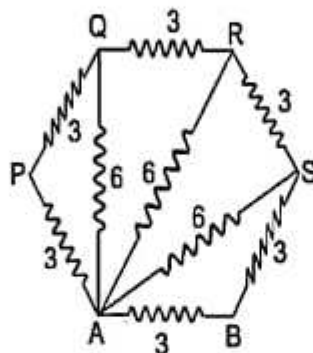


30. How is the average velocity of free electrons vary with increase in temperature?

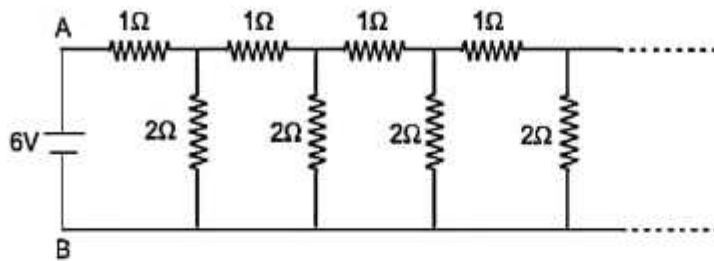
31. Find the current in $10\ \Omega$ resistance, V_1 , and source voltage V_s in the circuit shown in figure ($V_s = V_A - V_B$)



32. All resistance in diagram (fig.) are in ohms. Find the effective resistance between the points A and B



33. An infinite ladder network of resistance is constructed with $1\ \Omega$ and $2\ \Omega$ resistance, as shown in figure.



- i) Show that the effective resistance between A and B is 2Ω .
- (ii) What is the current that passes through the 2Ω resistance nearest to the battery ?

34. Plot a graph showing the variation of resistance of a conducting wire as function of its radius, keeping the length of the wire and the temperature constant.

35. A copper wire of resistance R_0 is stretched till its length becomes n times of its original length. What will be the new resistance?

36. A cell of emf E and internal resistance r is connected across a variable resistor R . Plot a graph showing the variation of terminal potential difference V and load resistance R . Predict from the graph the condition under which V becomes equal of E .

37. Show the variation of resistivity of silicon with temperature in a graph.

38. Two wires of equal length one of copper and other of manganin have the same resistance. Which one is thicker?

39. Define the term mobility. Write its SI unit.

40. On increasing the current drawn from a cell, the potential difference of its terminals is lowered. Why?

41. Can the terminal potential difference of a cell exceed its emf?

42. A parallel combination of cells of emfs ϵ_1 and ϵ_2 , and internal resistance r_1 and r_2 is used to supply current to a load of resistance R . Write the expression for the current through the load in terms of ϵ_1 , ϵ_2 , r_1 , r_2 and R .

CLASS 12
PRACTICE ASSIGNMENT
CH-2,3,4,

Chapter: Matrices and Determinants

1. Construct a matrix $A = [a_{ij}]_{2 \times 2}$ whose elements a_{ij} are given by

a) $a_{ij} = e^{2ix} \sin jx$. b) $a_{ij} = \frac{(i-2j)^2}{2}$ c) $a_{ij} = |-2i + 3j|$

2. Show that a matrix which is both symmetric and skew symmetric is a zero matrix.

3. If $X = \begin{bmatrix} 3 & 1 & -1 \\ 5 & -2 & -3 \end{bmatrix}$ and $Y = \begin{bmatrix} 2 & 1 & -1 \\ 7 & 2 & 4 \end{bmatrix}$, find a matrix Z such that $X + Y + Z$ is a zero matrix.

4. Find values of a and b if $A = B$ where $A = \begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix}$ and $B = \begin{bmatrix} 2a+2 & b^2+2 \\ 8 & b^2-5b \end{bmatrix}$.

5. Find the value of x if $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = O$

6. If $A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \\ 1 & 2 & 3 \end{bmatrix}$, then show that A satisfies the equation $A^3 - 4A^2 - 3A + 11I = O$.

7. Let $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$, then show that $A^2 - 4A + 7I = O$. Using this result calculate A^5 also.

8. If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$, then find $A^2 - 5A - 14I$. Hence obtain A^3 .

9. If the matrix $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is a skew symmetric matrix, find the values of a, b and c.

10. If $P(x) = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, then show that $P(x) \cdot P(y) = P(x+y) = P(y) \cdot P(x)$.

11. If $A = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$ and $A^{-1} = A'$, find the value of α .

12. Find the matrix A satisfying the following equations:

a) $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

b) $\begin{bmatrix} 4 \\ 1 \\ 3 \end{bmatrix} A = \begin{bmatrix} -4 & 8 & 4 \\ -1 & 2 & 1 \\ -3 & 6 & 3 \end{bmatrix}$

c) $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$

13. If $A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$, then show that $A^2 = \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

14. If $A = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$ and $B = \begin{bmatrix} 9 & 1 \\ 7 & 8 \end{bmatrix}$, find a matrix C such that $3A + 5B + 2C$ is a null matrix

15. Show that $A'A$ and AA' are both symmetric matrices for any matrix A .

16. Express the following matrices as sum of a symmetric and skew-symmetric matrices

a) $\begin{bmatrix} 2 & 3 & 1 \\ 1 & -1 & 2 \\ 4 & 1 & 2 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 4 & -6 \\ 7 & 3 & 5 \\ 1 & -2 & 4 \end{bmatrix}$

17. Give an example of matrices A , B and C such that $AB = AC$, where A is nonzero matrix, but $B \neq C$.

18. Show by an example that for $A \neq O$, $B \neq O$, $AB = O$.

19. Find inverse of the following matrices, if exists.

a) $\begin{bmatrix} 2 & -1 & 3 \\ -5 & 3 & 1 \\ -3 & 2 & 3 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 3 & -3 \\ -1 & -2 & 2 \\ 1 & 1 & -1 \end{bmatrix}$ c) $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

20. Evaluate a) $\begin{vmatrix} a+ib & c+id \\ -c+id & a-ib \end{vmatrix}$ b) $\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{vmatrix}$ c) $\begin{bmatrix} 1 & -3 & 2 \\ 4 & -1 & 2 \\ 3 & 5 & 2 \end{bmatrix}$ d) $\begin{bmatrix} 0 & 2 & 6 \\ 1 & 5 & 0 \\ 3 & 7 & 1 \end{bmatrix}$

21. Find x if $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$

22. Find the value of k such that the points are collinear

- a) $A(-3, 7)$, $B(7, k)$ and $(2, 1)$.
 b) $A(1, -5)$, $B(-4, 5)$ and $(k, 7)$.

23. Find the area of the triangle whose vertices are $A(11, 7)$, $B(5, 5)$ and $C(-1, 3)$

24. Compute A^{-1} for the matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

$$y + 2z + 8 = 0$$

Hence solve the system of equations: $x + 2y + 3z + 14 = 0$

$$3x + y + z + 8 = 0$$

25. Find A^{-1} for the matrix $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ and show that $A^{-1} = \frac{A^2 - 3I}{2}$

26. Using matrix method solve the following system of equations:

a) $6x - 9y - 20z = -4$ $2x + y + z = 1$ $3x + 2y - 2z = 3$
 $4x - 15y + 10z = -1$ b) $x - 2y - z = \frac{3}{2}$ c) $x + 2y + 3z = 6$
 $2x - 3y - 5z = -1$ $3y - 5z = 9$ $2x - y + z = 2$

27. If $A = \begin{bmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{bmatrix}$, find A^{-1} . Using A^{-1} solve the system of equations

$$x - 2y = 10, 2x - y - z = 8, -2y + z = 7.$$

28. Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations
 $x - y + 2z = 1, 2y - 3z = 1, 3x - 2y + 4z = 2$

29. Given $A = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$, find BA and use this to solve the system of equations $y + 2z = 7, x - y = 3, 2x + 3y + 4z = 17$

30. Prove that $(A^{-1})' = (A')^{-1}$, where A is an invertible matrix.

31. Show that the points $(a+5, a-4), (a-2, a+3)$ and (a, a) do not lie on a straight line for any value of a .

32. The sum of three numbers is 6. If we multiply third number by 3 and add second number to it, we get 11. By adding first and third numbers, we get double of the second number. Represent it algebraically and find the numbers using matrix method.

33. If A and B are invertible matrices, then prove that $(AB)^{-1} = B^{-1}A^{-1}$.

34. If $A = \begin{bmatrix} 3 & 1 \\ 2 & -3 \end{bmatrix}$, find $|adj A|$ and $|A adj A|$.

35. If $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{bmatrix}$, find $(A^T)'$. (Ans: $\begin{bmatrix} -9 & -8 & -2 \\ 8 & 7 & 2 \\ -5 & -4 & -1 \end{bmatrix}$)

Chapter: Relations and Functions

36. Let $A = \{1, 2, 3, \dots, 9\}$ and R be the relation in $A \times A$ defined by $(a, b)R(c, d)$ if $a + d = b + c$ for $(a, b), (c, d) \in A \times A$. Prove that R is an equivalence relation and also obtain the equivalence class $[(2, 5)]$ and $[(1, 3)]$.

37. Show that the relation R on the set Z of all integers defined by $(x, y) \in R \Leftrightarrow (x - y)$ is divisible by 3 is an equivalence relation.

38. Let N be the set of all natural numbers and let R be a relation on $N \times N$, defined by $(a, b)R(c, d) \Leftrightarrow ad = bc$ for all $(a, b), (c, d) \in N \times N$. Show that R is an equivalence relation. Also, find the equivalence class $[(2, 6)]$.

39. Let N be the set of all natural numbers and let R be a relation on $N \times N$, defined by $(a, b)R(c, d) \Leftrightarrow ad(b + c) = bc(a + d)$ for all $(a, b), (c, d) \in N \times N$. Show that R is an equivalence relation. Also, find the equivalence class $[(2, 6)]$.

40. Let R be the equivalence relation in the set $A = \{0, 1, 2, 3, 4, 5\}$ given by $R = \{(a, b) : 2 \text{ divides } (a - b)\}$. Write the equivalence class $[0]$.

41. Let $A = [-1, 1]$. Then discuss whether the following functions defined on A are one-one onto or bijective.

a) $f(x) = \frac{x}{2}$

b) $g(x) = |x|$

c) $h(x) = x|x|$

d) $k(x) = x^2$

42. Check whether following functions are one-one onto or not?

(i) $f(x) = \frac{x}{x^2+1}$, $f: R \rightarrow R$ (ii) $f(x) = \cos x$ (iii) $f(x) = 9x^2 + 6x - 5$, $f: R_+ \rightarrow [-5, \infty)$

iv) $f(x) = 5x^2 + 6x - 9$, $f: R_+ \rightarrow [-9, \infty)$ (R_+ is the set of all non-negative real numbers)

v) $f(x) = 4x^2 + 12x + 15$, $f: N \rightarrow S$ where S is the range of S

43. Show that $f: N \rightarrow N$ given by $f(x) = \begin{cases} x+1, & \text{if } x \text{ is odd} \\ x-1, & \text{if } x \text{ is even} \end{cases}$ is both one-one and onto.

44. Find the number of all one-one functions from set $A = \{a, b, c\}$ to itself.

Chapter: Inverse Trigonometric Functions

45. Find the principal value of $\tan^{-1}\left(\tan \frac{7\pi}{6}\right)$ (Ans: $\frac{\pi}{6}$)

46. Find the principal values of i) $\tan^{-1}\left(\tan \frac{9\pi}{8}\right)$ ii) $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$ iii) $\sec^{-1}\left(\sec \frac{9\pi}{5}\right)$

47. Evaluate: $\sin\left(\cot^{-1}\left(\cot \frac{17\pi}{3}\right)\right)$. (Ans: $\frac{\sqrt{3}}{2}$)

48. Find the domain of the following functions:

a) $\sin x + \sin^{-1} x$

b) $\cos^{-1}(3x-2)$

49. Evaluate: i) $\sin^{-1}(\sin 10)$ ii) $\sin^{-1}(\sin 5)$ iii) $\cos^{-1}(\cos 10)$

50. Find the principal value of $\cot^{-1}(-\sqrt{3}) + \tan^{-1}(1) + \sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$. (Ans: $\frac{5\pi}{4}$)