DEFENCE Affiliated to CBSE PUBLIC SCHOOL

CLASS XII – SCIENCE (SESSION 2026-2027)
HOLIDAY HOMEWORK

ENGLISH CORE

Instructions:-

Each student is supposed to choose any one out of the below mentioned topics and present them in the form of a project. The project should be a highly presentable one having 20 to 25 sheets with proper information along with pictures.

1. Child labour is a blot upon Indian society. There are number of children forced to work in order to earn livelihood and support their parents rather than going to school and enjoying their childhood. It is the responsibility of each adult member of the society to help our children come out of these clutches of child labour.(Lost Spring)
2. Linguistic chauvinism and cultural domination has been a common feature of human history and number of communities has faced it. Only those people who have resisted it have been successful in saving their identity.(Last Lesson)
3. Modern life is full of worries and stress. As a result there is a very common tendency of escapism. A tendency to avoid the present along with its realities and either live in the past with no problems or live in some utopian world where there is no struggle. This kind of defence mechanism of brain can be a tool of stress management but if too much in use, can have devastating impact upon personality. (Third Level)
4. Increasing rivalries and a blind race for victory amongst different countries of the world is increasing day by day. It can be on different platforms weather military or economic front. Instead of all this, there is an undercurrent of kindness flowing in the hearts of all human beings which makes this world worth living.(The Enemy)
5. In Deep Water Douglas recounts a childhood experience of terror. He also describes his determination of conquering that terror. His experience can serve a useful lesson for others to succeed even in the most hostile circumstances. (Deep Water)
6. How would you describe the behavior of the Maharaja's minions towards him? Do you find them truly sincere towards him or are they driven by fear when they obey him? Do we find a similarity in today's political order?(The Tiger King)
7. The actual pain or inconvenience caused by a physical impairment is often much less than the sense of alienation felt by the person with disabilities. Hence Inclusive Education is a step to bring the people with deformities into the mainstream so as to build up their confidence and morale. What do you think on the Inclusive Education.

Note: Other than the above mentioned topics any other topic from the syllabus can also be chosen.

MATHEMATICS

Exercise 1.1- Q. no. 2, 4, 5, 9
Exercise 1.2- Q. no. 2, 7, 9
Miscellaneous- Q. no. 2, 5, 6, 7
Exercise 2.1- Q. no- 5, 7, 10
Exercise 2.2- Q. no- 1, 5, 7, 14, 15
Define All Inverse Trigonometric function and their graphs.
Miscellaneous- Q. no.- 3, 6, 8, 9, 10, 11, 12
Maths Lab Manual- Any 5 activity in chapter no 1 to 6.
Solve worksheet (see attachment)

PHYSICS

1. **Project Work**: Prepare a PPT of 12 to 15 slides on any topic related to a concept showing physics.
2. **Practical File**: Complete the Practical instructed in the class in your Physics Lab Manual.
3. **Worksheet**: Solve worksheet (see attachment)

CHEMISTRY

1. Solve worksheet (see attachment)

BIOLOGY

1. Solve the given Worksheets (see attachment)
2. Complete the given lab activities.

FINE ART/PAINTING

Create one beautiful Canvas

INFORMATION PRACTICES

Solve the given worksheet. (see attachment)

PHYSICAL EDUCATION

Record Word File

1. Complete details of any one game of your choice out of the given list:

**Basketball, Football, Kabaddi, Kho-Kho, Volleyball, Handball, Hockey, Cricket.

**CWSN (Children with Special Needs Divyang): Bocce/Boccia, Sitting Volleyball, Wheelchair Basketball, Unified Badminton, Unified Basketball, Unified Football, Blind Cricket, Goalball, Floorball, Wheelchair races and throws, or any other sport/games of choice.

**Children With Special Needs may opt any one sport/game from the list as alternative for Yogic Practices. However, the sport/game must be different for skill of Game and alternate to yogic practices.

2. Labeled diagram of Field & Equipment, Rules, Terminologies & Skills)

i) SAI Khelo India Fitness Test administration for all items.

ii) Detailed procedure for Asanas, Benefits & contradiction for any Two Asanas for each given lifestyle diseases:

Obesity, Diabetes, Hypertension, Asthma and Back Pain & Arthritis. (You can take the help of your textbook)

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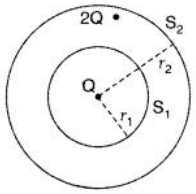
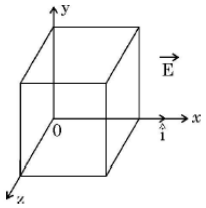
CLASS XII – PHYSICS – WORKSHEET
IMPORATANT QUESTIONS FROM CHAPTER 1, 2 and 3

CHAPTER 1

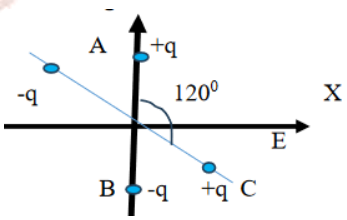
1. (i) Using Gauss Law, derive an expression for the Electric Field Intensity at any point outside a uniformly charged spherical shell of radius R and carrying charge q, with the help of suitable diagram.
   (ii) A uniformly charged spherical shell of 2.5 m radius has a surface charge density of 100μC/m^2. Calculate the Charge on the sphere and Total electric flux passing through the sphere.
2. (i) An electric dipole of dipole moment p consists of point charges + q and – q separated by a distance 2a apart. Deduce the expression for the electric field E due to the dipole at a distance x from the centre of the dipole on its axial line in terms of dipole moment p. What is electric field at midpoint of dipole?
   (ii) A sphere S_1 of radius r_1 encloses a net charge Q. If there is another concentric sphere S_2 of radius r_2 (r_2> r,) enclosing charge 2Q, find the ratio of the electric flux through S_1 and S_2. How will the electric flux through sphere S_1 change if a medium of dielectric constant K is introduced in the space in between S_1 and S_2 in place of air?



3. (i) Using Gauss's law, show that the electric field $\vec{E}$ at a point due to a uniformly charged infinite plane sheet, is given by $\vec{E} = \frac{\sigma}{2\varepsilon_0}\hat{n}$, where symbols have their ususal meanings.
   (ii) Electric field $\vec{E}$ in a region is given by $\vec{E} = (5x^2 + 2)\,\hat{\imath}$ where E is in N/C and x is in metres. A cube of side 10 cm is placed in the region as shown in figure. Calculate (1) the electric flux through the cube, and (2) the net charge enclosed by the cube.



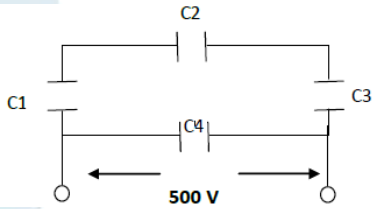
4. a) State Guass's therom. Express it mathematically.
   b) Use Gauss's law to prove that the electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it.
   c) Two parallel large thin metal sheets have equal surface densities 26.4×10^{-12} C/m^2 of opposite signs. Find the electric field between these sheets.
5. a) Derive an expression for the electric field at any point on the axial line of an electric dipole.
   b) Two small identical electrical dipoles AB and CD, each of dipole moment 'p' are kept at an angle of 120° as shown in the figure. What X' is the resultant dipole moment of this combination?



6. An electric field is uniform and acts along + x direction in the region of positive x. It is also uniform with the same magnitude but acts in – x direction in the region of negative x. The value of the field is E = 200 N/C for x > 0 and E = – 200 N/C for x < 0. A right circular cylinder of length 20 cm and radius 5 cm has its centre at the origin and its axis along the x-axis so that one flat face is at x = + 10 cm and the other is at x = – 10 cm. Find:
   (i) The net outward flux through each flat face
   (ii) The flux through the side of the cylinder
   (iii) The net outward flux through the cylinder.
   (iv) The net charge present inside the cylinder.
7. (a) Find out capacitance of a capacitor with a dielectric slab of thickness t between the capacitor plates having separation d.
   (b) What happens when the dielectric slab is replaced by a conducting slab of same thickness?
   (c) How would you connect two capacitors across a battery in series or parallel, so that they store greater (i) total charge and (ii) total energy.
8. (a) Define electric flux and write its SI unit.
   (b) Use Gauss's law to obtain the expression for the electric field due to a uniformly charged infinite plane sheet of charge.
   (c) A charge q is placed at the centre of a cube of side L. What is the electric flux passing through each face of the cube?

CHAPTER 2

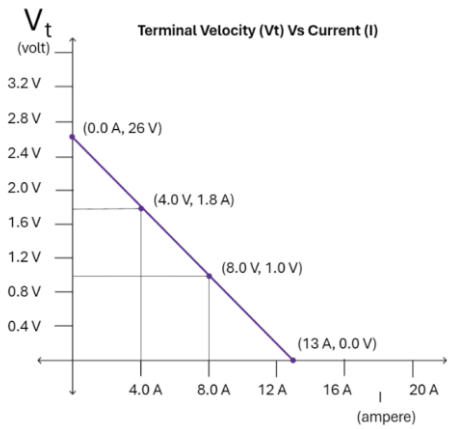
1. i) What is the principle of a capacitor?
   ii) Derive the equation for capacitance of a parallel plate capacitor with a dielectric slab.
   iii) What type of energy is stored between the two plates of a charged capacitor?
2. i) Derive the equation for potential at any point due to a short dipole.
   ii) Mention any two properties of equipotential surface.
3. (i) A dielectric slab of dielectric constant 'K' and thickness 't <d' is inserted between plates of a parallel plate capacitor of plate separation d and plate area A. Obtain an expression for its capacitance.
   (ii) Two capacitors of different capacitances are connected first (1) in series and then (2) in parallel across a dc source of 100 V. If the total energy stored in the combination in two cases are 40 mJ and 250 mJ respectively, find the capacitance of the capacitors.
4. (a) Define the term capacitance of a capacitor and state its SI unit.
   (b) What happens to the capacitance of the capacitor,
   (i) if the distance between the plates is doubled? (ii) If the voltage across the plates is doubled?
   (c) A parallel plate capacitor is made of circular plates of radius 60 cm separated by a distance of 1.0 mm. The capacitor is first charged by connecting its plates to a 12 V battery. Calculate the charge stored in the capacitor.
   (d) With the capacitor still connected to the battery, a dielectric slab of dielectric constant K= 5 and thickness 1.0 mm is inserted until all the space between the plates is filled. Calculate the charge that will be drawn from the battery when the dielectric slab is introduced.
5. (i) Obtain an expression for the capacitance of a parallel plate (air) capacitor.
   (ii) A network of four capacitors each of 12 μF capacitance is connected to 500V supply as shown in the figure.
   Determine (a) Equivalent capacitance of the network.
   (b) Charge on each capacitor.



6. (i) What in equipotential surface?
   (ii) Sketch equipotential surface for
   (a) a positive point charge (b) Two equal and opposite charges separated by a small distance.
   (iii) An infinite plane sheet of charge density 10^{-8} Cm^{-2} is held in air. In this situation how far apart are two equivalent surfaces, whose potential difference is 5V.
7. (i) Define the capacitance of a capacitor. Obtain the expression for the capacitance of a parallel plate capacitor in vacuum in terms of plate area A and separation d between the plates.
   (ii) A slab of material of dielectric constant K has the same area as the plates of a parallel plate capacitor but has a thickness $3d/4$. Find the ratio of the capacitance with dielectric inside it to its capacitance without the dielectric.
8. (i) Derive an expression for the potential energy of an electric dipole in a uniform electric field. Explain conditions for stable and unstable equilibrium.
   (ii) Is the electrostatic potential necessarily zero at a point where the electric field is zero? Give an example to support your answer.
9. a) Find the expression for electric field at a point 'r' away from the center of a hollow spherical charged shell 'R', if the total charge on it is 'Q'.
   b) Two charges +16μC and -9 μC are separated by a distance 1m. Find the position in the line joining two charges where potential is zero.

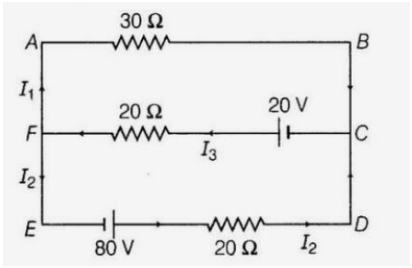
CHAPTER 3

1. (a) Explain why the resistivity of metals increase with temperature while that of semiconductors decrease with temperature.
   (b) Two cells are connected in parallel. The emf's and internal resistances of the two cells are given as $(\varepsilon_1, r_1)=(3.0\,V, 0.1\Omega)$ and $(\varepsilon_2, r_2)=(2.0\,V, 0.2\,\Omega)$. Calculate the effective internal resistance and effective emf of the battery.



(c) A graph of the potential difference across a cell is plotted as a function of the current drawn from it. Answer the following:
(i) Determine the emf of the cell. (ii) Determine the internal resistance of the cell.

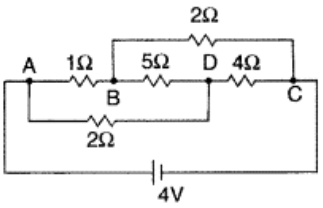
2. (i) State Kirchhoff's rules in electrostatics and explain on what basis they are justified?



(ii) Determine the values of I_1, I_2 and I_3 in the circuit given below.

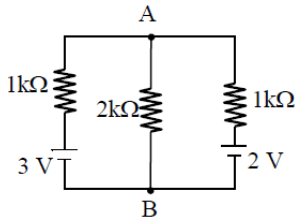
3. (i) Define internal resistance of a cell. Write any two factors on which it depends.
(ii) Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 are connected in parallel as shown in the figure.
(iii) Deduce an expression for the
(a) equivalent emf of the combination (b) equivalent internal resistance of the combination
(c) potential difference between the points A and C

4. (i) Derive an expression for drift velocity of electrons in a conductor. Hence, deduce Ohm's law.
(ii) A wire whose cross-sectional area is increasing linearly from one end to the other, is connected across of V volts. Which of the following quantity or quantities remain constant in the wire? Explain.
(a) Drift speed (b) current density (c) electric field.



5. i) Derive the relation for ξ_{eq} when two cells of EMF ξ_1 and ξ_2 are connected in parallel combination.
ii) Calculate the current drawn from the battery by the network of resistors shown in the figure.

6. (a) Two cells of emf E_1 and E_2 have their internal resistance r_1 and r_2 respectively. Deduce an expression for the equivalent emf and internal resistance of their parallel combination when connected across an external resistance R. Assume that the two cells are supporting each other.



(b) Find potential difference between points A & B in the given diagram.

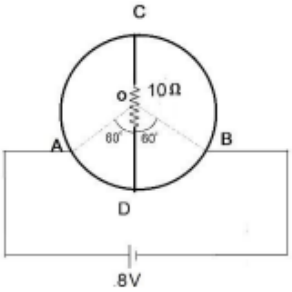
7. (a) Using Kirchhoff's laws obtain the equation of the balanced state in Wheatstone bridge.
(b) Two heating elements of resistances R_1 and R_2 when operated at a constant supply of voltage V, consumes power P_1 and P_2 respectively. Deduce the expression for the power of their combination when they are, in turn, connected in (i) series & (ii) parallel across the same voltage supply.

8. (i) Derive the relation between the current density, electric field and the conductivity of a conductor. Briefly explain with graph the variation of conductivity of a conductor with rise in temperature.
(ii) Two conducting wires X and Y of same diameter but different materials are joined in series across a battery. If the number density of electrons in X is twice that in Y. find the ratio of drift velocities of electrons in the two wires.

9. a) Define resistivity. Explain why resistivity of metals increases and that of semiconductors decreases with rise in temperature.
b) A series battery of 6 lead accumulators each of emf 2.0 V and internal resistance 0.50 Ω is charged by a 100 V d.c. supply. What series resistance should be used in the charging circuit in order to limit the current to 8.0 A? Using the required resistor, obtain the power supplied by the d.c. source.

10. a) Using Kirchhoff's laws obtain the equation of the balanced state in a Wheatstone bridge.
b) Two cells of emfs 1.5 V and 2 V and internal resistances 2 Ω and 1 Ω respectively have their negative terminals joined by a wire of 6 Ω resistance and positive terminals by a wire of 4 Ω resistance. A third resistance wire of 8 Ω connects middle points of these wires. Draw the circuit diagram. Using Kirchhoff laws, find the potential difference at the end of this third wire.

11. a) Using Kirchhoff's laws obtain the equation of the balanced state in Wheatstone bridge.
b) A wire of uniform cross-section and resistance of 12 ohm is bent in the shape of circle as shown in the figure. A resistance of 10 ohms is connected to diametrically opposite ends C and D. A battery of emf 8V is connected between A and B. Determine the current flowing through arm AD.



12. (a) Derive a relation between internal resistance emf and terminal potential

difference of a cell from current I is drawn. Draw V vs I graph for a cell and explain its significance.

(b) Two cells of different emfs and internal resistances are connected in parallel with one another. Derive the expression for the equivalent emf and equivalent internal resistance of the combination.

13. (a) Write two limitations of ohm's law. Plot their I-V characteristics.

(b) A heating element connected across a battery of 100 V having an internal resistance of 1 Ω draws an initial current of 10 A at room temperature 20.0 °C which settles after a few seconds to a steady value. What is the power consumed by battery itself after the steady temperature of 320.0 °C is attained? Temperature coefficient of resistance averaged over the temperature range involved is 3.70×10^{-4} °C^{-1}.

14. (i) Derive an expression for drift velocity of electrons in a conductor. Hence, deduce Ohm's law.

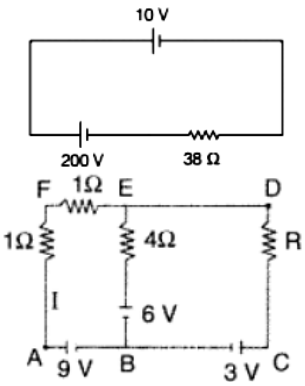
(ii) A wire whose cross-sectional area is increasing linearly from its one end to the other is connected across a battery of potential difference V volt. Which of the following quantities remain constant in the wire?

(a) Drift speed (b) Current density (c) Electric current (d) Electric field.

Justify your answer.

15. (a) Distinguish between emf (E) and terminal voltage (V) of cell having internal resistance r. Draw a plot showing the variation of terminal voltage(V)versus the current (I) drawn from the cell. Using this plot show how does one can determine the internal resistance of the cell?

(b) A 10 V cell of negligible internal resistance is connected in parallel across a battery of emf 200 V and internal resistance 38 Ω as shown in the figure. Find the value of current in the circuit.



16. a) Using Kirchhoff's rules determine the value of unknown resistance R into the circuit so that no current flows through 4Ω resistance. Also, find the potential difference between A and D.

b) Potential Difference V is applied across the ends of the copper wire of length *l* and diameter D. What is the effect on drift velocity of electrons if

i) V is doubled? ii) *l* is doubled? iii) D is doubled?

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CLASS XII – BIOLOGY
WORKSHEET- HOLIDAY HOMEWORK

Multiple Choice Questions:

1. Choose the incorrect statement from the following:
   (a) In birds and mammals internal fertilisation takes place
   (b) Colostrum contains antibodies and nutrients
   (c) Polyspermy is prevented by the chemical changes in the egg surface
   (d) In the human female implantation occurs almost seven days after fertilisation
2. Identify the wrong statement from the following:
   (a) High levels of estrogen triggers the ovulatory phase
   (b) Oogonial cells start to proliferate and give rise to functional ova in regular cycles from puberty onwards.
   (c) Sperms released from seminiferous tubules are poorly motile/non-motile
   (d) Progesterone level is high during the post-ovulatory phase of menstrual cycle.
3. Spot the odd one out from the following structures with reference to the male reproductive system:
   (a) Rete testis (b) Epididymis (c) Vasa effereritia (d) Isthmus
4. Seminal plasma, the fluid part of semen, is contributed by
   (i) Seminal vesicle (ii) Prostate (iii) Urethra (iv) Bulbourethral gland
   (a) (i) and (ii) (b) (i), (ii) and (iv) (c) (ii), (iii) and (iv) (d) (i) and (iv)
5. Spermiation is the process of the release of sperms from:
   (a) Seminiferous tubules (b) Vas deferens (c) Epididymis (d) Prostate gland
6. Mature Graafian follicle is generally present in the ovary of a healthy human female
7. Acrosomal reaction of the sperm occurs due to:
   (a) Its contact with zona pellucida of the ova (b) Reactions within the uterine environment of the female
   (c) Reactions within the epididymal environment of the male (d) Androgens produced in the uterus
8. Which one of the following is not a male accessory gland?
   (a) Seminal vesicle (b) Ampulla (c) Prostate (d) Bulbourethral gland
9. The immature male germ celts undergo division to produce sperms by the process of spermatogenesis. Choose the correct one with reference to above.
   (a) Spermatogonia have 46 chromosomes and always undergo meiotic cell division
   (b) Primary spermatocytes divide by mitotic cell division
   (c) Secondary spermatocytes have 23 chromosomes and undergo second meiotic division
   (d) Spermatozoa are transformed into spermatids
10. Which among the following has 23 chromosomes?
    (a) Spermatogonia (b) Zygote (c) Secondary oocyte (d) Ogonia
11. Which of the following hormones is not secreted by human placenta?
    (a) HCG (b) Estrogens (c) Progesterone (d) LH
12. The vas deferens receives duct from the seminal vesicle and opens into urethra as:
    (a) Epididymis (b) Ejaculatory duct (c) Efferent ductule (d) Ureter
13. Urethral meatus refers to the :
    (a) Urinogenital duct (b) Opening of vas deferens into urethra
    (c) External opening of the urinogenital duct (d) Muscles surrounding the urinogenial duct
14. Morula is a developmental stage :
    (a) Between the zygote and blastocyst (b) Between the blastocyst and gastrula

(c) After the implantation (d) Between implantation and parturition

15. The membranous cover of the ovum at ovulation is :

(a) Corona radiata (b) Zona radiata (c) Zona pellucida (d) Chorion

Short Questions:

1. Give the function of

(a) Corpus luteum (b) Endometrium

2. What is meant by L.H. Surge? Write the role of L.H.
3. Explain significance of the condition in which the testes remain suspended in scrotum outside the abdomen.
4. Describe the structure of a sperm with a diagram.
5. Enlist any two functions of a female placenta.
6. What is the number of chromosomes in the following cells? Primary oocyte, secondary oocyte, ootid and follicle.
7. What is corpus luteum. How dose it functions as endocrine gland?
8. Where are leydig cells located? What do they secrete?

Long Questions:

1. Briefly explain the primary male sex organs of man.
2. Draw well-labeled sketches of the front view and sagittal section of the male reproductive system of man.
3. Explain the events taking place at the time of fertilization of an ovum in a human female.
4. Explain the structure of sperm.
5. Explain the menstrual cycle.

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CLASS XII – INFORMATICS PRACTICES
HOLIDAY HOMEWORK

Q1. Create an empty series object using the Series() method.

Q2. Create following Series object s1 using list:

0	100
1	200
2	300
3	400
4	500
5	600
6	700
7	800
8	900
9	1000
10	1100

Q3. Create following Series object using two different lists:

Jan	31
Feb	28
Mar	31
Apr	30
May	31
Jun	30
Jul	31

Q4. Write a program to create a Series object using a range function for 10 elements in Series.

Q5. Write a Python program using the Pandas library to create a Series that contains some missing values (NaN). The Series should contain at least 5 elements, and you should explicitly include NaN in at least two positions. Print the Series after creation.

Q6. Write a Python program using the Pandas library to create a Series of 10 elements, all having the same constant value (e.g., 10). Display the Series after creating it.

Q7. Write a Python program using the Pandas library to create a Series from a dictionary, where the keys represent item names and the values represent their quantities. Also, assign a name to the Series (e.g., "Inventory"), and print it.

```
Pens           50
Pencils       100
Notebooks      30
Erasers        25
Markers        15
Scale          40
Glue           18
Sharpener      35
Files          20
Stapler        10
Name: Inventory, dtype: int64
```

Q8. Write a Python program using the Pandas library to create the following Series:

Ravi	89
Raju	75
Aarav	25
Anurag	65
Vijay	42
Yash	35
Krishna	38

After creating the Series, display the following attributes:

1. The index of the Series 2. The values in the Series 3. The size 4. Whether the Series is empty or not.

Q9. Write a Python program using the Pandas library to create a Series named marks containing marks of 10 students given below:

[78, 85, 92, 67, 88, 74, 91, 80, 69, 95]

Perform the following operations:

1. Display the first 5 values of the Series using the head() function.
2. Display the last 4 values of the Series using the tail() function.
3. Print the complete Series.

Q10. Write a Python program using the Pandas library to create a Series named sales from the following dictionary:

```
{
    "January": 2500,
    "February": 3200,
    "March": 4100,
    "April": 2800,
    "May": 5000,
    "June": 4600,
    "July": 3900
}
```

Perform the following operations using iloc[] and loc[]:

1. Display the first element using iloc[].
2. Display the third element using iloc[].
3. Display elements from index position 2 to 5 using iloc[].
4. Display the sales of "April" using loc[].
5. Display the sales from "March" to "June" using loc[].
6. Display the last two elements using iloc[].

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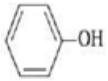
CLASS XII – CHEMISTRY
HOLIDAY HOMEWORK

Chapter-6 (Haloalkanes & Haloarenes)

VERY SHORT ANSWER TYPE QUESTIONS

1. What happens when an excess of bromine attacks on $CH_2=CH—CH_2—C\equiv CH$?
2. Aryl chlorides and bromides can be easily prepared by electrophilic substitution of arenes with chlorine and bromine respectively in the presence of Lewis acid catalysts. But why does the preparation of aryl iodides require the presence of an oxidizing agent?
3. Out of o-and p-dibromo benzene which one has a higher melting point and which of the following compounds (a) and (b) will not react with a mixture of NaBr and H_2SO_4. Explain why? (a) $CH_3CH_2CH_2OH$ (b) 
4. Which of the products will be the major product in the reaction given below? Explain.

$$CH_3CH=CH_2 + HI \longrightarrow \underset{(A)}{CH_3CH_2CH_2I} + \underset{(B)}{CH_3CHICH_3}$$

5. Draw resonance structures of haloarene and find out whether the functional group present in the molecule is ortho, para directing, or meta directing.
6. Write the structures and names of the compounds formed when compound 'A' with the molecular formula, C_7H_8 is treated with Cl_2 in the presence of $FeCl_3$.
7. Identify the products A and B formed in the following reaction:

$$CH_3—CH_2—CH=CH—CH_3 + HCl \longrightarrow A + B$$

8. Write down the structure and IUPAC name for neo-pentyl bromide.
9. Compound 'A' with molecular formula C_4H_9Br is treated with aq. KOH solution. The rate of this reaction depends upon the concentration of compound 'A' only. When another optically active isomer 'B' of this compound was treated with aq. In KOH solution, the rate of reaction was found to be dependent on the concentration of the compound and KOH both. Write down the structural formula of both compounds 'A' and 'B'.
10. Out of these two compounds, which one will be converted to the product with an inverted configuration?
11. Why can aryl halides not be prepared by reaction of phenol with HCl in the presence of $ZnCl_2$?
12. Why is it necessary to avoid even traces of moisture during the use of a Grignard reagent?
13. Aryl halides are extremely less reactive towards nucleophilic substitution. Predict and explain the order of reactivity of the following compounds towards nucleophilic substitution:
14. Cyanide ion acts as an ambient nucleophile. From which end it acts as a stronger nucleophile in the aqueous medium? Give a reason for your answer.

LONG ANSWER TYPE QUESTIONS

15. Some alkyl halides undergo substitution whereas some undergo elimination reaction on treatment with bases. Discuss the structural features of alkyl halides with the help of examples that are responsible for this difference.
16. What happens when
    (i) n-butyl chloride is treated with alcoholic KOH,
    (ii) bromobenzene is treated with Mg in the presence of dry ether,
    (iii) chlorobenzene is subjected to hydrolysis,

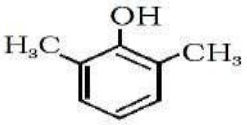
Chapter-7 (Alcohol)

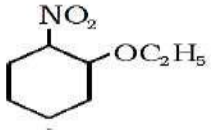
VERY SHORT ANSWER TYPE QUESTIONS

1. Out of o-nitrophenol and p-nitrophenol, which is more volatile? Explain
2. Nitration is an example of aromatic electrophilic substitution and its rate depends upon the

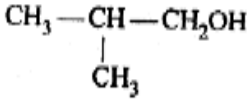
group already present in the benzene ring. Out of benzene and phenol, which one is more easily nitrated and why?

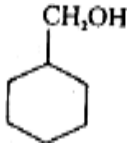
3. In Kolbe's reaction, instead of phenol, phenoxide ion is treated with carbon dioxide. Why?
4. Arrange the following sets of compounds in order of their increasing boiling points:
   (a) Pentan-1-ol, butan-1-ol, butan-2-ol, ethanol, propan-1-ol, methanol.
   (b) Pentan-1-ol, n-butane, pentanal, ethoxyethane.
5. The carbon– oxygen bond length (136 pm) in phenol is slightly less than that in methanol (142 pm). Explain.
6. Give the IUPAC names of the following compounds:-

(i) 

(ii) 

7. Give reasons for the following:
   a) Phenol is more acidic than ethanol.
   b) Boiling point of ethanol is higher in comparison to methoxymethane.
   c) $(CH_3)_3C-O-CH_3$ on reaction with HI gives $CH_3OH$and $(CH_3)_3C-I$ as the main products and not $(CH_3)_3C-OH$ and CH_3I.
8. Give one chemical test each to distinguish between the following pairs of compounds:
   (i) Phenol and Benzoic acid (ii) Propan-1-ol and Propan-2-ol (iii) Methanol and ethanol.
9. Show how are the following alcohols prepared by the reaction of a suitable Grignard reagent on methanal?

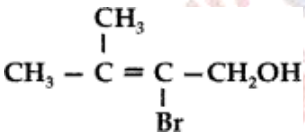
(i) 

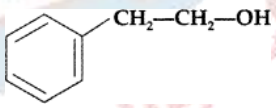
(ii) 

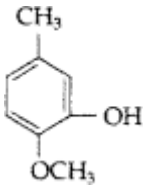
10. Give reasons for the following: -
    (a) Alcohols are more soluble in water than the hydrocarbon of comparable molecular masses.
    (b) Alcohol reacts with sodium metal whereas ether do not.
11. Account for the following: -
    (a) Phenol doesn't react with NaHCO3 whereas carboxylic acid reacts.
    (b) Phenol is more easily nitrated than benzene.

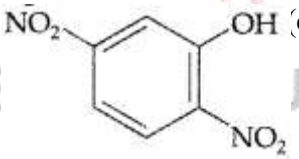
NOMENCLATURE TYPE QUESTIONS

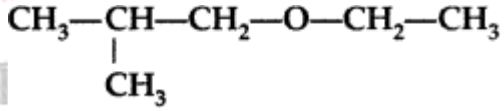
1. Write the IUPAC name of the following compounds.

(a) 

(b) 

(c) 

(d) 

(e) 

2. Write the structure of the following compound whose IUPAC name are as follows:
   (a) 2-methylpropan- 2-ol molecule. (b) Hex-l-en-3-ol (c) Butane-1,3-diol

REASONING TYPE QUESTIONS

1. Ortho nitrophenol has lower boiling point than p-nitrophenol. Why?
2. Ortho-nitrophenol is more acidic than ortho-methoxyphenol. Why?
3. Alcohols are more soluble in water than the hydrocarbons of comparable molecular masses?
4. The boiling point of ethanol is higher than that of methoxymethane?
5. The C—O—H bond angle in alcohols is slightly less than the tetrahedral angle (190°28′)?
6. (CH3)3C—O—CH3 on reaction with HI gives (CH3)3C—I and CH3—OH as the main products and not (CH3)3C—OH and CH3—I?
7. (CH3)3C—Br on reaction with sodium methoxide (Na+ _OCH3) gives alkene as the main product and not an ether.

CHEMICAL TEST TYPE QUESTIONS

1. Give one chemical test to distinguish between: Propan-1-ol and Propan-2-ol
2. Give one chemical test to distinguish Phenol and Acetic acid.
3. Give one chemical test to distinguish
   (i) β – naphthol and ethanol (ii) diethyl ether and n-butane (iii) Diethyl ether and but-1-ene

NAME REACTION TYPE QUESTIONS

1. Write the following name reaction:
   a) Kolbe's reaction b) Reimer-Tiemann reaction c) Williamson synthesis
   d) Hydroboration e) Esterification

MECHANISM TYPE QUESTIONS

1. Write the mechanism of acid catalysed hydration of alkenes.
2. Write the mechanism of acid catalysed dehydration of ethanol to yield ethene at 443K.
3. Write the mechanism of dehydration of Alcohol to form Ether at 413 K.

CONVERSION TYPE QUESTIONS

1. How are the following conversions carried out? (i) Propane to Propan-2-ol (ii) Phenol to acetophenone (iii) Propene to propan-1-ol
2. How will you bring about the following conversions? (i) Ethyl chloride to Ethanal (ii) Phenol to salicylic acid (ii) Benzyl chloride to Benzyl alcohol
3. Write the chemical reactions for the following conversions. (i) Phenol to anisole (ii) Ethyl magnesium chloride to Propan-1-ol (iii) Cumene to phenol (iv) Phenol to picric acid

COMPLETE THE REACTIONS TYPE QUESTIONS

1. Predict the products of the following reactions :
   a) $CH_3 - CH_2 - CH_2 - CH_2 - OH + SOCl_2 \rightarrow$
   b) $CH_3 - CH_2 - CH_2 - O - CH_3 + HBr \rightarrow$
   c) $C_6H_5 - CH_2 - O - C_6H_5 + HI \xrightarrow{\text{heat}}$

ARRANGE IN CORRECT ORDER TYPE QUESTIONS

1. Arrange each set of compounds in the decreasing order of property indicated
   a) Methanol, ethanol, diethyl ether, ethylene glycol. (Boiling point)
   b) Phenol, O- nitrophenol, p- methoxyphenol, p- nitrophenol. (K_a value)
   c) Dimethyl ether, ethanol, phenol. (Solubility in water)
   d) Ethanol, isopropanol, tertiary butyl alcohol (reactivity towards Lucas reagent)
   e) Phenol, o- nitrophenol, p-nitrophenol, m-nitrophenol (boiling point order)

WORD PROBLEM TYPE QUESTIONS

1. An organic compound A with molecular formula $C_8H_{16}O_2$ was hydrolysed with sulphuric acid to give a carboxylic acid B and alcohol C. Oxidation of C with chromic acid produced B. C on dehydration gives but-1-ene. Write reactions involved.
2. When an aromatic organic compound with molecular formula C_6H_6O is treated with bromine water, white precipitate of compound Y is obtained. Give the structure and the name of X and Y and write the chemical reaction involved.
3. An organic compound A (C_6H_6O) gives a characteristic colour with aq.$FeCl_3$ solution.
   (A) On reacting with CO_2 and NaOH at 400 K under pressure gives (B) which on acidification gives a compound (C). The compound (C) reacts with acetyl chloride to give (D) which is a popular pain killer. Deduce the structure of A, B, C& D.
4. An organic compound (X) when dissolved in ether and treated with magnesium metal forms a compound Y. The compound, Y, on treatment with acetaldehyde and the product on acid hydrolysis gives isopropyl alcohol. Identify the compound X. What is the general name of the compounds of the type Y.

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CLASS XII – MATHEMATICS
HOLIDAY HOMEWORK

Chapter: Relations and Functions

Section A: Multiple Choice & Assertion-Reasoning (1 Mark Each)

Q.1 For real x, let $f(x) = x^3 + 5x + 1$. Then : (CBSE 2025 - 65/4/1)

A. f is one-one but not onto on R
B. f is one-one and onto on R
C. f is neither one-one nor onto on R
D. f is onto on R but not one-one

Q.2 If f: N → W is defined as

$$f(n) = \begin{cases} \frac{n}{2}, & \text{if } n \text{ is even} \\ 0, & \text{if } n \text{ is odd} \end{cases}$$

then f is: (CBSE 2025-65/4/1)

A. a bijection B. neither surjective nor injective C. surjective only D. injective only

Q.3 Analyze the statement below and select the correct option. (CBSE 2025-65/6/1)

Assertion (A): Let $f(x) = e^x$ and $g(x) = \log x$. Then $(f + g)(x) = e^x + \log x$, where the domain of $(f + g)$ is R.

Reason (R): The domain of the sum of two functions is given by $Dom(f + g) = Dom(f) \cap Dom(g)$.

A. Both (A) and (R) are true and (R) is the correct explanation of (A).
B. Both (A) and (R) are true, but (R) is NOT the correct explanation of (A).
C. Assertion (A) is false, but Reason (R) is true.
D. Assertion (A) is true, but Reason (R) is false.

Q.4 The domain of the function $f(x) = \cos^{-1} x + \sin x$ is: (CBSE 2025-65/7/1)

A. Φ (Empty Set) B. (-1, 1) C. R D. [-1, 1]

Q.5 Analyze the statements regarding mapping domains and select the correct option. (CBSE 2025-65/5/1)

Assertion (A): Let $A = \{x \in R : -1 \le x \le 1\}$. If f: A → A be defined as $f(x) = x^2$, then f is not an onto function.

Reason (R): If $y = -1 \in A$, then $x = \pm\sqrt{(-1)} \notin A$.

A. Assertion (A) is false, but Reason (R) is true.
B. Both (A) and (R) are true and (R) is the correct explanation of (A).
C. Both (A) and (R) are true, but (R) is NOT the correct explanation of (A).
D. Assertion (A) is true, but Reason (R) is false.

Q.6 Analyze the property of functions over integers and select the correct option. (CBSE 2025- 65/1/1)

Assertion (A): Let Z be the set of integers. A function f: Z → Z defined as $f(x) = 3x - 5$ is a bijective function.

Reason (R): A function is bijective if and only if it is both surjective and injective.

A. Both (A) and (R) are true, but (R) is NOT the correct explanation of (A).
B. Both (A) and (R) are true and (R) is the correct explanation of (A).
C. Assertion (A) is true, but Reason (R) is false.
D. Assertion (A) is false, but Reason (R) is true.

Section B: Short Answer Questions (2 Marks Each)

Q.7 Find the mathematical domain of the function defined by $f(x) = \sin^{-1}\sqrt{(x - 1)}$. (CBSE 2025-65/4/1)

Q.8 Determine the domain of the algebraic-trigonometric function $f(x) = \sin^{-1}(-x^2)$. (CBSE 2025-65/6/1)

Q.9 Let f: A → B be defined by $f(x) = (x - 2)/(x - 3)$, where the sets are defined as $A = R - \{3\}$ and $B = R - \{1\}$. Comprehensively discuss the bijectivity of this function. (CBSE 2025-65/7/1)

Q.10 Find the valid domain of the function $f(x) = \cos^{-1}(x^2 - 4)$. (CBSE 2025-65/5/1)

Section C: Analytical & Proof-Based Questions (3 Marks Each)

Q.11 If f: $R^+ \to R$ is a logarithmic function defined as $f(x) = \log_a x$ ($a > 0$ and $a \neq 1$), prove that f is a bijection. (R^+ denotes the set of all positive real numbers). (CBSE 2025-65/4/1)

Q.12 Let $A = \{1, 2, 3\}$ and $B = \{4, 5, 6\}$. A relation R from set A to set B is explicitly defined as $R = \{(x, y) : x + y = 6, x \in A, y \in B\}$. (CBSE 2025-65/4/1)

(i) Write all the constituent ordered pairs / elements of relation R.

(ii) Evaluate whether R qualifies as a function. Provide a rigorous justification.

(iii) Determine the precise domain and range of R.

Q.13 A student intends to pair up natural numbers in such a manner that they strictly satisfy the linear equation $2x + y = 41$, where $x, y \in N$. Based on this system: (CBSE 2025-65/6/1)

- Find the complete domain and range of the relation.
- Verify if the relation formed is reflexive, symmetric, and transitive.
- Conclude and state conclusively whether it constitutes an equivalence relation.

Q.14 Show that the piecewise function f: N → N, where N is the set of natural numbers, given by

$$f(n) = \begin{cases} n - 1, & \text{if } n \text{ is even} \\ n + 1, & \text{if } n \text{ is odd} \end{cases}$$

is a bijection: (CBSE 2025-65/6/1)

Q.15 Let R be a relation defined over N, where N is set of natural numbers, defined as " mRn if and only if m is a multiple of n, m, n ∈ N." Find whether R is reflexive, symmetric and transitive or not. (CBSE 2025-65/2/1)

Q.16 Show that the cubic function f: R → R defined by $f(x) = 4x^3 - 5$, ∀ x ∈ R is strictly both one-one (injective) and onto (surjective). (CBSE 2025-65/7/1)

Q.17 Let R be a relation defined on a set N of natural numbers such that R = {(x, y) : xy is a perfect square of a natural number, x, y ∈ N}. Determine with full mathematical proof if the relation R is an equivalence relation. (CBSE 2025-65/7/1)

Section D: Integrated Case Studies (4 Marks Each)

Q.18 **Case Study 1**: Conceptual Audit of Relations (CBSE 2025-65/1/1)

A class-room teacher is keen to assess the learning of her students the concept of "relations" taught to them. She writes the following five relations each defined on the set A = {1, 2, 3}:

- $R_1 = \{(2, 3), (3, 2)\}$
- $R_2 = \{(1, 2), (1, 3), (3, 2)\}$
- $R_3 = \{(1, 2), (2, 1), (1, 1)\}$
- $R_4 = \{(1, 1), (1, 2), (3, 3), (2, 2)\}$
- $R_5 = \{(1, 1), (1, 2), (3, 3), (2, 2), (2, 1), (2, 3), (3, 2)\}$

The students are required to parse these frameworks and answer the following directives:

(i) Identify the relation which is reflexive and transitive but strictly not symmetric.

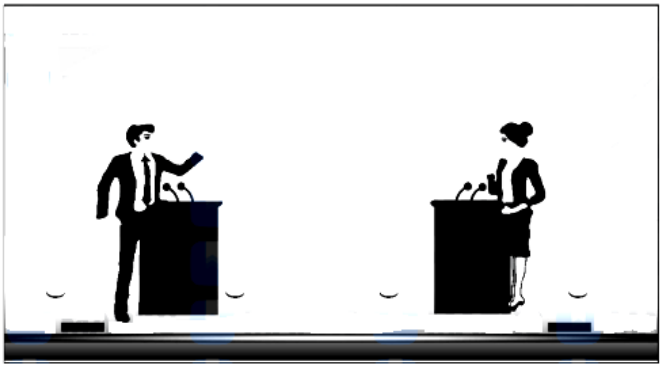
(ii) Identify the relation which is reflexive and symmetric but fails to be transitive.

(iii) (a) Identify the relations which are symmetric but neither reflexive nor transitive.

(iii) (b) What pairs should be added to the relation R_2 to make it an equivalence relation?

Q.19 **Case Study 2**: Combinatorics & Functions in School Competitions (CBSE 2025-65/2/1)

A school is organizing an inter-house debate competition. The setup includes a set of speakers $S = \{S_1, S_2, S_3, S_4\}$ and a panel of judges $J = \{J_1, J_2, J_3\}$. Each speaker can be assigned to exactly one judge. Let R be a relation from set S to set J defined as $R=\{(x, y)$: speaker x is judged by judge y, where $x \in S, y \in J\}$



Based on this logistical model, solve the following problems:

(i) How many relations can be there from S to J ?

(ii) A student identifies a function from S to J as f = {(S1, J1), (S2, J2), (S3, J2), (S4, J3)} Check if it is bijective.

(iii) (a) How many one-one functions can be there from set S to set J ?

(iii) (b) Another student considers a relation R1 = {(S1, S2), (S2, S4)} in set S.

Write minimum ordered pairs to be included in R1 so that R1R1 is reflexive but not symmetric.

Q.20 **Case Study 3**: School Administration & Database Modeling (CBSE 2025-65/5/1)

Let A be the set of 30 students of class XII in a school. Let $f : A \rightarrow N$, N is a set of natural numbers such that function f(x)=f(x)= Roll Number of student x.

On the basis of the given information, answer the following :

(i) Is f a bijective function ?

(ii) Give reasons to support your answer to (i).

(iii) (a) Let R be a relation defined by the teacher to plan the seating arrangement of students in pairs, where $R = \{(x, y) : x, y$ are Roll Numbers of students such that $y = 3x\}$. List the elements of RR. Is the relation R reflexive, symmetric and transitive? Justify your answer.

(iii) (b) Let RR be a relation defined by $R = \{(x, y) : x, y$ are Roll Numbers of students such that $y = x^3\}$. List the elements of R. Is R a function? Justify your answer.