

**Class : XII (A+B)**  
**(SUMMER HOLIDAYS' HOMEWORK)**  
**(Session:2026-27)**

**ENGLISH**

1. Newspaper Article Designing :- Write articles as per CBSE FORMAT on contemporary issue such as:

- \* Social Media Impact
- \* Climate Change
- \* Mental Health
- \* Artificial Intelligence in Education

Instructions:-

- \*Design it like a real newspaper column with:
  - \* Headlines. \* Images/sketches
  - \* Quotes. \* Facts/statistics. \* Do on A4 sheets.
  - \* Follow proper article format.
  - \* Use attractive newspaper-style layout.
  - \* Word limit: 150–200 words.

Rubrics:- \* Format & Content – 4 Marks , \* Creativity – 3 Marks  
\* Language Accuracy – 2 Marks, \* Presentation – 1 Mark

2. Poetic Devices Creative Album :- Create a creative album on poetic devices used in the poems from the Class XII syllabus.

Instructions :-

- \* At least 15 poetic devices
  - \* Definition of each device
  - \* Example from syllabus poems
  - \* Creative visual representation/doodles/sketches for each
- \* Examples: Imagery, Metaphor, Alliteration, Symbolism ,  
Personification, Enjambment, Simile, Personification, Anaphora,  
Antithesis, Oxymoron, Transferred Epithet
  - \* Use A3 sized sheets.
  - \* Make each page colourful and informative.
  - \* Mention poem and poet name clearly.

Rubrics: \* Understanding of Poetic Devices – 5 Marks  
\* Creativity & Visual Presentation – 5 Marks  
\* Content Accuracy – 5 Marks  
\* Organisation & Neatness – 5 Marks

3. Revised syllabus covered till date :-

- \* The Last Lesson, The Third Level, Lost Spring, Tiger King,  
Journey To The End Of The World , Poem 1, 2 and 3, Articles, Letters  
To Editor, Notices , Reading Passages.

# BIOLOGY

## Note: Ch-4

Section A- Question no one to four is of 01 mark  
each Section B- Questions no five and six are of  
02 marks each Section C- Question number  
seven is of 03 marks  
Section D- The eighth question is a case study worth four  
marks. Section E- Question number nine is of 5 marks.

| SN                | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Marks |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| <b>Section A</b>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |
| 1                 | In human XX and XY determines the sex of the child. The sex of the son is determined by-<br>a. Sex chromosome of the father<br>b. Sex chromosome of the mother<br>c. Type of ovum of the mother<br>d. Phenotype of parents                                                                                                                                                                                                                                                           | 1     |
| 2                 | Failure of segregation of chromatids during the cell division cycle results in the gain or loss of a chromosome(s) is called-<br>a. XX and XY chromosomes<br>b. Female heterogamety<br>c. Aneuploidy<br>d. (d) None of the above                                                                                                                                                                                                                                                     | 1     |
| 3                 | Assertion- The offspring/ progeny produced has characters of both parents.<br>Reason: Inheritance is the process by which hereditary characters pass from parent to progeny. a- Both assertion and reason are correct and the reason is the correct explanation of assertion.<br>b- Both assertion and reason are correct and the reason is not a correct explanation of assertion.<br>c- Assertion is true but the reason is false<br>d- Assertion is false but the reason is true. | 1     |
| 4                 | Assertion- An allele is an alternative form of a gene.<br>Reason: hat occupy a specific location on a particular chromosome and control the same trait. a- Both assertion and reason are correct and the reason is the correct explanation of assertion.<br>b- Both assertion and reason are correct and the reason is not a correct explanation of assertion.<br>c- Assertion is true but the reason is false<br>d- Assertion is false but the reason is true.                      | 1     |
| <b>Section- B</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |
| 5                 | The male Fruit fly and female Fowl are heterogametic while the female Fruitfly and the male Fowl are homogametic. Why are they called so?                                                                                                                                                                                                                                                                                                                                            | 2     |
| 6                 | Compare linkage and linked genes. How Linkage and crossing-over is affected by the distance between genes?                                                                                                                                                                                                                                                                                                                                                                           | 2     |

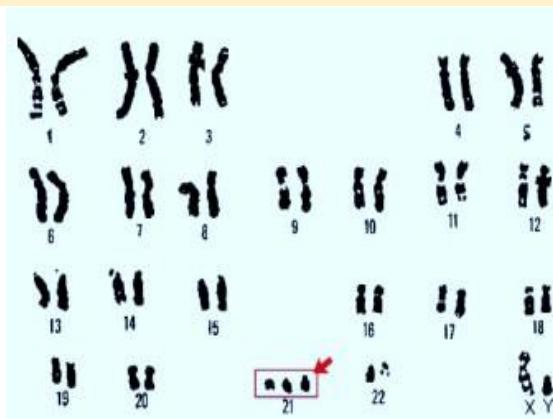
### Section C

- 7 Blood shows dominance, codominance, and multiple alleles. Explain.

3

### Section- D

- 8 A karyotype is an individual's complete set of chromosomes. Joe Hin Tjio and Albert Levan discovered that the number of chromosomes (karyotype) in humans was 46 chromosomes, that is, 23 pairs and not 48 as was thought previously. By using karyotypes, we can diagnose various types of chromosomal and genetic disorders. In the given diagram a karyotype is presented.



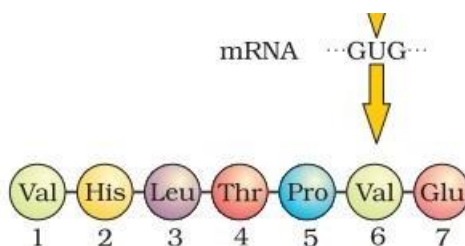
4

- Which type of chromosomal disorder is possible with such a karyotype?
- What does numerical values written in the karyogram depicts?
- Write any two symptoms of such a disorder.

### Section- E

- 9 a- Categorize following either autosomal or sex-linked disease- Hemophilia, Sickle cell anemia, Phenylketonuria  
b- Identify the disorder by the following symptom- Individuals with overall masculine development with i.e., Gynecomastia  
c- In the given diagram a polypeptide is given. What conclusion will you arrive after careful observation-

5



Note: **Chapter V- Molecular Basis of Inheritance**

Section A- Question no one to four is of 01 mark each

Section B- Questions no five and six are of 02 marks each

Section C- Question number seven is of 03 marks

Section D- The eighth question is a case study worth four marks. Section E- Question number nine is of 5 marks.

| SN | Question | Marks |
|----|----------|-------|
|----|----------|-------|

### Section A

- 1 DNA is a double-stranded, helical molecule. Watson and Crick's model is based on the X-ray crystallography provided by-
- Wilkins and Franklin
  - Messelson and Stahl
  - McLeod and McCarty
  - Singer and Nicholson

1

- 2 Identify the correct answer related to the statement, : Fredrick Griffith injected a smooth strain of Streptococcus in the mouse- 1
- a- Mouse remains live
  - b- Mouse died
  - c- He does not use the S- Strain of the bacteria
  - d- He used Pneumococcus instead of Streptococcus.
- 3 Assertion- Histone proteins are organized to form a unit of eight molecules called the histone octamer. 1
- Reason: Histone is an acidic molecule that helps in the formation of Nucleosomes.
- a- Both assertion and reason are correct and the reason is the correct explanation of assertion.
  - b- Both assertion and reason are correct and the reason is not a correct explanation of assertion.
  - c- Assertion is true but the reason is false
  - d- Assertion is false but the reason is true.
- 4 Assertion- DNA is a polynucleotide molecule like mRNA, t RNA and r RNA. 1
- Reason: Both DNA and RNA contain the same type of ribose sugar.
- a- Both assertion and reason are correct and the reason is the correct explanation of assertion.
  - b- Both assertion and reason are correct and the reason is not a correct explanation of assertion.
  - c- Assertion is true but the reason is false
  - d- Assertion is false but the reason is true.

#### Section- B

- 5 Why do Alfred Hershey and Martha Chase use radioactive phosphorus and Sulphur in their experiment to prove DNA is a genetic material? 2
- 6 Write the coding sequence of the following m RNA strand- 2

**5' AAUGUUAGAGAGUAGGGAAU3'**

#### Section C

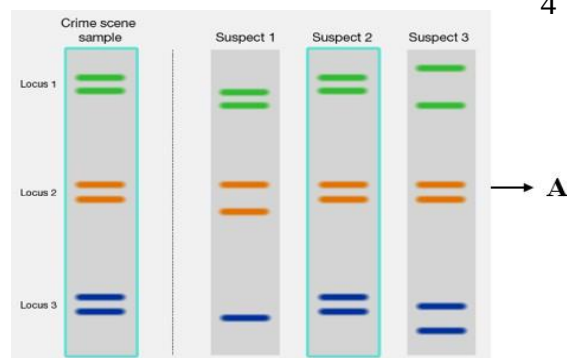
- 7 a- What is the charging of t RNA? Mention its importance. 3
- b- What are the inducers in Lac operon?
- c- AUG codon performs a dual function. Justify the statement.

#### Section- D

- 8 DNA fingerprinting is used in a variety of situations, such as criminal investigations, other forensic purposes and paternity testing. In these situations, one aims to “match” two DNA fingerprints with one another, such as a DNA sample from a known person and one from an unknown person.

(Source: *National Human Genome Research Institute*)

- a- What does ‘A’ represent?
- b- What is the basis of DNA fingerprinting?
- c- What is the use of autoradiography in DNA fingerprinting?
- d- Of the total base sequence present in humans-
  - i- 99.9% of all human beings are identical.
  - ii- 0.01 % of all human beings are identical
  - iii- 100 % different
  - iv- No difference is observed till now



4

### Section- E

- 9
- a- Give a brief description of the role of DNA-dependent DNA polymerase.
  - b- Why Okazaki fragments are formed in short fragments?
  - c- Write two roles of dNTPs.

5

OR

Explain the characteristic features of genetic code.

## PHYSICS

### WORKSHEET -1

Q1. Two point charges  $q_1$  and  $q_2$  are placed close to each other. What is the nature of the force between them when: (i)  $q_1q_2 < 0$  and (ii)  $q_1q_2 > 0$ ?

Q2. Name the quantity with unit J/C. Is it a scalar or vector quantity?

Q3. An electric dipole of dipole moment  $2 \times 10^{-6} \text{ C m}$  is enclosed by a closed surface. What is the flux passing out of the surface?

Q4. What is the angle between the directions of electric field at any (i) axial point and (ii) equatorial point due to an electric dipole?

Q5. Two point charges placed at a distance  $r$  in air exert a force  $F$  on each other. At what distance will these charges experience the same force  $F$  in a medium of dielectric constant  $K$ ?

Q6. Consider a dipole of length  $2a$ . What is the magnitude and direction of electric field at the midpoint of the length of the dipole .

Q7. Two charges  $+10\mu\text{C}$  and  $-20\mu\text{C}$  are placed 15 cm apart. At what point on the line joining the two charges is the electric potential zero?

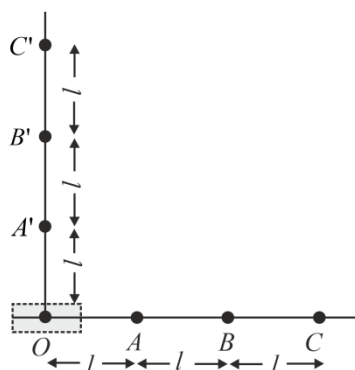
Q8. The following data was obtained for the dependence of the magnitude of electric field, with distance, from a reference point O, within the charge distribution in the shaded region.

(i) Identify the charge distribution and justify your answer.

(ii) If the potential due to this charge distribution has a value  $V$  at the point A, what is its value at the point B and C.

Q9. Derive expression for electric field at a point on the equatorial line of dipole.

Q10. Using Gauss Theorem, show mathematically that for a point outside a shell, the field due to a uniformly charged thin shell is the same as if the entire charge of the shell is concentrated at the centre. Why do you expect electric field inside the shell to be zero according to this theorem?



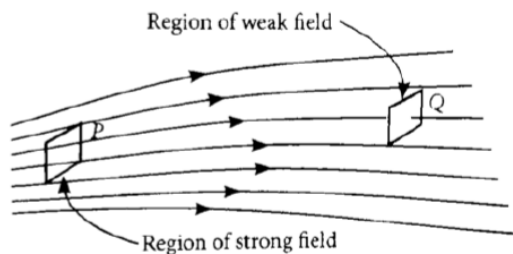
| Field Point                 | A | B   | C    | A'  | B'   | C'   |
|-----------------------------|---|-----|------|-----|------|------|
| Magnitude of electric field | E | E/8 | E/27 | E/2 | E/16 | E/24 |

Q11.

### CASE STUDY BASED

An electric dipole of dipole moment  $p$  is placed in a uniform electric field. Write the expression for the torque experienced by the dipole. Identify two pairs of perpendicular vectors in the expression. Show diagrammatically the orientation of the dipole in the field for which the torque is (i) Maximum (ii) Half the maximum value (iii) Zero

Electric field strength is proportional to the density of lines of force i.e., electric field strength at a point is proportional to the number of lines of force cutting a unit area element placed normal to the field at that point. As illustrated in given figure, the electric field at P is stronger than at Q.



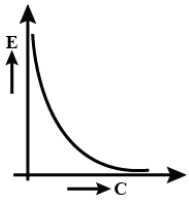
(i) Electric lines of force about a positive point charge are

(a) radially outwards

- (b) circular clockwise
- (c) radially inwards
- (d) parallel straight lines
- (ii) Which of the following is false for electric lines of force?
  - (a) They always start from positive charge and terminate on negative charges.
  - (b) They are always perpendicular to the surface of a charged conductor.
  - (c) They always form closed loops.
  - (d) They are parallel and equally spaced in a region of uniform electric field.
- (iii) Why electric lines are always continuous?
- (iv) Mention a difference between electric and magnetic lines, diagrammatically.

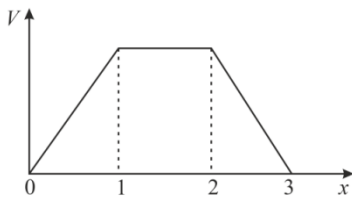
### WORKSHEET-2

Q1. The graph shown here, shows the variation of the total energy  $I$  stored in a capacitor against the value of the capacitance  $C$  itself. Which of the two – the charge on the capacitor or the potential used to charge it is kept constant for this graph?

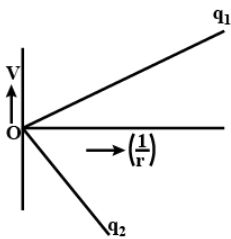


Q2. In which orientation a dipole placed in uniform electric field is in (i) stable (ii) unstable equilibrium?

Q3. The electric potential as a function of distance  $x$  is shown in Fig. Construct a graph of the electric field strength  $E$ .



Q4. The two graphs drawn below, show the variation of electrostatic potential ( $V$ ) with  $r$  being distance of point from the point charge for two point charges  $Q_1$  and  $Q_2$ . (iii) What are the signs of the two charges? (ii) Which of the two charges has a larger magnitude?



Q5. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. What is the potential at the centre of sphere.

Q6. Define electric potential. Derive an expression for the electric potential at a distance  $r$  from a point charge  $q$ .

Q7. Why two equipotential do not cross each. Draw equipotential surface for electric field which is decreasing along X-axis.

Q8. A uniformly charged conducting sphere of 2.4m diameter has a surface charge density  $8.0 \times 10^{-7} \text{ C/m}^2$ . Find the charge on the sphere. What is the total flux leaving the surface?

Q9 A parallel plate capacitor is charged to a potential difference 'V' by a dc source. The capacitor is then disconnected from the source and a dielectric slab of dielectric constant 'K' is inserted between the plates. How does the (i) the capacitance, (ii) electric field between the plates and (iii) the energy stored in the capacitor be affected? Justify your answer in each case.

Q10. A conducting slab of thickness 't' is introduced between the plates of a parallel plate capacitor, separated by a distance 'd'. Find an expression of its capacitance.

### **CASE STUDY BASED**

Smallest charge that can exist in nature is the charge of an electron. During friction it is only the transfer of electron which makes the body charged. Hence net charge on any body is an integral multiple of charge of an electron ( $1.6 \times 10^{-19}$  C) i.e.,  $q = \pm ne$

where  $n = 1, 2, 3, 4, \dots$

Hence no body can have a charge represented as  $1.8e, 2.7e, 2e/5$ , etc.

Recently, it has been discovered that elementary particles such as protons or neutrons are elemental units called quarks.

- (i) Which of the following properties is not satisfied by an electric charge?
  - (a) Total charge conservation.
  - (b) Quantization of charge.
  - (c) Two types of charge.
  - (d) Circular line of force.
- (ii) Which one of the following charges is possible?
  - (a)  $5.8 \times 10^{-18}$  C
  - (b)  $3.2 \times 10^{-18}$  C
  - (c)  $4.5 \times 10^{-19}$  C
  - (d)  $8.6 \times 10^{-19}$  C
- (iii) If a charge on a body is  $1\text{nC}$ , then how many electrons are present on the body?
- (iv) Does electrification lead to mass variation? Comment.

#Read the taught chapters from the NCERT book and underline the sentences you are not able to understand.

#Take out electrical components like diode, capacitor etc from an old or unusable toys, mobile charger etc, collect them in a scrap book and write brief details about each.

#Visit any Science museum and make a detailed account of a project that fascinated you the most in a separate small sized note book.

## **CHEMISTRY**

1. What is the van't Hoff factor for a compound which undergoes tetramerisation in an organic solvent?
2. State the main advantage of molality over molarity as the unit of concentration.
3. Calculate the freezing point of a solution containing 60 g of glucose (Molar mass =  $180 \text{ g mol}^{-1}$ ) in 250 g of water. [270.67 K]
4. Why a mixture of carbon disulphide and acetone shows positive deviation from Raoult's law? What type of azeotrope is formed in this mixture?
5. What is meant by positive deviations from Raoult's law? Give an example. What is the sign of  $\Delta_{\text{mix}} H$  for positive deviation?
6. (a) Why are aquatic species more comfortable in cold water than in warm water?  
(b) What happens when we place the blood cell in saline water solution (hypertonic solution)?

7. Calculate the mass of compound (molar mass =  $256 \text{ g mol}^{-1}$ ) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K ( $K_f = 5.12 \text{ K kg mol}^{-1}$ ) [1.8g]
8. A 1.00 molal aqueous solution of trichloroacetic acid ( $\text{CCl}_3\text{COOH}$ ) is heated to its boiling point. The solution has a boiling point of  $100.18^\circ\text{C}$ . Determine the van't Hoff factor for trichloroacetic acid ( $K_b$  for water =  $0.512 \text{ K kg mol}^{-1}$ ) [0.3516]
9. Define the terms, 'osmosis' and 'osmotic pressure'. What is the advantage of using osmotic pressure as compared to other colligative properties for the determination of molar masses of solutes in solutions?
10. Which of the following solutions has higher freezing point?  
0.05M  $\text{Al}_2(\text{SO}_4)_3$ , 0.1 M  $\text{K}_3[\text{Fe}(\text{CN})_6]$ . Justify
11. Determine the molarity of an antifreeze solution containing 250 g water mixed with 22g ethylene glycol ( $\text{C}_2\text{H}_6\text{O}_2$ ). The density of this solution is  $1.07 \text{ g/mL}$  [8.12M]
12. Components of a binary mixture of two liquids A and B were being separated by distillation. After some time separation of components stopped and composition of vapour phase became same as that of liquid phase. Both the components started coming in the distillate. Explain why this happened?
13. Give reason for the following :
  - a. At higher altitudes, people suffer from a disease called anoxia. In this disease, they become weak and cannot think clearly.
  - b. When mercuric iodide is added to an aqueous solution KI, the freezing point is raised.
14. Explain the solubility rule "like dissolves like" on terms of intermolecular forces that exist in solutions.
15. Why is the vapour pressure of an aqueous solution of glucose lower than that of water?
16. How does sprinkling of salt help in clearing the snow covered roads in hilly areas? Explain the phenomenon involved in the process. [272.425K]
17. Calculate the boiling point of solution when 4 g of  $\text{MgSO}_4$  ( $M=120 \text{ g mol}^{-1}$ ) was dissolved in 100 g of water, assuming  $\text{MgSO}_4$  undergoes complete ionization. [ $K_p$  for water =  $0.52 \text{ K kg mol}^{-1}$ ] [373.347K]
18. Calculate the freezing point of solution when 2 g of  $\text{Na}_2\text{SO}_4$  ( $M = 142 \text{ g mol}^{-1}$ ) was dissolved in 50g of water, assuming  $\text{Na}_2\text{SO}_4$  undergoes complete ionization. [ $K_f$  for water =  $1.86 \text{ K kg mol}^{-1}$ ] [ $-1.57^\circ\text{C}$  or  $271.43\text{K}$ ]
19. A solution is prepared by dissolving 10g of non-volatile solute in 200 g of water. It has a vapour pressure of 31.84 mm Hg at 308K. Calculate the molar mass of the solute. [Vapour pressure of pure water at 308 K = 32 mmHg] [180]
20. Calculate the mass of NaCl [molar mass =  $58.5 \text{ g mol}^{-1}$ ] to be dissolved in 37.2 g of water to lower the freezing point by  $2^\circ\text{C}$ , assuming that NaCl undergoes complete dissociation. [ $K_f$  for water =  $1.86 \text{ K kg mol}^{-1}$ ] [1.17g]
21. A decimolar solution of potassium ferrocyanide  $\text{K}_4\text{Fe}(\text{CN})_6$  is 50% dissociated at 300K. Calculate the value of van't Hoff factor for potassium ferrocyanide. [2]
22. On dissolving 19.5 g of  $\text{CH}_2\text{FCOOH}$  in 500 g of water, a depression constant of fluoroacetic acid. Given  $K_f = 1.86 \text{ K kg mol}^{-1}$ . [ $2.83 \times 10^{-3}$ ]
23. Heptane and octane form an ideal solution at 373 K. The vapour pressure of the pure liquids at this temperature are 105.2 kPa and 46.8 kPa, respectively. If the solution contains 25 g of heptanes and 28.5 g of octane, calculate.
  - a. vapour pressure exerted by heptanes
  - b. vapour pressure exerted by solution

- c. mole fraction of octane in the vapour phase. [52.6 kPa , 76 kPa , 0.3078 ]
24. Using Raoult's law, explain how the total vapour pressure over the solution is related to mole fraction of components in the following solutions :
- a.  $\text{CHCl}_3(\text{l})$  and  $\text{CH}_2\text{Cl}_2(\text{l})$  b.  $\text{NaCl}(\text{s})$   $\text{H}_2\text{O}(\text{l})$
25. Calculate the mass of a non volatile solute (molar mass = 40 g/mol) which should be dissolved in 114g octane to reduce its vapour pressure to 80%. [10g]
26. At 300K, 36 g of glucose,  $\text{C}_6\text{H}_{12}\text{O}_6$  present per litre in its solution has an osmotic pressure of 4.98 bar. If the osmotic pressure of another glucose solution is 1.52 bar at the same temperature, calculate the concentration of the other solution. [0.061 moles / litre]
27. The freezing point of benzene decreases by 2.12 K when 2.5 g of benzoic acid ( $\text{C}_6\text{H}_5\text{COOH}$ ) is dissolved in 25 g of benzene. If benzoic acid forms a dimer in benzene, calculate the van't Hoff factor and the percentage association of benzoic acid. [ $K_f$  for benzene =  $5.12 \text{ K mol}^{-1}$ ] [99]
28. a. A solution containing 30 g of non – volatile solute exactly in 90 g water has a vapour pressure of 2.8 kPa at 298 K. Further 18 g of water is then added to this solution , the new vapour pressure becomes 2.9 kPa at 298 K . Calculate
- (i) the molar mass of solute (ii) vapour pressure of water at 298 K
- b. Give reasons : (i) Aquatic species are more comfortable in cold water than in hot water.
- (ii) 10 mL of liquid A was mixed with 10mL of liquid B. The volume of resulting solution decreases to 19.8mL.
29. What mass of NaCl must be dissolved in 65.0 g of water to lower the freezing point of water by  $7.50^\circ\text{C}$  ?
- The freezing point depression constant ( $K_f$ ) for water is  $1.86^\circ\text{C/m}$  . Assume van't Hoff factor for NaCl is 1.87. [Molar mass of NaCl = 58.5 g ] [8.177g]
30. Give reasons for the followings:
1. Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers.
  2. Aquatic animals are more comfortable in cold water than in warm water.
  3. Elevation of boiling point of 1 M KCl solution is nearly double than that of 1 M sugar solutions.

## PHYSICAL EDUCATION

**# Prepare a project file on yoga as preventive measure of lifestyle diseases. (\*\*Use A4 colour sheets)**

Three asana each for the following lifestyle diseases:-

1. Obesity
2. Diabetes
3. Asthma
4. Hypertension
5. Back pain.

# Each Lifestyle disease should contain 3 Asanas and details about-

1. Causes,
2. Procedure
3. Benefits
4. Contraindications

# Suitable pictures should be pasted along each asana (size and posture, prefer colour pic's from magazines, newspaper etc.

**\*\* (Use self/your own color printed pic's against the described asanas)**

- # Informative& printed matter in sort of research, medical, nutrition, etc. can also be pasted in your project.
- \*\*\* Video dairy with standing, sitting and lying posture asana. Use a good app with proper effects and text details etc. to be maintained and shared to the teacher concerned. (Approx. 30-35 sec. video clip with at least 8-10 asanas, also keep your video below 12mb)
- \*\*\*Try regular practice of asanas for first 20 days and then make a video; it will help you get perfect pose for the digital diary.

## COMPUTER SCIENCE WITH PYTHON

*Start working on project file on any one of the below motioned topic.*

1. Hotel Management System
2. School Management System
3. ATM
4. Library Management System
5. Billing Software for any shop or organization
6. Hospital Management System
7. Any other games

New idea is also welcome.

*Do let me know the progress of the project. Also create project file as well.*

Do any 15 program and save them.

1. A list contains the following elements: 3, 25, 13, 6, 35, 8, 14, 45. Write a function to swap the content with the next value divisible by 5 so that the resultant List will look like: 25, 3, 13, 35, 6, 8, 45, 14
2. Write a program to accept values from a user in a tuple. Add a tuple to it and display its elements one by one. Also display its maximum and minimum value.
3. Write a program to input any values for two tuples. Print it, interchange it and then compare them.
4. Write a Python program to input 'n' classes and names of their class teachers to store them in a dictionary and display the same. Also accept a particular class from the user and display the name of the class teacher of that class.
5. Write a program to store student names and their percentage in a dictionary and delete a particular student name from the dictionary. Also display the dictionary after deletion.
6. Write a Python program to capitalize first and last letters of each word of a given string.
7. Write a Python program to remove duplicate characters of a given string.
8. Write a Python program to compute sum of digits of a given string.
9. Write a Python program to find the second most repeated word in a given string.
10. Write a Python program to change a given string to a new string where the first and last chars have been exchanged.
11. Write a Python program to multiply all the items in a list.
12. Write a Python program to get the smallest number from a list.
13. Write a Python program to append a list to the second list.
14. Write a Python program to generate and print a list of first and last 5 elements where the values are square of numbers between 1 and 30 (both included).
15. Write a Python program to get unique values from a list.
16. Write a Python program to convert a string to a list.
17. Write a Python script to check if a given key already exists in a dictionary.
18. Write a Python script to merge two Python dictionaries. Write a Python program to sort a dictionary by key.
19. Write a Python program to combine two dictionary adding values for common keys. d1 = {'a':100,'b': 200, 'c':300} d2 = {'a':300, 'b':200, 'd':400}  
*Sample output: {'a':400, 'b':400, 'd':400, 'c': 300}*

20. Write a Python program to find the highest 3 values in a dictionary.
21. Write a Python program to sort a list alphabetically in a dictionary.
22. Write a Python program to count number of items in a dictionary value that is a list.
23. Write a python program to remove duplicate from a list.
24. Write a python program to get the largest number from a list.

**Email all the program and project file on [sandeepsinghsgs@gmail.com](mailto:sandeepsinghsgs@gmail.com)**

# HOLIDAY HOMEWORK

## ASSIGNMENT CLASS XII DIFFERENTIATION

1. Find  $\frac{dy}{dx}$  for the following:

(a)  $y = \frac{1}{\sqrt{a^2 - x^2}}$

(b)  $y = \frac{5x}{\sqrt[3]{1-x^2}} + \sin^2(2x+3)$

(c)  $y = \frac{\cos x + \sin x}{\cos x - \sin x}$

(d)  $y = \log \sqrt{\frac{1+\cos^2 x}{1-e^{2x}}}$

(e)  $y = \log(x + \sqrt{1+x^2})$

(f)  $y = \sqrt{\frac{1-\sin 2x}{1+\sin 2x}}$

2. Show that  $\frac{d}{dx} \left[ \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \left( \frac{x}{a} \right) \right] = \sqrt{a^2 - x^2}$ .

3. If  $y = \sqrt{\frac{1-x}{1+x}}$ , prove that  $(1-x^2) \frac{dy}{dx} + y = 0$ .

4. If  $y = (x + \sqrt{x^2 + a^2})^n$ , prove that  $\frac{dy}{dx} = \frac{ny}{\sqrt{x^2 + a^2}}$ .

5. Find  $\frac{dy}{dx}$  for the following:

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

(b)  $\tan^{-1} \left( \frac{1 - \cos x}{\sin x} \right)$

(c)  $\tan^{-1} \left( \frac{\cos x - \sin x}{\cos x + \sin x} \right)$

(d)  $\tan^{-1} \left( \sqrt{\frac{1+\sin x}{1-\sin x}} \right)$

(e)  $\tan^{-1} \left( \frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} \right)$

6. Find  $\frac{dy}{dx}$  for the following:

(a)  $\cos^{-1}(4x^3 - 3x)$

(b)  $\cot^{-1} \left( \frac{1-x}{1+x} \right)$

(c)  $\tan^{-1} \left( \frac{\sqrt{1+x^2} - 1}{x} \right)$

(d)  $\tan^{-1} \left( \frac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}} \right)$

(e)  $\sin^{-1} \left( \frac{5x + 12\sqrt{1-x^2}}{13} \right)$

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

8. If  $y = \sqrt{x} + \frac{1}{\sqrt{x}}$ , prove that  $2x \frac{dy}{dx} + y = 2\sqrt{x}$ .

9. If  $y\sqrt{x^2+1} = \log(\sqrt{x^2+1} - x)$ , show that  $(x^2+1) \frac{dy}{dx} + xy + 1 = 0$ .

10. If  $y \log x = x - y$ , prove that  $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$ .

11. If  $\log(\sqrt{x^2 + y^2}) = \tan^{-1} \frac{y}{x}$ , prove that  $\frac{dy}{dx} = \frac{x + y}{x - y}$ .

12. If  $y = \frac{\sin^{-1} x}{\sqrt{1 - x^2}}$ , prove that  $(1 - x^2) \frac{dy}{dx} = xy + 1$ .

13. If  $y = x^{\cos x} + \cos x^{\sin x}$ , find  $\frac{dy}{dx}$ .

14. If  $x^a y^b = (x + y)^{(a+b)}$ , prove that  $\frac{dy}{dx} = \frac{y}{x}$ .

15. If  $f(x) = \left( \frac{3+x}{1+x} \right)^{2+3x}$ , find  $f'(0)$ .

16. Differentiate  $\tan^{-1} \left( \frac{2x}{1-x^2} \right)$  w.r.t.  $\sin^{-1} \left( \frac{2x}{1+x^2} \right)$ .

17. If  $x = a \sin 2t (1 + \cos 2t)$ ,  $y = b \cos 2t (1 - \cos 2t)$ , show that  $\left( \frac{dy}{dx} \right)_{at=\frac{\pi}{4}} = \frac{b}{a}$ .

18. If  $x = a \left( \frac{1+t^2}{1-t^2} \right)$ ,  $y = \frac{2t}{1-t^2}$ , show that  $\frac{dy}{dx} = \frac{1+t^2}{2at}$ .

19. If  $x = 2 \cos \theta - \cos 2\theta$  and  $y = 2 \sin \theta - \sin 2\theta$ , find  $\left( \frac{d^2 y}{dx^2} \right)_{\theta=\frac{\pi}{2}}$ .

20. If  $y = A \cos nx + B \sin nx$ , prove that  $\frac{d^2 y}{dx^2} + n^2 y = 0$ .

21. If  $y = e^x (\sin x + \cos x)$ , prove that  $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + 2y = 0$ .

22. If  $y = \tan^{-1} x$ , show that  $(1 + x^2) \frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} = 0$ .

23. If  $y = \left[ \log \left( x + \sqrt{x^2 + 1} \right) \right]^2$ , show that  $(1 + x^2) \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = 2$ .

### Application of Derivatives

1. Water is dripping out from a conical funnel of semi vertical angle  $\frac{\pi}{4}$  at a uniform speed of  $2 \text{ cm}^3 / \text{sec}$  through a tiny hole at the vertex of the bottom. When the slant height of water is 4cm , find the rate of decrease of slant height of the water.
  2. A man is moving away from a tower 49.6 m high at the rate of 2 m/s. Find the rate at which the angle of elevation of the top of the tower is changing, when he is at a distance of 36 m from the foot of the tower. Assume that the eye level of the man is 1.6 m from the ground.
  3. Evaluate following up to three decimal places using differentiation:  
 $\sqrt{25.2}$ ,  $\sqrt[3]{29}$  ,  $\sqrt{0.037}$
  4. Find the intervals in which the function  $f(x) = \log(1+x) - \frac{2x}{2+x}$  is increasing or decreasing.
  5. Find the intervals in which the function  $f(x) = (x+1)^3 (x-3)^3$  is increasing or decreasing. Also find the points at which the function has local maxima, local minima and the point of inflexion.
  6. Find all the points of local maximum and minimum and the corresponding maximum and minimum values of the following function  $\frac{3}{4}x^4 - 8x^3 + \frac{45}{2}x^2 + 105$ .
  7. Find the point on the curve  $y^2 = 4x$  which is nearest to the point  $(2, -8)$
  8. Find the equation of the tangent to the curve  $y = (x^3 - 1)(x - 2)$  at the points where the curve cuts the x-axis.
  9. Find the intervals in which the function  $f(x) = 2x^3 - 9x^2 + 12x + 15$  is increasing and decreasing.
  10. Separate  $\left[0, \frac{\pi}{2}\right]$  into sub intervals in which  $f(x) = \sin^4 x + \cos^4 x$  is increasing or decreasing.
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11. Find the points of local maxima and local minima and also the local maximum and local minimum values of the following functions : (i)  $f(x) = 2\cos x + x, x \in (0, \pi)$   
(ii)  $f(x) = 2\sin x - x, x \in \left[ \frac{-\pi}{2}, \frac{\pi}{2} \right]$
12. Find the equation of the tangent and normal to the curve  
 $x = 1 - \cos \theta; y = \theta - \sin \theta$  at  $\theta = \frac{\pi}{4}$
13. Prove that the radius of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half of that of cone.
14. An open box with a square base is to be made of given iron sheet of area 27 sq.m. Show that the maximum volume of the box is 13.5 cu. m.
15. Show that the triangle of maximum area that can be inscribed in a given circle is an equilateral triangle.
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## ASSIGNMENT CLASS XII INDEFINITE INTEGRALS

Evaluate the following Integrals:

1.  $e^{x \log a} + e^{a \log x} + e^{a \log a}$
2.  $\frac{1}{1 + \cos x}$
3.  $\frac{\sin x}{1 + \sin x}$
4.  $\tan^{-1}(\sec x + \tan x)$
5.  $\frac{\sin^6 x + \cos^6 x}{\sin^2 x \cos^2 x}$
6.  $\tan^{-1} \sqrt{\frac{1 - \sin x}{1 + \sin x}}$
7.  $\frac{1}{\sqrt{3x+4} - \sqrt{3x+1}}$
8.  $\frac{x^3}{x+2}$
9.  $\sin^3 x \cos^3 x$
10.  $\cos^4 x$
11.  $\cos 2x \cos 4x$
12.  $\frac{x^4 + 3}{x^2 + 1}$
13.  $\sin 4x \cos 7x$
14.  $\frac{1 + \cos x}{1 - \cos x}$
15.  $\frac{e^x - e^{-x}}{e^x + e^{-x}}$
16.  $\frac{\sin 2x}{a^2 \sin^2 x + b^2 \cos^2 x}$
17.  $\frac{\sin x}{\sin(x-a)}$
18.  $\frac{1}{\sin(x-a) \sin(x-b)}$
19.  $\frac{1 - \cot x}{1 + \cot x}$
20.  $\frac{1}{e^x + 1}$
21.  $\frac{1}{\sqrt{x}(\sqrt{x} + 1)}$
22.  $\frac{\sin 2x}{(a + b \cos x)^2}$
23.  $\frac{\sec^2(2 \tan^{-1} x)}{1 + x^2}$
24.  $\sin^2 x \cos^5 x$
25.  $\sin^5 x$
26.  $\tan^3 x$
27.  $\left(\frac{x+1}{x}\right)(x + \log x)^2$
28.  $\frac{\cos^5 x}{\sin x}$
29.  $\frac{1}{\sqrt{9 - 25x^2}}$
30.  $\frac{x^4 + 1}{x^2 + 1}$
31.  $\frac{1}{3 + 2x - x^2}$
32.  $\frac{1}{x^2 + 8x + 20}$
33.  $\frac{e^x}{e^{2x} + 6e^x + 5}$
34.  $\frac{1}{x(x^n + 1)}$
35.  $\frac{x}{x^4 - x^2 + 1}$
36.  $\frac{1}{\sqrt{9 + 8x - x^2}}$
37.  $\frac{1}{\sqrt{16 - 6x - x^2}}$
38.  $\frac{2x}{\sqrt{1 - x^2 - x^4}}$
39.  $\frac{2x - 3}{x^2 + 3x - 18}$
40.  $\frac{2 \sin 2\phi - \cos \phi}{6 - \cos^2 \phi - 4 \sin \phi}$
41.  $\frac{x + 2}{2x^2 + 6x + 5}$
42.  $\frac{x^2}{x^2 + 6x + 12}$
43.  $\sqrt{\frac{a-x}{a+x}}$
44.  $\frac{3x + 1}{\sqrt{5 - 2x - x^2}}$
45.  $\frac{1}{a^2 \sin^2 x + b^2 \cos^2 x}$
46.  $\frac{\sin x}{\sin 3x}$
47.  $\frac{1}{2 - 3 \cos 2x}$
48.  $\frac{\sin 2x}{\sin^4 x + \cos^4 x}$
49.  $\frac{1}{1 - 2 \sin x}$
50.  $\frac{1}{5 + 4 \cos x}$
51.  $\frac{1}{3 + 2 \sin x + \cos x}$
52.  $\frac{3 \sin x + 2 \cos x}{3 \cos x + 2 \sin x}$
53.  $(\log x)^2$
54.  $\sin^{-1} x$
55.  $\frac{x - \sin x}{1 - \cos x}$
56.  $\sec^3 x$

57.  $\frac{\sin^{-1} x}{(1-x^2)^{3/2}}$       58.  $x^2 \tan^{-1} x$       59.  $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$       60.  $\frac{\sin^{-1} x}{x^2}$
61.  $e^x \left(\frac{1-\sin x}{1-\cos x}\right)$       62.  $\frac{\log x}{(1+\log x)^2}$       63.  $\frac{2-x}{(1-x)^2} e^x$       64.  $\frac{1}{\log x} - \frac{1}{(\log x)^2}$
65.  $e^{ax} \cos bx$       66.  $\sqrt{7x-10-x^2}$       67.  $\frac{\sqrt{16+(\log x)^2}}{x}$       68.  $(3x-2)\sqrt{x^2+x+1}$
69.  $(x+1)\sqrt{1-x-x^2}$       70.  $\frac{2x-1}{(x-1)(x+2)(x-3)}$       71.  $\frac{1}{\sin x - \sin 2x}$       72.  $\frac{3x+1}{(x-2)^2(x+2)}$
73.  $\frac{8}{(x+2)(x^2+4)}$       74.  $\frac{x^2}{(x^2+1)(x^2+4)}$       75.  $\frac{\tan \theta + \tan^3 \theta}{1 + \tan^3 \theta}$       76.  $\frac{\sin 2x}{(1+\sin x)(2+\sin x)}$
77.  $\frac{1}{x(x^5+1)}$       78.  $\frac{x^2-1}{x^4+x^2+1}$       79.  $\frac{x^2+4}{x^4+16}$       80.  $\frac{1}{x^4+1}$
81.  $\sqrt{\tan x}$       82.  $\sqrt{\cot x}$       83.  $\frac{1}{\sin^4 x + \cos^4 x}$       84.  $\frac{x^2-1}{x^4+1}$
85.  $\frac{1}{(x-3)\sqrt{x+1}}$       86.  $\frac{1}{(x^2-4)\sqrt{x+1}}$       87.  $\frac{1}{(x+1)\sqrt{x^2-1}}$       88.  $\frac{1}{x^2\sqrt{1+x^2}}$
89.  $\frac{x}{x^3+x^2+x+1}$       90.  $\frac{\sin(x-\alpha)}{\sin(x+\alpha)}$       91.  $\frac{(x+1)e^x}{(x+2)^2}$       92.  $\frac{1-\tan x}{x+\log(\cos x)}$
93.  $\frac{\sqrt{x^2+a^2}}{x}$       94.  $\frac{e^x}{\sqrt{5-4e^x-e^{2x}}}$       95.  $\frac{1}{x^4-5x^2+16}$       96.  $\sqrt{1+2\tan x(\sec x+\tan x)}$
97.  $e^{\sqrt{x}} \frac{\cos e^{\sqrt{x}}}{\sqrt{x}}$       98.  $\cos(\log x)$       99.  $\frac{2\sin 2\theta - \cos \theta}{6 - \cos^2 \theta - 4\sin \theta}$       100.  $\tan^{-1}\left(\sqrt{\frac{1-\cos 2x}{1+\cos 2x}}\right)$