S.H.I.P.S.

[A Premier Institution

Home Assignment
2024-25

Grade-XII-Science

Name: _____

Section: _____   Roll. No. _____

Note:

1. **Assignment Marks will be added in the Terminal Assessment.**
2. **Parents are required to let their child do his/her assignments on his/her own.**
3. **Use loose sheets if required to perform the task.**
4. **Best Assignment of the year will be recognised.**

'Summer Vacation weaves a magic wand over the little world of our kids, everything softer and more beautiful.'

So, Hello Summer!!

The seven Golden Commandments for an exemplary Summer Vacation [to be followed by Parents Ward Duo].

a) What about Dining Together? A family that dines together, stays happy forever.

Feasting together with your ward atleast twice a day will strengthen bonds between you and your ward. They will share with you their innermost desires, once you start this process.

b) Teaching them Dignity of Labour: Asking your ward to engage in household chores like cleaning their dishes after meals, assisting maids and house servants, or gardeners or assisting you in cooking and serving food.

c) Visit to Orphanages: Instead of visiting malls, which promotes pseudo culture, allow your kids to visit orphanages so that they connect with the lesser fortunate, learn about their plight. Only by seeing the downtrodden, first hand, can they develop 'Empathy'.

d) Kinship with Mother Nature:- In order to develop affinity and accordance with nature, let the kids work in their kitchen garden, let them plant a sapling or a seed in medium sized pot on the first day of summer break. Ask them to nurture it throughout the holiday and to carry to school with their name tags on 11 July, 2018. This sapling will be nurtured by your ward in the school for the next few years. This way they will learn the value of 'caring' and also appreciate all that you do for them.

e) Shun the Indoor Era: Let them gel with rustic, invigorating natural environment. Let them steer clear of indoor culture which has made them slothful. Let them get dirty, let them bask in natural sunshine, prohibit air conditioners for them.

As Emerson said, "Live in the sunshine, swim the sea, drink the wild air."

Let your kids be adventurous, wild. Let them be REAL KIDS FOR A CHANGE.

f) Sow in them seeds of Philanthropy and Good Humanitarianism: Allow them to donate their old, unused stuff to the needy. Teach them to be generous. Let them donate with their own hands, their discarded clothes, stationery, bags, books, bottles, tiffin boxes etc.

So Dear Parents,

LET HOLIDAY MODE BE

ACTIVATED

Holidays are a perfect time to reflect on our blessings and seek out ways to make life better for those around us.

May Your Days be Merry and Bright

Hope You Enjoy a Blissful Bonding with Your Ward.

LET THE MEMORIES OF HOLIDAYS LAST FOREVER

S.H.I.P.S.
[A Premier Institution]

ENGLISH

CLASS XII ENGLISH PROJECTǀ (2024-25)

1. **MARKING SCHEME**

The project consists of 10 MARKS. Out of which, 5 MARKS will be allotted for the PROJECT FILE, And remaining 5 MARKS for the VIVA based on the file.

The viva will be conducted by the EXTERNAL/INTERNAL EXAMINER.

2. **CONTENT OF THE PROJECT FILE:**

The project file may include the following:

Cover page, with the title of the project, school details and details of the student

Certificate of Completion under the guidance of the teacher (sample will be sent)

Objectives of the topic

Action Plan for the completion of assigned tasks (steps involved in doing the Project)

The **800-1000 words essay/report**

Student reflections (what new learning experience/outcome you have achieved After completing the project)

If possible, photographs that capture positive learning experience of the students (collages/pics from various online sources)

List of Resources/Bibliography (Last page of the project file)

INSTRUCTIONS:

✓Refer to the topics (You can also select different videos available on YouTube, relevant to your topic)

✓Listen to these podcasts, documentaries, interviews etc. on the given topics

✓Do a thorough research on the topic assigned

✓Prepare a report/essay in about 800-1000 words describing the topic/issue/giving your ownopinion/suggestions/measures/viewpoints/its impact on people/your learning experience

✓You can also state the name of various speakers/people (in the given

documentaries/video links), quote them and express their viewpoints

✓The project should be neat, legible, with an emphasis on quality of content, accuracy of information, creative expression, proper sequencing and should be relevant as per your assigned topic

✓PROJECT TO BE DONE ON A4 SHEET.

✓No repetition or copying of project work would be accepted.

✓Please don't share your work with anyone. If the External examiner points out any repetition or copying of the project, the consequences would be severe.

✓No marks will be awarded for a casual approach of completing the project

✓There are 15 topics. Topics are distributed Roll-No Wise

✓Roll no 16 will get topic no 1 and so on…

TOPICS

Given below is a list of some suggestive topics

1.Importance of Mother Tongue

2. Language Chauvinism

3. Lost Childhoods

4. Overcoming Fears (Phobia)

5. Transforming Lives Through Kindness and Empathy

6. Gandhian Principles

7. Film City Departments

8. How to conduct an Interview

9. Fantasy World of a Teenager

10. Care of the Elderly

11. Violence Against Women in India

12. Global Warming: Revelations from Arctic and Antarctic Regions

13.How to Overcome Disability

14. Education is Empowerment: Fighting Marginalization in Society

15.Impact of Technology on Youth

Punjabi

ਸੁਝਾਏ ਗਏ ਪ੍ਰੋਜੈਕਟ (SUGGESTED PROJECTS)

1. ਖ਼ੁਰਾਕ (ਕਿਸੇ ਇੱਕ ਰਾਜ/ਪ੍ਰਦੇਸ਼ ਆਧਾਰਿਤ)

2. ਪੰਜਾਬ ਦੇ ਮੇਲੇ ਤੇ ਤਿਓਹਾਰ

3. ਬਜ਼ੁਰਗਾਂ ਦਾ ਘੱਟ ਰਿਹਾ ਸਤਿਕਾਰ (ਕਾਰਨ ਤੇ ਸੁਝਾਅ)

4. ਕਰੋਨਾ-ਕਾਲ ਸਮੇਂ ਪੇਂਡੂ ਤੇ ਸ਼ਹਿਰੀ ਜੀਵਨ ਦਾ ਅੰਤਰ

5. ਕਰੋਨਾ-ਕਾਲ ਸਮੇਂ ਆਨ-ਲਾਈਨ ਪੜ੍ਹਾਈ

6. ਕਰੋਨਾ-ਕਾਲ ਸਮੇਂ ਉਭਰੀ ਲੋਕ-ਸੇਵਾ ਭਾਵਨਾ

7. ਕਰੋਨਾ-ਕਾਲ ਸਮੇਂ ਪ੍ਰਦੂਸ਼ਨ ਦੀ ਸਥਿਤੀ

8. ਕਰੋਨਾ-ਕਾਲ ਤੋਂ ਬਾਅਦ ਸਕੂਲਾਂ ਦੀ ਸਥਿਤੀ ਤੇ ਵਿਦਿਆਰਥੀਆਂ ਦਾ ਵਿਹਾਰ

9. ਵਿਦੇਸ਼ਾਂ ਵਿੱਚ ਜਾਣ ਦੀ ਹੋੜ (ਸ਼ੌਕ, ਮਜ਼ਬੂਰੀ ਜਾਂ ਸਮਾਜਿਕ ਰੁਤਬਾ)

10. ਸੋਸ਼ਲ ਮੀਡੀਆ ਦਾ ਵੱਧ ਰਿਹਾ ਪ੍ਰਭਾਵ

11. ਵਿਗਿਆਨੀ (ਸਮਾਜ ਨੂੰ ਦੇਣ)

12. ਲੇਖਕ (ਸਾਹਿਤਕ ਦੇਣ)

13. ਮਹਾਂਪੁਰਸ਼ (ਜੀਵਨੀ ਤੇ ਉਪਦੇਸ਼)

Physical Education

HOME ASSIGNMENT

CLASS XII

THEORATICAL WORK

Q.1 How Does sports management Contribute to the success of sports events?

Q.2 List all the committees involved in organizing a tournament and describe the roles of three Committees for ensuring the Smooth Conduct of the event.

Q.3 As the Sports captain of the School, what are the five essential committes you should establish for organizing a one day run for health, Care and what responsibilities should each Committee have?

Q.4 League tournament is a better way to judge the best team of the tournament. Comments

Q.5 Draw a fixture of 7 teams according to the staircase method.

Q.6 Calculate and draw a fixture of 11 Volleyball teams on knockout basis.

Q.7 Mention all Calculations and steps involved to draw a knock out fixture of 19 teams Where 4 teams are to be seeded.

Q.8 What is league tournament? Draw a fixture of 9 teams on the basis of league tournament using Cyclic method.

Q.9 Drew a fixture of 6 teams on league basis following the Tabular method.

Q.10 What is the Significance of zintramurals and Extramural

Q.11 What is the meaning of physical activity?

Q.12 Name some Common postural deformities.

OR

Mention the name of Lower Leg Deformities and Spinal Card Deformities.

Q.13 Participation in physical activites can be utilised as corrective measure for correcting postural deformities among children Justify.

Q.14 What is osteoporosis? Explain factors, those lead to osteoporosis in women.

Q.15 Explain in detail the venous benefit of women participation in sports.

Q.16 Anita was facing the problems of kyphosis. Due to this, She was under stress and tetension. One day, her physical education teacher come to know about the problem. She also advised Anita some corrective exercisesto minimize the deformity of kyphosis. After few months of regular exercise, She was confident enough to get rid of Kyphosis.

1. Kyphosis is problem related to...

(a) Heart

(b) Spine

(c) Brain

(d) Legs

2. Kyphosis is.....

(a) Abnormal curvature of spine at front

(b) Sideways curve in the spine

(c) Rounding of upper back

(d) Rounding of lower back

3. Which of the following is a Corrective measure for kyphosis?

(a) Horse riding

(b) walking on toes

(c) Tadasana (mountain pose)

(d) Sukhasana

Q.17 Priya, a Student of class XI. has very lower BMI due to which her class teacher has asked the school counselor to help priya because it seems priya is not taking proper meals.

1. List down the different types of eating disorders.

2. What Is the range for underweight students in BMI?

3. What could be the possible course of eating disorders?

Q.18 Sohum was the Sports captain of ABC Public school. The School Committee decided to organize an annual sports meet in the school and the responsibilities were given to sohum for planning the events.

1. Effective planning Can help in :

(a) Improving efficiency

(b) Proper ccoordination

(c) Reducing chance of mistakes

(d) All of the above

2. Which the following is the first step in a sports programme?

(a) Staffing

(b) Planning

(c) Budgeting

(d) Directing

3. Pre - tournaments tasks are done :

(a) During the tournament

(b) After the tournament...

(c) Before the tournament

(d) After the award Ceremony

Q.19 In a Lawn Tennis Competition, there were 8 players in the first round, 4 players were eliminated after they lost their matches. Based on the information, answer the following questions..

1. What type of tournament is mentioned above?

(a) Round Rabin tournament

(b) Knockout tournament

(c) Challenge tournament

 (d) None of the above

2. For these 8 players how many matches will be played if it is a single knockout tournament?

(a) 8

(b) 7

(c) 9

(d) 10

3. An advantage of this type of tournament is

(a) takes less time

(b) Weak team may enter the final

(c) Strong teams may get eliminated

(d) Is more expensive

PROJECT FILE WORK

Q.20 What do you mean by Lifestyle diseases?

Q.21 Briefly explain the procedure, benefits, symptoms, causes and contraindications of any two asanas to prevent

- Asthma

- Obestiy

- Diabetes

- Hypertension

- Back pain and Arthrities

Mathematics

<div align="center">

CLASS XII MATHEMATICS

SELF ASSESSMENT TEST (2024-25)

MATRICES

</div>

Time allowed: 1 hour 15 minutes   **Max. Marks: 30**

GENERAL INSTRUCTIONS

(a) The question paper consists of 10 questions divided into Four sections A, B, C & D.

(b) Each question in section A (Q. No. 1 – 10) MCQ/AR carry 1 Mark.

(c) Each question in section B (Q. No. 11 – 14) carries 2 Marks

(d) Each question in section C (Q. No. 15 – 18) carries 3 Marks.

<div align="center">

SECTION – A (1 MARK EACH)

</div>

Q1.	Find the matrix A^2, where $A = [a_{ij}]$ is a 2×2 matrix whose elements are given by $a_{ij} = \text{maximum }(i, j) - \text{minimum }(i, j)$: (A) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
Q2.	If $A = \begin{bmatrix} x & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 0 \\ -1 & 1 \end{bmatrix}$, then value of x for which $A^2 = B$ is : (A) -2 (B) 2 (C) 2 or -2 (D) 4
Q3.	If a matrix has 36 elements, the number of possible orders it can have, is : (A) 13 (B) 3 (C) 5 (D) 9
Q4.	If $A = [a_{ij}]$ be a 3×3 matrix, where $a_{ij} = i - 3j$, then which of the following is *false* ? (A) $a_{11} < 0$ (B) $a_{12} + a_{21} = -6$ (C) $a_{13} > a_{31}$ (D) $a_{31} = 0$

Q5.	The number of all scalar matrices of order 3, with each entry − 1, 0 or 1, is : (A) 1 (B) 3 (C) 2 (D) 3^9
Q6.	If $A = \begin{bmatrix} 2 & 1 \\ -4 & -2 \end{bmatrix}$, then the value of $I - A + A^2 - A^3 + \ldots$ is : (A) $\begin{bmatrix} -1 & -1 \\ 4 & 3 \end{bmatrix}$ (B) $\begin{bmatrix} 3 & 1 \\ -4 & -1 \end{bmatrix}$ (C) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
Q7.	If $\begin{bmatrix} x + y & 2 \\ 5 & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$, then the value of $\left(\dfrac{24}{x} + \dfrac{24}{y} \right)$ is (a) 7 (b) 6 (c) 8 (d) 18
Q8.	If $A = [a_{ij}]$ is an identity matrix, then which of the following is true ? (A) $a_{ij} = \begin{cases} 0, & \text{if } i = j \\ 1, & \text{if } i \neq j \end{cases}$ (B) $a_{ij} = 1, \forall\, i, j$ (C) $a_{ij} = 0, \forall\, i, j$ (D) $a_{ij} = \begin{cases} 0, & \text{if } i \neq j \\ 1, & \text{if } i = j \end{cases}$

	Given below are two statements: one is labelled as **Assertion A** and other is labelled as **Reason R.**
	 In the light of the given statements, choose the *most appropriate* answer from the options given below
	      a. Both **A** and **R** are correct and **R** is the correct explanation of **A**
	      b. Both **A** and **R** are correct but **R** is **NOT** the correct explanation of **A**
	      c. **A** is correct but **R** is not correct
	      d. **A** is not correct but **R** is correct

Q9.	*Assertion (A) :* Every scalar matrix is a diagonal matrix. *Reason (R) :* In a diagonal matrix, all the diagonal elements are 0.
Q10.	*Assertion (A) :* For any symmetric matrix A, B′AB is a skew-symmetric matrix. *Reason (R) :* A square matrix P is skew-symmetric if P′ = − P.

SECTION – B (2 MARKS EACH)

Q11.	Matrix $A = \begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ is given to be symmetric, find values of a and b.
Q12.	If A is a square matrix such that $A^2 = I$, then find value of $(A - I)^3 + (A + I)^3 - 7A$.
Q13.	If $A^T = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, then find $A^T - B^T$.
Q14.	Find a matrix A such that $2A - 3B + 5C = O$, where $B = \begin{bmatrix} -2 & 2 & 0 \\ 3 & 1 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 0 & -2 \\ 7 & 1 & 6 \end{bmatrix}$.

SECTION – C (3 MARKS EACH)

Q15.	Find matrix A such that $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 \\ 1 & -2 \\ 9 & 22 \end{bmatrix}$
	OR
	Express the following matrix as the sum of a symmetric and skew symmetric matrix. $A = \begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix}$
Q16.	If $A = \begin{bmatrix} -3 & 2 \\ 1 & -1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find scalar k so that $A^2 + I = kA$.
Q17.	If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then prove that $A^2 - 4A - 5I = O$.
Q18.	Find the value of $x + y$ from the following equation: $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$

CLASS XII MATHEMATICS

SELF ASSESSMENT TEST (2024-25)

DETERMINANTS

Time allowed: 1 hour 15 minutes   **Max. Marks: 30**

GENERAL INSTRUCTIONS

(a) The question paper consists of 10 questions divided into Four sections A, B, C & D.

(b) Each question in section A (Q. No. 1 – 6) MCQ/AR carry 1 Mark.

(c) Each question in section B (Q. No. 7 – 9) carries 2 Marks

(d) Each question in section C (Q. No. 10 – 12) carries 3 Marks.

(e) Each question in section D (Q. No. 13) carries 5 Marks.

(f) The case study question in section E (Q. No.14) carry 4 Mark.

SECTION – A (1 MARK EACH)

Q1.	For the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ \lambda & 2 & 0 \\ 1 & -2 & 3 \end{bmatrix}$ to be invertible, the value of λ is : (A) 0 (B) 10 (C) $\mathbb{R} - \{10\}$ (D) $\mathbb{R} - \{-10\}$
Q2.	If $\begin{vmatrix} -a & b & c \\ a & -b & c \\ a & b & -c \end{vmatrix} = kabc$, then the value of k is : (A) 0 (B) 1 (C) 2 (D) 4
Q3.	If A is a square matrix of order 3 such that the value of $\left| \text{adj·}A \right| = 8$, then the value of $\left| A^T \right|$ is : (A) $\sqrt{2}$ (B) $-\sqrt{2}$ (C) 8 (D) $2\sqrt{2}$

Q4.	If a_{ij} and A_{ij} represent the $(ij)^{th}$ element and its cofactor of $\begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{bmatrix}$ respectively, then the value of $a_{11} A_{21} + a_{12} A_{22} + a_{13} A_{23}$ is :
	(A) 0 (B) -28
	(C) 114 (D) -114
Q5.	If inverse of matrix $\begin{bmatrix} 7 & -3 & -3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ is the matrix $\begin{bmatrix} 1 & 3 & 3 \\ 1 & \lambda & 3 \\ 1 & 3 & 4 \end{bmatrix}$, then value of λ is :
	(A) -4 (B) 1
	(C) 3 (D) 4

	Given below are two statements: one is labelled as **Assertion A** and other is labelled as **Reason R.** In the light of the given statements, choose the ***most appropriate*** answer from the options given below
	    a. Both **A** and **R** are correct and **R** is the correct explanation of **A**
	    b. Both **A** and **R** are correct but **R** is **NOT** the correct explanation of **A**
	    c. **A** is correct but **R** is not correct
	    d. **A** is not correct but **R** is correct

Q6.	*Assertion (A) :* For matrix $A = \begin{bmatrix} 1 & \cos\theta & 1 \\ -\cos\theta & 1 & \cos\theta \\ -1 & -\cos\theta & 1 \end{bmatrix}$, where $\theta \in [0, 2\pi]$, $\|A\| \in [2, 4]$. *Reason (R) :* $\cos\theta \in [-1, 1], \forall \theta \in [0, 2\pi]$.

SECTION – B (2 MARKS EACH)

Q7.	Show that the determinant $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ is independent of θ.

Q8.	Find the maximum value of $$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cos\theta \end{vmatrix}.$$
Q9.	If $\begin{vmatrix} x+1 & x-1 \\ x-3 & x+2 \end{vmatrix} = \begin{vmatrix} 4 & -1 \\ 1 & 3 \end{vmatrix}$, then write the value of x.

SECTION – C (3 MARKS EACH)

Q10.	If $A = \begin{bmatrix} 1 & \cot x \\ -\cot x & 1 \end{bmatrix}$, show that $A'A^{-1} = \begin{bmatrix} -\cos 2x & -\sin 2x \\ \sin 2x & -\cos 2x \end{bmatrix}.$
Q11.	If $A = \begin{bmatrix} -1 & a & 2 \\ 1 & 2 & x \\ 3 & 1 & 1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & -1 & 1 \\ -8 & 7 & -5 \\ b & y & 3 \end{bmatrix}$, find the value of $(a + x) - (b + y)$.
Q12.	If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ and I is the identity matrix of order 2, then show that $A^2 = 4A - 3I$. Hence find A^{-1}.

SECTION – D (5 MARKS EACH)

Q13.	Using the matrix method, solve the following system of linear equations : $\dfrac{2}{x} + \dfrac{3}{y} + \dfrac{10}{z} = 4,\quad \dfrac{4}{x} - \dfrac{6}{y} + \dfrac{5}{z} = 1,\quad \dfrac{6}{x} + \dfrac{9}{y} - \dfrac{20}{z} = 2.$ **OR** Determine the product $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix} \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ and use it to solve the system of equations $x - y + z = 4$, $x - 2y - 2z = 9,\ 2x + y + 3z = 1.$

SECTION – E (4 MARKS – CASE STUDY)

Q14. A scholarship is a sum of money provided to a student to help him or her pay for education. Some students are granted scholarships based on their academic achievements, while others are rewarded based on their financial needs.

Every year a school offers scholarships to girl children and meritorious achievers based on certain criteria. In the session 2022 – 23, the school offered monthly scholarship of ₹ 3,000 each to some girl students and ₹ 4,000 each to meritorious achievers in academics as well as sports.

In all, 50 students were given the scholarships and monthly expenditure incurred by the school on scholarships was ₹ 1,80,000.

Based on the above information, answer the following questions :

(i)		Express the given information algebraically using matrices.	1
(ii)		Check whether the system of matrix equations so obtained is consistent or not.	1
(iii)	(a)	Find the number of scholarships of each kind given by the school, using matrices.	2

OR

(iii)	(b)	Had the amount of scholarship given to each girl child and meritorious student been interchanged, what would be the monthly expenditure incurred by the school ?	2

<div align="center">

CLASS XII MATHEMATICS

SELF ASSESSMENT TEST (2024-25)

INVERSE TRIGONOMETRY

</div>

Time allowed: 1 hour   **Max. Marks: 30**

GENERAL INSTRUCTIONS

     (a) The question paper consists of 10 questions divided into Four sections A, B, C & D.

     (b) Each question in section A (Q. No. 1 – 3) MCQ/AR carry 1 Mark.

     (c) Each question in section B (Q. No. 4 – 5) carries 2 Marks

     (d) Each question in section C (Q. No. 6 – 8) carries 3 Marks.

     (e) Each question in section D (Q. No. 9 – 10) carries 5 Marks.

     (f) The case study question in section E (Q. No.11) carry 4 Mark.

<div align="center">

SECTION – A (1 MARK EACH)

</div>

Q1.	The value of $\cos^{-1}\left(\cos\dfrac{2\pi}{3}\right) + \sin^{-1}\left(\sin\dfrac{2\pi}{3}\right)$ is: (a) $\dfrac{4\pi}{3}$ (b) $\dfrac{\pi}{2}$ (c) $\dfrac{3\pi}{4}$ (d) π
Q2.	The value of $\cos\left(\tan^{-1}\dfrac{3}{4}\right)$ is: (a) $\dfrac{3}{5}$ (b) $\dfrac{4}{5}$ (c) $\dfrac{3}{5}$ (d) $\dfrac{1}{5}$

Q3.	Given below are two statements: one is labelled as **Assertion A** and other is labelled as **Reason R.**
	
	 Assertion (A) : Domain of $y = \cos^{-1}(x)$ is $[-1, 1]$.
	
	 Reason (R) : The range of the principal value branch of $y = \cos^{-1}(x)$ is $[0, \pi] - \left\{\dfrac{\pi}{2}\right\}$.
	
	 In the light of the above statements, choose the _most appropriate_ answer from the options given below
	    a. Both **A** and **R** are correct and **R** is the correct explanation of **A**
	    b. Both **A** and **R** are correct but **R** is **NOT** the correct explanation of **A**
	    c. **A** is correct but **R** is not correct
	    d. A is not correct but **R** is correct

SECTION – B (2 MARKS EACH)

Q4. If $a = \sin^{-1}\left(\dfrac{\sqrt{2}}{2}\right) + \cos^{-1}\left(-\dfrac{1}{2}\right)$ and

$b = \tan^{-1}\left(\sqrt{3}\right) - \cot^{-1}\left(-\dfrac{1}{\sqrt{3}}\right)$

then find the value of $a + b$.

Q5. Find the domain of $y = \sin^{-1}(x^2 - 4)$.

SECTION – C (3 MARKS EACH)

Q6. Find the value of $\left[\sin^2\left\{\cos^{-1}\left(\dfrac{3}{5}\right)\right\} + \tan^2\left\{\sec^{-1}(3)\right\}\right]$.

Q7. Simplify : $\cos^{-1}x + \cos^{-1}\left[\dfrac{x}{2} + \dfrac{\sqrt{3 - 3x^2}}{2}\right]$; $\dfrac{1}{2} \le x \le 1$

Q8. Draw the graph of $f(x) = \sin^{-1} x$, $x \in \left[-\dfrac{1}{\sqrt{2}}, \dfrac{1}{\sqrt{2}}\right]$. Also, write range

of $f(x)$.

SECTION – D (5 MARKS EACH)

Q9. **(a)** Prove that

$\tan^{-1}\left(\dfrac{\cos x}{1 + \sin x}\right) = \dfrac{\pi}{4} - \dfrac{x}{2}, x \in \left(-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right)$.

(b) Show that: $\cot^{-1}\left(\dfrac{\sqrt{1 + \sin x} + \sqrt{1 - \sin x}}{\sqrt{1 + \sin x} - \sqrt{1 - \sin x}}\right) = \dfrac{x}{2}$, $x \in \left(0, \dfrac{\pi}{4}\right)$

Q10. **(a)** Write $y = \tan^{-1}\left[\dfrac{\sqrt{1 + x^2} - 1}{x}\right], x \ne 0$ in the simplest form.

(b) Prove that $\tan\left\{\dfrac{\pi}{4} + \dfrac{1}{2}\cos^{-1}\dfrac{a}{b}\right\} + \tan\left\{\dfrac{\pi}{4} - \dfrac{1}{2}\cos^{-1}\dfrac{a}{b}\right\} = \dfrac{2b}{a}$

Q11.

If a function f : X → Y defined as f(x) = y is one-one and onto, then we can define a unique function g : Y → X such that g(y) = x, where x ∈ X and y = f(x), y ∈ Y. Function g is called the inverse of function f.

The domain of sine function is R and function sine : R → R is neither one-one nor onto. The following graph shows the sine function.

$y = \sin x$
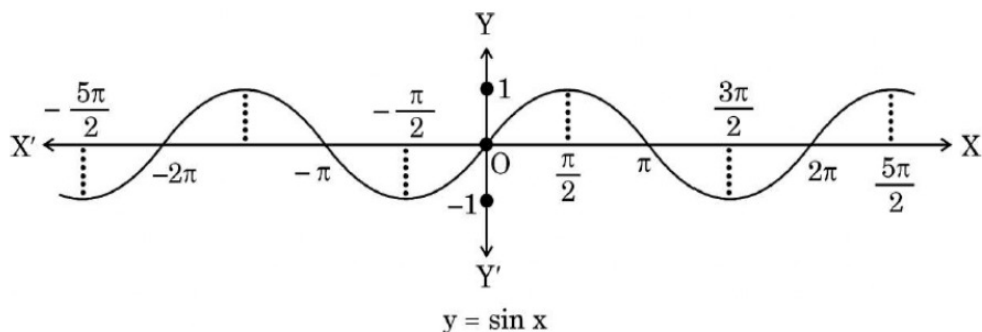
Let sine function be defined from set A to [– 1, 1] such that inverse of sine function exists, i.e., $\sin^{-1} x$ is defined from [– 1, 1] to A.

On the basis of the above information, answer the following questions :

(i) If A is the interval other than principal value branch, give an example of one such interval.   *1*

(ii) If $\sin^{-1}(x)$ is defined from [– 1, 1] to its principal value branch, find the value of $\sin^{-1}\left(-\dfrac{1}{2}\right) - \sin^{-1}(1)$.   *1*

(iii) (a) Draw the graph of $\sin^{-1} x$ from [– 1, 1] to its principal value branch.   *2*

OR

(iii) (b) Find the domain and range of $f(x) = 2\sin^{-1}(1 - x)$.   *2*

Biology

MULTIPLE CHOICE QUESTIONS:-

1.Birth control tablets in females, popularly referred to as pills, prevent pregnancy by
A. delaying menstruation
B. inhibiting ovulation and implantation
C. suppressing sperm motility and fertility
D. blocking the entry of sperms during coitus

2.Which of the following statements is/are correct about ZIFT and GIFT as methods of helping conception in cases of infertility?
P) ZIFT can help where the female is unable to form a viable ovum.
Q) ZIFT uses methods of in vitro fertilisation.
R) GIFT involves the injection of one's own ovum into the body.
S) GIFT uses in vivo fertilisation method.
A. only P
B. only P and R
C. only Q, R and S
D. all - P, Q, R and S

3.Bartholin glands are situated
A. At reduced end of tale of on
B.Other side of vagina in humans
C. On either side of vas deferens in humans
D. Onsides of head of some amphibians

4. After ovulation the structure formed by the rupture of follicle is known as
A. Corpus albicans
B. Corpus luteum
C. Corpus callosum
D. Corpus memmilare

5. Which substance is secreted by corpus luteum ?
(A) Enzyme
(B) Bile
(C) Hormone
(D) Pheromone

6. Oestrous cycle is indication of:
(A) Menopause
(B) Pregnancy
(C) Estrogen secretion
(D) Breeding period

7. In human female ova are produced in :
(A) Ovarian follicles
(B) Uterus
(C) Vagina
(D) Oviduct

8. Sertoli cells help in of eggs
(A) Maturation of sperms
(B) Enzyme production
(C) Ovulation
D.) Maturation of eggs

9. Corpus luteum secretes.
(A) LH
(B) Progesterone

(C) Estrogen
(D) FSH
10. Acrosome is formed by:
(A) mitochondria
(B) cytoplasm
(b) Estrogen
(d) FSH
(C) nucleus
(D) golgi bodies
11. Development of gamete into embryo without ferilization.
(A) Pseudogamy
(B) Parthenogenesis
(C) Apogamy
(D) Parthenocarpy
12. Study of pollen grains is called
(A) Micrology
(B) Palynology
(C) Microsporogensis
(D) Aerology
13. When the body of ovule, embryo sac, micropyle and
funicle, all lie in one vertical plane, the ovule is.
(A) Orthotropous
(B) Campylotropous
(C) Anatropous
(D) Amphitropous
14. Polar nuclei are suspended in.
(A) Egg
(B) Suspensor
(C) Central cell
(D) Nucellus
15. In flowering plants, a mature 'male gametophyte' derived
from a pollen mother cell by:
(A) Three 'mitotic division
asibn
(B) One 'meiotic' two 'mitotic divisions'
(C) Two 'meiotic divisions'
(D) A single 'meiotic division'.
ASSERTION/REASON

ASSERTION/RE
A. Both assertion and reason are true, and reason is the correct explanation of assertion.
B.Both assertion and reason are true, but reason is not the correct explanation of assertion.
c.Assertion is true but reason is false.
D. Both assertion and reason are false.
1.Assertion: All flowering plants of this earth show sexual reproduction.
Reason: Some flowering plants perform vegetative mode
of reproduction also.
2. Assertion : Several hormonal and structural changes
are initiated in a plant before flowering.
Reason: Flower has male and female sex organs for sexual
reproduction.
3. Assertion: A typical anther of a flower is bilobed.

Reason: Each lobe of anther is dithecous.

4. Assertion: The penis is the male external genitali and made up of special erectile tissue.

Reason: The enlarged end of penis is glans penis is covered by a loose fold of skin i.e., fore skin prepuce.

5. Assertion: The first menstruation cycle begins at puberty and is called as menarche.

Reason: In human females, menstruation is repeated at an average of interval of about 28 to 29 days.

6. Assertion: Corpus luteum is yellow endocrine gland in human female.

Reason: It secretes large amounts of progesterone and small amounts of estrogen.

7. Assertion: Zona pellucida is a cellular layer of ovum in human females.

Reason: Corona radiata is a non cellular layer of ovum.

8. 8. Assertion: Reproductive tract infection is due to virus, bacteria or protozoans.

Reason: These infections are usually not curable

9. Assertion: In IVF, fertilisation is performed inside the test tube.

Reason: Embryo with more than 8 blastomeres transferred into the uterus.

10. Assertion: In ZIFT technique, zygote is release into the uterus for implantation.

Reason: In GIFT technique, mixture of gametes is released into the fallopian tube.

SHORT ANSWER QUESTIONS

1. Correct the following statement: i. Surgical method of contraception prevents the gamete formation.

ii. All sexually transmitted diseases are completely curable

iii. Oral pills are a very popular contraceptive among rural women.

 iv. In E.T technique embryo or always transferred into the uterus.

2. Age group of 15 to 24 years is highly vulnerable to sexual transmitted diseases. What preventive measures should be taken.

3. 'Parturition is induced by a complex neuro endocrine mechanism'.Justify

4. Describe the process of fertilisation and implantation.

5. Study the graph of menstruation cycle and identify the

    A. 5th day to12th day of the cycle.

    B. 14 day of the cycle

    C. 16th day to 25th day of the cycle.

6. Why does Corpus luteum secrete large amounts of progesterone during the luteal phase of the menstruation cycle?

7. How many eggs are released by human ovary in a month? How many eggs do you think would have been released if the mother give birth to identical twins? Would you answer change if the twins born were fraternal?

8. In case of polyembryony if an embryo develops from the synergid and another from the nucellus which is haploid and which is diploid?

9. explain embryo formation in monocotyledons.

10. If you squeeze a seed of orange you might observe many embryos of different sizes? How is it possible to explain?

    ● DRAW WELL LABELLED DIAGRAMS OF UNIT REPRODUCTION.

PROJECT

1. To prepare project of 35-40 pages on the topic already discussed It should include:

• Cover page

• Index

• Acknowledgement

• Introduction

• Details about the project

• Bibliography

PRESENTATION

• Short presentation on Topic (unit REPRODUCTION)

Chemistry

Section B

1. Explain the following :
 (a) Solubility of a solid in a liquid involves dynamic equilibrium.
(b) Ionic compounds are soluble in water but are insoluble in non-polar solvents.

2. Give two examples each of a solution :
(a) showing positive deviation from Raoult's Law.
(b) showing negative deviation from Raoult's Law.

3. Draw Vapour pressure vs composition (in terms of mole fraction) diagram for an ideal solution.

4. Define azeotropes with one example of each type.

5. Draw the total vapour pressure Vs. mol fraction diagram for a binary solution exhibiting non-ideal behaviour with negative deviation.

6.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.

7. Why should a solution of a non-volatile solute boil at a higher temperature?

8.Explain with the help of a diagram. Derive the relationship between molar mass and elevation in boiling point.

9. 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.

10. Why do colligative properties of solution of a given concentration are found to give abnormal molecular weight of solute. Explain with the help of suitable examples.

11. Give reasons for the following :–

(a) RBC swell up and finally burst when placed in 0.1% NaCl solution.

(b) When fruits and vegetables that have been dried are placed in water, they slowly swell and return to original form.

(c) A person suffering from high blood pressure is advised to take less amount of table salt.

12. Glycerine, ethylene glycol and methanol sell at the same price per Kg. Which would be cheaper for preparing an antifreeze solution for the radiator of an automobile?

13. Determine the correct order of the property mentioned against them :
10% glucose (p1), 10% urea (p2), 10% sucrose (p3)

14.(a) State Henry's Law.
(b) If O2 is bubbled through water at 393 K how many millimoles of O2gas would be dissolved in 1L of water? Assume that O2 exerts apressure of 0.95 bar. (Given KH for O2 = 46.82 bar at 393K).

UNIT-II (SOLUTION)

Q1. Read the questions and tick the correct option.

i. Which of the following fluoride is used as rat poison?

    a. CaF_2 b. KF   c. NaF   d. MgF_2

ii. Vapour pressure of a pure liquid X is 2 atm at 300 K. It is lowered to 1 atm on dissolving 1 g of Y in 20 g of liquid X. If molar mass of X is 200, what is the molar mass of Y?

    a. 20   b. 50   c. 100   d. 200

iii. Most of the processes in our body occur in

    a. solid solution   b. liquid solution   c. gaseous solution   d. colloidal solution

iv. The term homogenous mixtures signify that

    a. its composition is uniform throughout the mixture.

    b. its properties are uniform throughout the mixture.

    c. both composition and properties are uniform throughout the mixture.

    d. neither composition nor properties are uniform throughout the mixture.

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

    a. mole fraction   b. parts per million   c. mass percentage   d. molality

Q2. In the following questions, a statement of assertion (A) followed by statement of reason(R) is given. Choose the correct answer out of the following choices.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.

b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.

c. Assertion is correct but reason is incorrect.

d. Assertion is incorrect but reason is correct.

i. **Assertion:** Molarity of a solution in liquid state changes with temperature.

  Reason: The volume of a solution changes with change in temperature.

ii. **Assertion:** If a more volatile liquid solute is added to the solvent, the vapour pressure of the solution may increase i.e. $p_s > p_o$.

  Reason: In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not.

Q3. i. Which of the following analogies is correct?

    a. Ideal solution: $\Delta H_{mix}= 0$, $:\Delta V_{mix}= 0$:: Non ideal solution: $\Delta H_{mix}\neq 0$, $: \Delta V_{mix}= 0$

    b. Ideal solution: $\Delta H_{mix}= 0$, $:\Delta V_{mix}= 0$:: Non ideal solution: $\Delta H_{mix}\neq 0$, $: \Delta V_{mix}\neq 0$

    c. Ideal solution: $\Delta H_{mix}\neq 0$, $:\Delta V_{mix}= 0$:: Non ideal solution: $\Delta H_{mix}\neq 0$, $: \Delta V_{mix}= 0$

    d. Ideal solution: $\Delta H_{mix}\neq 0$, $:\Delta V_{mix}\neq 0$:: Non ideal solution: $\Delta H_{mix}\neq 0$, $: \Delta V_{mix}\neq 0$

ii. **Complete the following analogy.**

  The elevation in boiling point for 1M urea :A :: 1M NaCl:B.

  a. Urea:1:: NaCl:2   b. Urea:2:: NaCl:2   c. Urea:2:: NaCl:1   d. Urea:1:: NaCl:1

Q4. Answer the following questions.

i. State Raoult's law. How is it formulated for solutions of non-volatile solutes?

ii. State Henry's law and mention two of its important applications.

iii. 18 g of glucose, $C_6H_{12}O_6$ (Molar mass 180 g mol^{-1}) is dissolved in 1 kg of water in a sauce pan. At what temperature will this solution boil? (K_b for water = 0.52 K kg mol^{-1}, boiling point of pure water = 373.15 K)

iv. Derive expression for Raoult's law when the solute is non-volatile.

v. What is meant by positive deviations from Raoult's law? Give an example. What is the sign of $\Delta_{mix}H$ for positive deviation?

vi. Define azeotropes. What type of azeotrope is formed by positive deviation from Raoult's law? Give an example.

vii. Define osmotic pressure of a solution. How is the osmotic pressure related to the concentration of a solute in a solution?

Q5. Read the passage given below and answer the questions that follow.

The concentration of a solute is very important in studying chemical reactions because it determines how often molecules collide in solution and thus indirectly determine the rate of reactions and the conditions at equilibrium. There are several ways to express the amount of solute present in a solution. The concentration of a solution is a measure of the amount of solute that has been dissolved in a given amount of solvent or solution. Concentration can be expressed in terms of molarity, molality, parts per million, mass percentage, volume percentage etc.

i. A solution is prepared using aqueous KI which is turned out to be 20% w/w. Densityof KI is 1.202 g/ml. The molality of the given solution and mole fraction of solute are respectively:

a. 1.95 m, 0.12   b. 1.5 m, 0.0263   c. 2.5 m, 0.0569   d. 3.0 m, 0.0352

ii. Which of the following is temperature dependent?

a. molarity   b. molality   c. mole fraction   d. mass percentage

iii. Define minimum boiling azeotropic mixture?

iv. What is the molality of pure water?

v. Calculate mole fraction of solute in one molal aqueous solution.

Physics

| Physics					**Holidays Home work**		Roll No. :	
Student Name :							Class :	
Question	1	2	3	4	Marks Obtained	Total Marks	Signature of Examiner :	
Marks Obtained						28	Date : 15-05-2024	

➤ **Multiple choice questions** [12]

1. Figure shows some equipotential lines distributed in space. A charged object is moved from point A to point B.
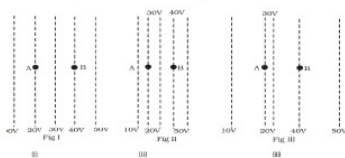
   (A) The work done in Fig. (i) is the greatest.

   (B) The work done in Fig. (ii) is least.

   (C) The work done is the same in Fig. (i) Fig. (ii) and Fig. (iii).

   (D) The work done in Fig. (iii) is greater than Fig. (ii) but equal to that in Fig. (i).

2. Two metal spheres of capacitances C_1 and C_2 carry some charges. They are put in contact and then separated. The final charges Q_1 and Q_2 on them will satisfy:

   (A) $\frac{Q_1}{Q_2} < \frac{C_1}{C_2}$

   (B) $\frac{Q_1}{Q_2} = \frac{C_1}{C_2}$

   (C) $\frac{Q_1}{Q_2} > \frac{C_1}{C_2}$

   (D) $\frac{Q_1}{Q_2} = \frac{C_2}{C_1}$

3. A foil of aluminium of negligible thickness is inserted in between the space of a parallel plate condenser. If the foil is electrically insulated, the capacity of the condenser will:
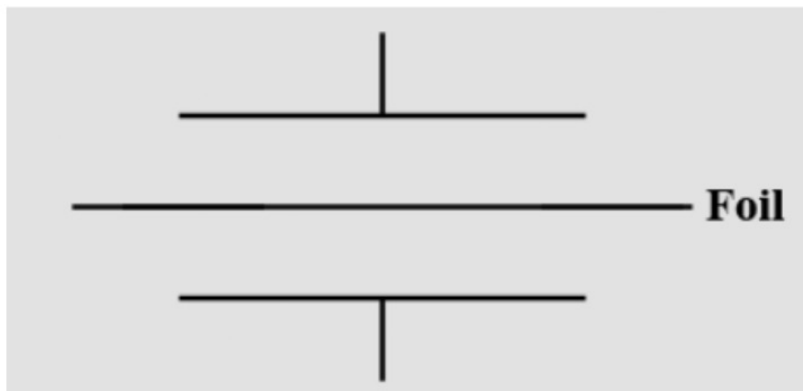
   (A) increase

   (B) decrease

   (C) remain unchanged

   (D) become zero

4. Each capacitor in the circuit shown is a 1F capacitor. What would be the equivalent capacitance between A and B?
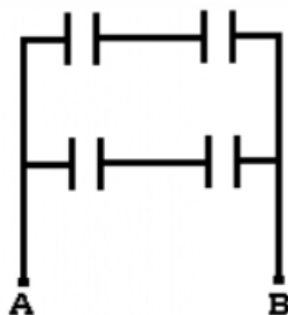
(A) 0.5F   (B) F   (C) 2F   (D) 4F

5. If flux of the electric field through a closed surface is zero:
   a. The electric field must be zero everywhere on the surface.
   b. The electric field may be zero everywhere in the surface.
   c. The charge inside the surface must be zero.
   d. The charge in the vicinity of the surface must be zero.

6. Figure shows a closed surface which intersects a conducting sphere. If a positive charged is placed at the point P, the flux of the electic field through the closed surface:
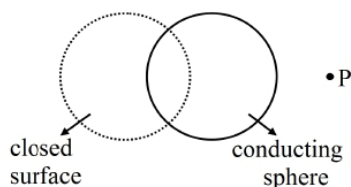
   a. Will remain zero.
   b. Will become positive.
   c. Will become neagative.
   d. Will become undefined.

7. A large nonconducting sheet M is given a uniform charge density. Two uncharged small metal rods A and B are placed near the sheet as shown in figure:
   a. M attracts A.
   b. M attracts B.
   c. A attracts B.
   d. B attracts A.
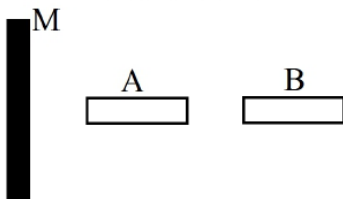

8. If the net electric flux through a closed surface is zero, then we can infer:
   (A) No net charge is enclosed by the surface.
   (B) Uniform electric field exists within the surface.
   (C) Electric potential varies from point to point inside the surface.
   (D) Charge is present inside the surface.

9. A point positive charge is brought near an isolated conducting sphere. The electric field is best given by:
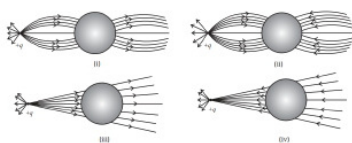
(A) Fig (i).   (B) Fig (ii).   (C) Fig (iii).   (D) Fig (iv).

10. Figure shows a charge q placed at the centre of a hemisphere. A second charge Q is placed at one of the positions A, B, C and D. In which position(s) of this second charge, the flux of the electric field through the hemisphere remains unchanged?
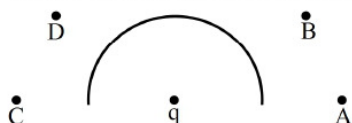
(A) A   (B) B   (C) C   (D) D

11. The electric potential decreases uniformly from 120V to 80V as one moves on the x-axis from x = -1cm to x = + 1cm. The electric field at the origin.

(A) Must be equal to 20Vcm^{-1}

(B) May be equal to 20Vcm^{-1}

(C) May be greater than 20Vcm^{-1}

(D) May be lees than 20Vcm^{-1}

12. In the figure shown here, A is a conducting sphere and B is a closed spherical surface. If a-q change is placed at C near A, then the electric flux through the closed surface is -
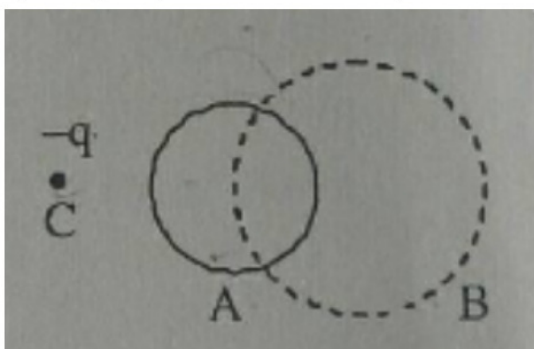
(A) Zero   (B) Positive

(C) Negative   (D) None of the above can be predicted

13. A large nonconducting sheet M is given a uniform charge density. Two uncharged small metal rods A and B are placed near the sheet as shown in figure:

(A) M attracts A.   (B) M attracts B.   (C) A attracts B.   (D) B attracts A.

14. The charges 1, 2, 3 are moving in uniform transverse magnetic field then:

[3]
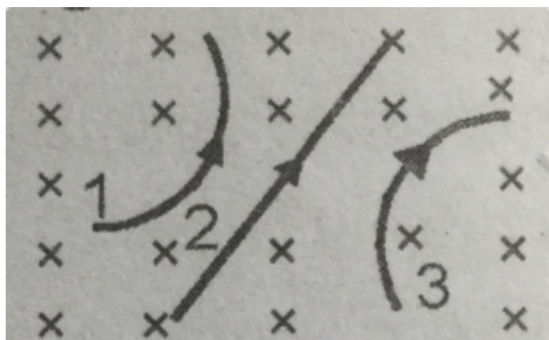
(A) Particle 1 positive and particle 3 negative.

(B) Particle 1 negative and particle 3 positive.

(C) Particle 1 negative and particle 2 neutral.

(D) Particle 1 and 3 are positive and particle 2 neutral.

15. Identify the correct statement about the charges q_1 and q_2:
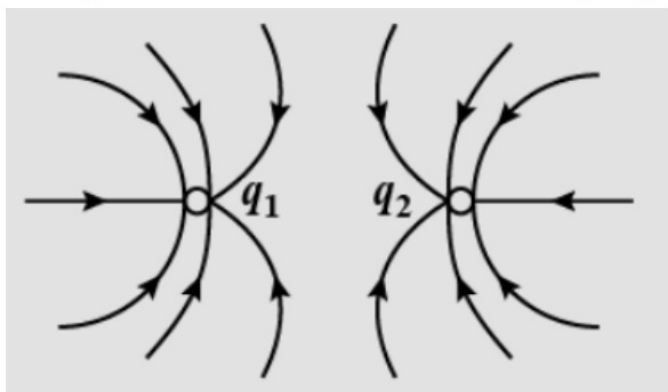
(A) q_1 and q_2, both are positive.

(B) q_1 and q_2, both are negative.

(C) q_1 is positive and q_2 is negative.

(D) q_2 is positive and q_1 is negative.

➤ **Short questions**   **[5]**

16. Three capacitors each of capacitance 9 pF are connected in series.
   a. What is the total capacitance of the combination?
   b. What is the potential difference across each capacitor if the combination is connected to a 120 V supply?

17. A small sphere of radius r_1 and charge q_1 is enclosed by a spherical shell of radius r_2 and charge q_2. Show that if q_1 is positive, charge will necessarily flow from the sphere to the shell (when the two are connected by a wire) no matter what the charge q_2 on the shell is.

18. A test charge 'q' is moved without acceleration from A to C along the path from A to B and then from B to C in electric field E as shown in the figure. (i) Calculate the potential difference between A and C. (ii) At which point (of the two) is the electric potentialmore and why?
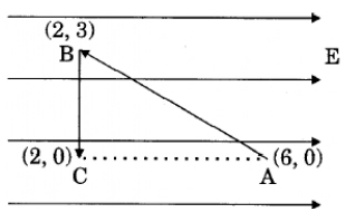
19. The given graph shows the variation of charge q versus potential difference V for two capacitors C_1 and C_2. The two capacitors have same plate separation, but the plate area of C_2 is double than that of C_1. Which of the lines in the graph correspond to C_1 and C_2 and why?
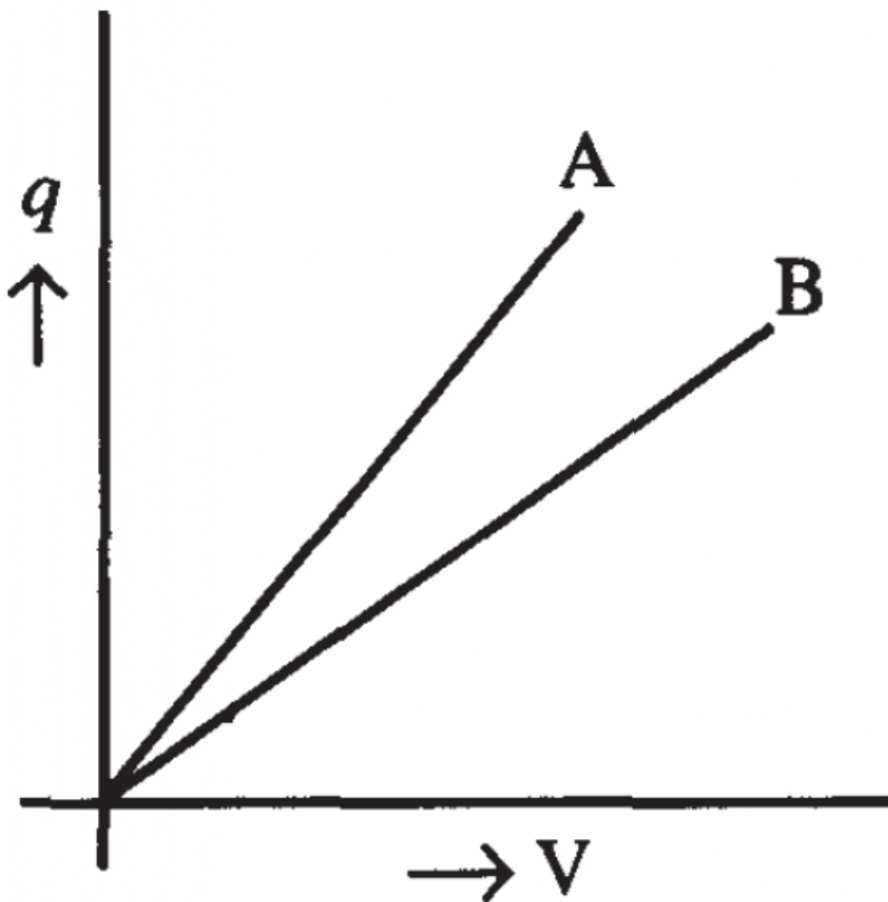

20. The space between the plates of a parallel plate capacitor is completely filled in two ways. In the first case, it is filled with a slab of dielectric constant K. In the second case, it is filled with two slabs of equal thickness and dielectric constants K_1 and K_2 respectively as shown in the figure. The capacitance of the capacitor is same in the two cases. Obtain the relationship between K, K_1 and K_2.
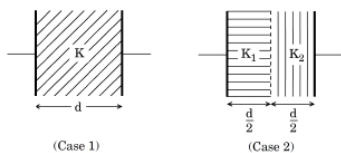
➤ **Short questions type II**   [05]

21. Figure 1.33 shows tracks of three charged particles in a uniform electrostatic field. Give the signs of the three charges. Which particle has the highest charge to mass ratio?
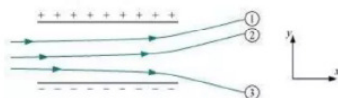
22. A point charge +10 µC is a distance 5cm directly above the centre of a square of side 10cm, as shown in Fig. 1.34. What is the magnitude of the electric flux through the square? (Hint: Think of the square as one face of a cube with edge 10cm.)
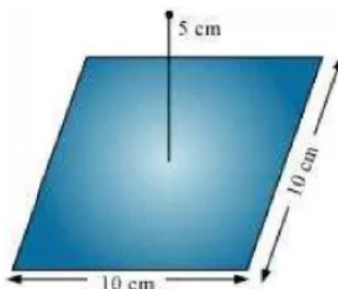
23. The electric field components in Fig. 1.24 are $E_x = \alpha x^{1/2}, E_y = E_z = 0$, in which $\alpha = 800 N/Cm^{1/2}$. Calculate (a) the flux through the cube, and (b) the charge within the
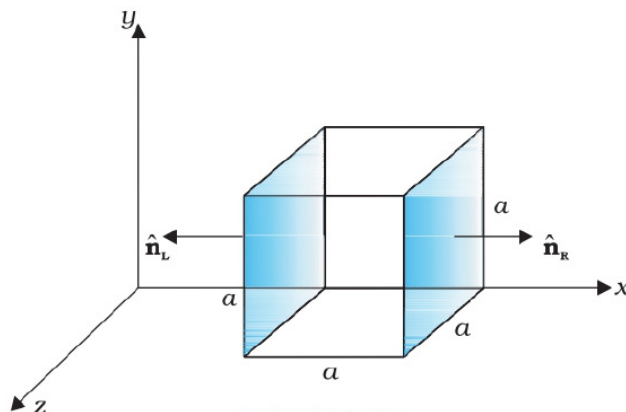
cube. Assume that $a = 0.1m$.

FIGURE 1.24

24. A capacitor of unknown capacitance is connected across a battery of V volts. The charge stored in it is 360 μC. When potential across the capacitor is reduced by 120 V, the charge stored in it becomes 120 μC.

Calculate:

   i.   The potential V and the unknown capacitance C.
    ii.   What will be the charge stored in the capacitor, if the voltage applied had increased by 120 V?

25. A nonconducting sheet of large surface area and thickness d contains uniform charge distribution of density ρ. Find the electric field at a point P inside the plate, at a distance x from the central plane. Draw a qualitative graph of E against x for 0 < x < d.

26. It is said that any charge given to a conductor comes to its surface. Should all the protons come to the surface? Should all the electrons come to the surface? Should all the free electrons come to the surface?

➤ **long questions**   [04]

27. Two charges $\pm 10\mu C$ are placed $5.0mm$ apart. Determine the electric field at (a) a point P on the axis of the dipole $15cm$ away from its centre O on the side of the positive charge, as shown in Fig. $1.18(a)$, and (b) a point Q, $15cm$ away from O on a line passing through O and normal to the axis of the dipole, as shown in Fig. 1.18(b).

(a)

(b)
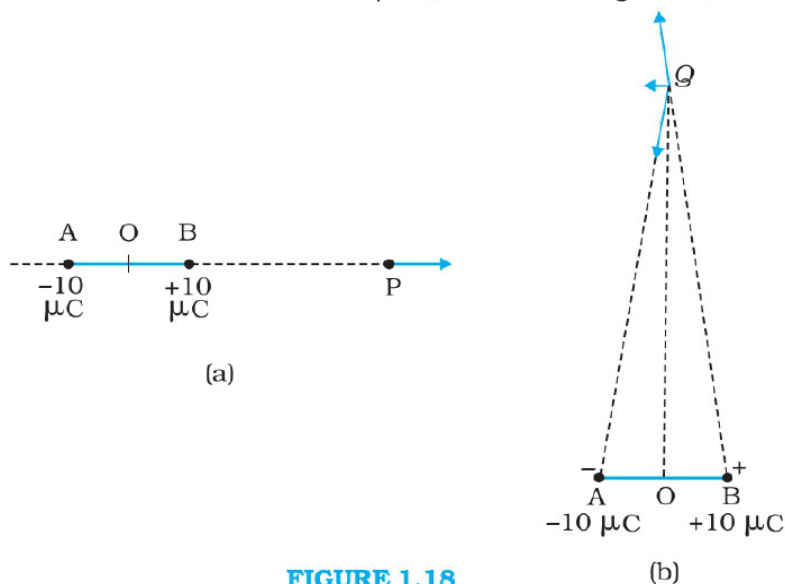
FIGURE 1.18

28. Fig. shows the electric field lines around three point charges A, B and C.

    a.   Which charges are positive?
    b.   Which charge has the largest magnitude? Why?
    c.   In which region or regions of the picture could the electric field be zero? Justify your answer.
    i.   Near A,
    ii.   Near B,
    iii.   Near C,
    iv.   Nowhere.

29. There is another useful system of units, besides the SI/mks A system, called the cgs (centimeter-gram-second) system. In this system Coloumb's law is given by

$$F = \frac{Qq}{r^2}\hat{r}$$

where the distance r is measured in cm (= 10^{-2}m), F in dynes (=10^{-5}N) and the charges in electrostatic units (es units), where

$$\text{les unit of charge} = \frac{1}{[3]} \times 10^{-9}C$$

The number [3] actually arises from the speed of light in vaccum which is now taken to be exactly given by c = 2.99792458 × 108 m/s. An approximate value of c then is c = [3] × 108 m/s.

    i.   Show that the coloumb law in cgs units yields
        1 esu of charge = 1 (dyne)1/2 cm.

Obtain the dimensions of units of charge in terms of mass M, length L and time T. Show that it is given in terms of fractional powers of M and L.

ii. Write 1 esu of charge = x C, where x is a dimensionless number. Show that this gives
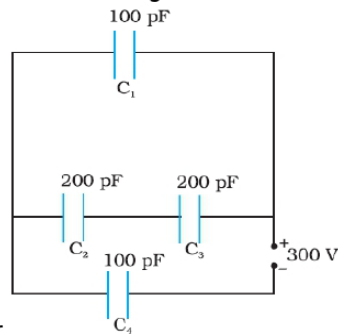
$$\frac{1}{4\pi\epsilon_0} = \frac{10^{-9}}{x^2}\frac{N.m^2}{C^2}$$

With $x = \frac{1}{[3]} \times 10^{-9}$, we have

$$\frac{1}{4\pi\epsilon_0} = [3]^2 \times 10^9 \frac{Nm^2}{C^2}$$

Or, $\frac{1}{4\pi\epsilon_0} = (2.99792458)^2 \times 10^9 \frac{Nm^2}{C^2}$ (exactly).

30. Obtain the equivalent capacitance of the network in Fig. For a 300V supply, determine the


charge and voltage across each capacitor.

31. A $5.0\mu F$ capacitor is charged to 12V. The positive plate of this capacitor is now connected to the negative terminal of a 12V battery and vice versa. Calculate the heat developed in the connecting wires.

32. Take the potential of the point B in figure to be zero:
     a. Find the potentials at the points C and D.
     b. If a capacitor is connected between C and D, what charge will appear on this capacitor?
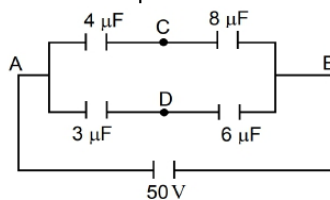
33. Find the capacitances of the capacitors shown in figure. The plate area is A and the separation between the plates is d. Different dielectric slabs in a particular part of the figure are of the same thickness and the entire gap between the plates is filled with the dielectric slabs.
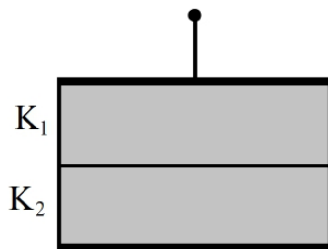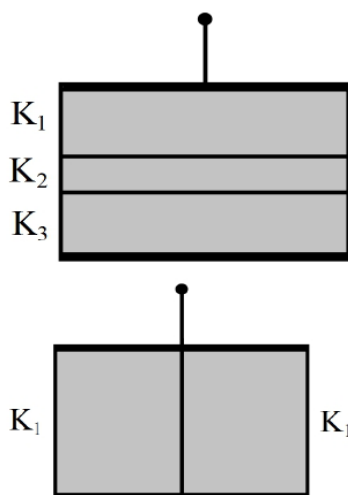
34. A parallel-plate capacitor of capacitance $5\mu F$ is connected to a battery of emf 6V. The separation between the plates is 2mm:

    a.   Find the charge on the positive plate.

    b.   Find the electric field between the plates.

    c.   A dielectric slab of thickness 1mm and dielectric constant 5 is inserted into the gap to occupy the lower half of it. Find the capacitance of the new combination.

    d.   How much charge has flown through the battery after the slab is inserted?

➤ **case study** [02]

35. Potential difference $(\triangle V)$ between two points A and B separated by a distance x, in a uniform electric field E is given by $\triangle V = -Ex$, where xis measured parallel to the field lines. If a charge q_0 moves from P to Q, the change in potential energy $(\triangle U)$ is given as $\triangle U = -q_0 \triangle V$. A proton is released from rest in uniform electric field of magnitude $4.0 \times 10^8 Vm^{-1}$ directed along the positive X-axis. The proton undergoes a displacement of 0.25m in the direction of E.

Mass of a proton $= 1.66 \times 10^{-27} kg$ and charge of proton $= 1.6 \times 10^{-19} C$.
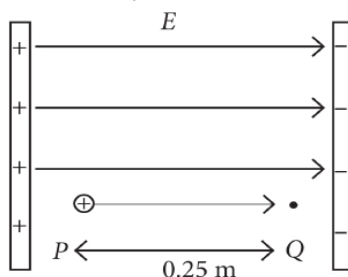
    i.   The change in electric potential of the proton between the points A and B is:

        a. $-1 \times 10^8 V$

        b. $1 \times 10^8 V$

        c. $6.4 \times 10^{-19} V$

        d. $-6.4 \times 10^{-19} V$

    ii.   The change in electric potential energy of the proton for displacement from A to B is:

        a. $1.6 \times 10^{11} J$

        b. $0.5 \times 10^{23} J$

c. -1.6×10^{-11} J

d. 3.2×10^{22} J

iii. The mutual electrostatic potential energy between two protons which are at a distance of 9×10^{-15} m, in $_{92}U^{235}$ nucleus is:

a. 1.56×10^{-14} J

b. 5.5×10^{-14} J

c. 2.56×10^{-14} J

d. 4.56×10^{-14} J

iv. If a system consistsoftwocharges 4mC and -3mC with no external field placed at (-5cm, 0, 0) and (5cm, 0, 0) respectively. The amount of work required to separate the two charges infinitely away from each other is:

a. -1.1J

b. 2J

c. 2.5J

d. 3J

v. As the proton moves from P to Q, then:

a. The potential energy of proton decreases.

b. The potential energy of proton increases.

c. The proton loses kinetic energy.

d. Total energy of the proton increases.

36. Net electric flux through a cube is the sum of fluxes through its six faces. Consider a cube as shown in figure, having sides of length L = 10.0cm. The electric field is uniform, has a magnitude E = 4.00×10^3 N C^{-1} and is parallel to the xy plane at an angle of 37º measured from the + x - axis towards the + y - axis.
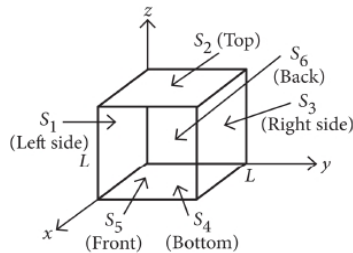
i. Electric flux passing through surface S_6 is:

a. -24N m^2 C^{-1}

b. 24N m^2 C^{-1}

c. 32N m^2 C^{-1}

d. -32N m^2 C^{-1}

ii. Electric flux passing through surface S_1 is:

a. -24N m^2 C^{-1}

b. 24N m^2 C^{-1}

c. 32N m^2 C^{-1}

d. -32N m^2 C^{-1}

iii. The surfaces that have zero flux are:

a. S_1 and S_3

b. S_5 and S_6

c. S_2 and S_4

d. S_1 and S_2

iv. The total net electric flux through all faces of the cube is:

a. 8N m^2 C^{-1}

b.   -8N m^2 C^{-1}

c.   24N m^2 C^{-1}

d.   Zero.

v.   The dimensional formula of surface integral $\oint \vec{E} \cdot \vec{dS}$ of an electric field is:

    a. $[M\ L^2\ T^{-2}\ A^{-1}]$

    b. $[M\ L^3\ T^{-3}\ A^{-1}]$

    c. $[M\ L^{-1}\ T^3\ A^{-3}]$

    d. $[M\ L^{-3}\ T^{-3}\ A^{-1}]$

----- -----