



MANAV STHALI SCHOOL

R - Block, New Rajendra Nagar, New Delhi - 110060

Class - XII

**Holiday Homework
Science Group**

2013 - 2014

ENGLISH

- Q.1** You are Arun / Aruna Dixit. Write an application for the post of an English teacher in Navyug Public School, giving all details.
- Q.2** You are the chief Warden of Sariska Wild Life Sanctuary, Sariska, Rajasthan. Write a notice for the visitors informing them that hunting/poaching of any animal is prohibited in the sanctuary. Defaulters can be fined and punished. Also appeal to the visitors not to pollute the sanctuary.
- Q.3** Strengthening economy, boom in infrastructure, more employment opportunities, excellence in higher education, improving health, nuclear power, strong defence..... Are we looking at the rise of a new India? Express your views in the form of a Newspaper article.
- Q.4** You are Gangadharan Bandhopadhyaya. As a part of young India Campaign for India, write a letter to the Editor of a leading daily, emphasising the role of youngsters in leading the country. Write in 120 words.
- Read "**The Hound of the Baskervilles**" and answer the following questions :
- Q5.** What element in the story holds your interest and makes it exciting?
- Q6.** Discuss the way in which the personalities of Sherlock Holmes and Dr. Watson complement each other. Do you think they are lacking in any characteristics? Why?
- Q7.** How would you sum up Mrs. Laura Jones' Character?

BIO - TECHNOLOGY

- Q1.** Compare plasmids with bacteriophages as vectors for cloning?
- Q2.** Differentiate chemically between dNTP and ddNTP?
- Q3.** Distinguish between BAC and YAC?
- Q4.** Many viruses have RNA- based genomes. Outline how the single stranded RNA sequence of a given virus can be determined using DNA sequencing methods?
- Q5.** Which of the following proteins has been produced by site directed mutagenesis?
- | | |
|-------------------------|-----------------|
| a) Alkaline Phosphatase | b) RNase |
| c) PAGE | d) b- lactamase |
- Q6.** What is the significance of proteins?
- Q7.** How are protein fingerprinting database useful? Briefly indicate the principle of 3D gel electrophoresis?
- Q8.** Name the muscular protein?
- Q9.** What is probiotics?
- Q10.** How does chymotrypsin work?

PHYSICS

ELECTROSTATICS

- Q1** Define one Coulomb.
- Q2** Find the value of electric field that would balance the weight of an electron.
- Q3** Two electric lines of force never intersect each other. Why ?

- Q4 Give SI unit of electric moment of a dipole.
- Q5 Can electric potential at any point in the space be zero while intensity of electric field at that point is not zero ? Why ?
- Q6 What is the dimensional formula of E_0 .
- Q7 What is the importance of having large value of dielectric constant of water?
- Q8 Is Coulomb's law in tune with Newton's third law of motion? Explain.
- Q9 Give two points of distinction between mass and charge.
- Q10 When is the torque on electric dipole in a field maximum?
- Q11 At what points is the dipole field intensity parallel to the line joining the charges?
- Q12 What is the dielectric constant of a metal?
- Q13 If V is constant throughout a given region of space, what can be said about E in that region ?
- Q14 A cube of side b has a charge q at each of its vertices. Determine the potential and electric field due to this charge array at the centre of the cube.
- Q15 A regular hexagon of each side 10 cm. has a charge of 5mC at each of its vertices. Calculate the potential at the centre of the hexagon.
- Q16 An electric dipole when held at 300 with respect to a uniform electric field of 104 NC^{-1} experiences a torque of $9 \times 10^{-26} \text{ Nm}$. Calculate the dipole moment of the dipole.
- Q17 Two point charges of values Q and q are placed at a distance of x and $x/2$ respectively from a third point charge of charge value $4q$, all charges being in the same straight line. Calculate the magnitude and nature of charge Q such that the net force on charge q is zero.
- Q18 Calculate the electric potential at a point X due to a charge of 0.5mC located at 10 cm from it. Also calculate the work done in bringing a charge, of $3 \times 10^{-9} \text{ C}$ from infinity to that point.
- Q19. An infinite number of charges each carrying 4mC are place along x axis at $x = 1 \text{ cm}$, $x = 2 \text{ cm}$, $x = 4 \text{ cm}$, $x = 8 \text{ cm}$ and so on. Find the total force on charge of 1C placed at the origin.
- Q20. Electric charge is uniformly distributed on the surface of a spherical balloon. Show how electric intensity and electric potential vary
a) on the surface b) inside c) outside.
- Q21. State Gauss's theorem. Using it
a) Derive an expression for electric field intensity at any point inside hollow charged conducting sphere.
b) Find electric field due to an infinite plane sheet of charge.
- Q22. An electric dipole is held in a uniform electric field.
I) Show that no translatory force acts on it.
II) Derive an expression for torque acting on it.
- Q23 Define dipole moment of an electric dipole. Show mathematically that the electric field intensity due to a short dipole at a distance along its axis is twice the intensity of the same distance along the equatorial line.

- Q24 Derive an expression for the total work done in rotating a dipole through an angle Q in uniform electric field E .
- Q25 State and explain principle of superposition. Find the expression for the total force acting on a given charge due to a number of other charges in form of continuous and discrete charges.
- Q26 Determine the electric intensity due to two thin parallel sheet of charges.
- Q27 How are electric intensity and potential gradient related to each other ?
Show that equipotential surfaces with specific distance are closer in the region of stronger field.
- Q28 A charge of 6mC is located at the origin of a coordinate system. Find the work done in taking a small charge of $-2 \times 10^{-12}\text{C}$ from a point $A(0,0,2\text{cm})$ to a point $B(0,3\text{cm},0)$ via a point $C(0,4\text{cm},5\text{cm})$
- Q29 A bird perches on bare high power line and nothing happens to it. A man standing on the ground touches the same line with bare feet and gets a fatal shock. Why ?
- Q30 A sphere S_1 of radius r_1 encloses a total charge Q . If there is another concentric sphere S_2 of radius r_2 ($r_2 > r_1$) and there be no additional charge between S_1 and S_2 , find the ratio of electric flux through S_1 and S_2 .

CHEMISTRY

Solutions

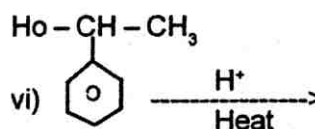
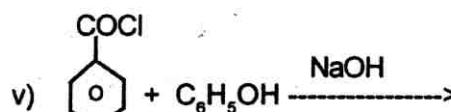
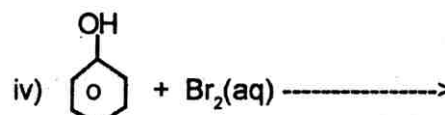
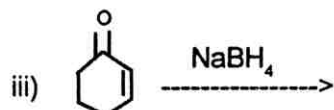
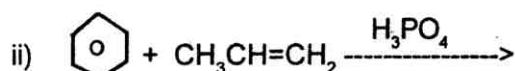
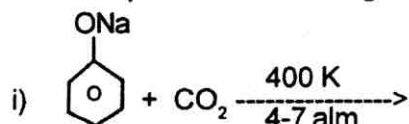
- Q1 What will happen to the vapour Pressure of water if a spoon of sugar is added to it?
- Q2 Equimolar solutions of NaCl and glucose are not isotonic. Why?
- Q3 Two liquids A & B are mixed and the resulting solution is found to be cooler? what do you conclude about the deviation from the ideal behaviour?
- Q4 Addition of HgI_2 to aqueous solution of KI shows an increase in vapour pressure. why?
- Q5 Mixing of acetone with chloroform takes place with reduction in volume. What type of deviation from Raoult's law is shown in this case?
- Q6 Name and explain the process which can be used for desalination of the sea water.
- Q7 Which colligative property is preferred for the molar mass determination of macro molecules and why?
- Q8 Why CaCl_2 is used to remove snow on the roads?
- Q9 What are silica gardens?
- Q10 Aerated water bottles are kept under water during summer. why?
- Q11 What characteristics do colligative properties of solutions share?
- Q12 A little common salt is added to water used for boiling egg to get hard boiled egg. why?
- Q13 Liquid ammonia bottle is cooled before opening the seal. why?
- Q14 Tea or coffee is sipped from a saucer when it is quite hot why?
- Q15 Semi permeable membrane of $\text{Cu}_2[\text{Fe}(\text{CN})_6]$ is not used for studying osmosis in non aqueous solutions.
- Q16 Why does water boil at lower temperature in Shimla than in Delhi?
- Q17 Why does a solution of NaCl boil at higher temperature than water?

- Q18 Will elevation in boiling point be the same for 0.1M NaCl and 0.1M sucrose solution?
- Q19 Why is molality of solution preferred for expressing conc than molarity?
- Q20 Which aqueous solution has higher conc 1 molar or 1 molal having the same solute?
- Q21 Find the molarity and molality of a 13% solution of sulphuric acid (density of sulphuric acid solution = 1.10 g/cm^3)
- Q22 The vapour pressure of a 5% aqueous solution of a non volatile organic substance at 373 K is 745 mm Hg. Calculate the molar mass of the substance.
- Q23 A solution contains 3.5g of a non volatile solute in 125g of water and it boils at 373.52 K. Calculate the molar mass of the solute (k_b of water = 0.52 K kg/mol)
- Q24 Calculate the molecular mass of a substance 1.0g of which on being dissolved in 100g of solvent gave an elevation of 0.307 K in the boiling point.
($k_b = 1.84 \text{ K kg/m}$)
- Q25 The boiling point of water becomes 100.52 degree celcius if 1.5g of non volatile solute is dissolved in 100ml of it. Calculate the molar mass of the solute.
(k_b for water = 0.6 K/m)
- Q26 Calculate the freezing point of a one molar aq solution. (density = 1.06 g/ml), k_f for water = 1.86 K kg/mol . atomic mass : K = 39, Br = 80
- Q27 A solution of urea in water freezes at 0.400 degree celcius. What will be the boiling point of the same solution if the depression and elevation constants of water are $1.86 \text{ degree kg/mol}$ and $0.512 \text{ degree kg/mol}$ respectively?
- Q28 Find the boiling point and the freezing point of a solution containing 0.520 g of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) dissolved in 80.20g of water for. Water, $k_f = 1.86 \text{ K/m}$ and $k_b = 0.52 \text{ K/m}$
- Q29 A decinormal solution of NaCl exerts an osmotic pressure of 4.6 atm at 300K. Calculate its degree of dissociation ($R = 0.082 \text{ L atm/K/mol}$) (87%)
- Q30 Calculate the amount of sodium chloride which must be added to one kg of water so that the freezing point is depressed by 3K. Given k_f for water = 1.86 K kg/mol . (47.2g)
- Q31 The freezing point of a solution containing 0.2g of acetic acid in 20g of benzene is lowered by 0.45 degree celcius. Calculate the degree of association of acetic acid in benzene (k_f for benzene = 5.12 K kg/mol) (94.6%)
- Q32 0.85% aqueous solution sodium nitrate is approx 90% dissociated at 27 degree celcius. Calculate the osmotic pressure. ($R = 0.0821 \text{ L atm/K/mol}$) (4.674 atm)
- Q33 A very small amount of non volatile solute (that does not dissociate) is dissolved in 56.8 cm³ of benzene (density = 0.889 g/cm^3). At room temp, Vap pressure of the solution is 98.88 mm Hg while that of benzene is 100 mm Hg. Find the molality of the solution. If the freezing point temperature of the solution is 0.73 degree lower than that of the benzene, what is the value of k_f for benzene. (5.08 K kg/mol)
- Q34 A solution of non volatile solute in water freezes at - 0.30 degree celcius. The vap pressure of pure water at 298 K is 23.51 mm Hg and k_f for water is $1.86 \text{ degree/molal}$. Calculate the vap pressure of the solution at the 298K. (23.44 mm/Hg)
- Q35 To 500 cm³ of water 0.003 kg of acetic acid added. If 23% of acetic acid is dissociated, what will be the depression in freezing point? k_f and density of water are 1.86 K kg/mol and 0.997 g/cm^3 respectively. ($i = 1.23, \Delta T_f = 0.229$)

Organic Chemistry

- Q1.** Phenols are acidic while alcohols are not although both have OH groups. Explain
- Q2.** Why is OH group in phenol ortho and Para directing in nature.
- Q3** Picric acid has no carboxyl group. Why is it a strong acid?
- Q4** Thionyl chloride is considered the best reagent for converting alcohols to alkyl chlorides. Explain.
- Q5** Sodium metal cannot be used for drying alcohols. Assign reason?
- Q6** Ethyl alcohol and dim-ethyl ether are isomeric but alcohol is a liquid at room temperature while ether is a gas. Explain?
- Q7** Give a brief account of the following for the commercial preparation of phenol.
1) Dow's process 2) Cumene process.
- Q8** Explain giving reasons:-
- 1) Phenol has a smaller dipole moment than methanol.
 - 2) Unlike phenols, alcohols are easily protonated.
 - 3) The lower homologues of alcohols are soluble in water whereas phenols are only slightly soluble in water.
 - 4) C-O bond is much shorter in phenol than in ethanol.
 - 5) 2- nitro phenol can be separated from its 'isomer 4- nitro phenol by steam distillation
 - 6) Phenol develop colour on standing
 - 7) P- nitrophenol is a stronger acid than phenol while p- cresol is a weaker acid.
 - 8) Unlike phenol , 2,4 dinitrophenol is soluble in aqueous Na_2CO_3 solutions
 - 9) A small quantity of ethanol is added to chloroform bottles.
 - 10) Anhydrous CaCl_2 cannot be used for drying ethyl alcohol

Q9 Complete the following reactions:-



- Q10.** Distinguish between the following giving suitable chemical reaction: -
- a) Acetaldehyde & acetone
 - b) 2-pentanone & 3-pentanone
 - c) 1-propanol & 2-propanol

- d) 1- phenyl ethanol & 2- phenyl ethanol
- e) Ethyl alcohol & 2- propanol
- f) Allyl alcohol & n- propyl alcohol
- g) Pri , sec & tert alcohol
- h) ACETOPHENONE & BENZOPHENONE

Q11 Out of phenol and benzene, which is more easily nitrated and why?

Q12 Name the enzyme present in yeast, which converts sucrose into glucose and fructose & then to ethyl alcohol

Q13 Explain the mechanism of acid catalysed dehydration of ethanol at low & high temperature?

Q14 What is power alcohol?

Q15 Explain why dehydration of alcohols to form alkenes is always carried out with Conc H_2SO_4 and not with ConcHCl or HNO_3 .

Q16 Carry out the following conversions:-

- 1) Benzene to phenol
- 2) Ethanol to ethanoic acid
- 3) Phenol to 2- acetoxy benzoic acid
- 4) Ethanol to propanone
- 5) Propan – 2ol to 1- bromopropane
- 6) ethyl alcohol to t- butyl alcohol
- 7) Methyl alcohol to isopropylalcohol
- 8) Phenol to benzoic acid
- 9) Benzoic acid to phenol
- 10) phenol to acetophenone

Q17 Show with the help of chemical equations what happens when :-

- 1) Cumene hydro-peroxide is treated with phosphoric acid
- 2) Phenol reacts with Br_2 in the presence of CS_2 at 278K.
- 3) 2,4,6 trinitrophenol is heated with Zn dust.
- 4) Acetone reacts with CH_3MgBr followed by hydrolysis

Q18 Write short notes on:-

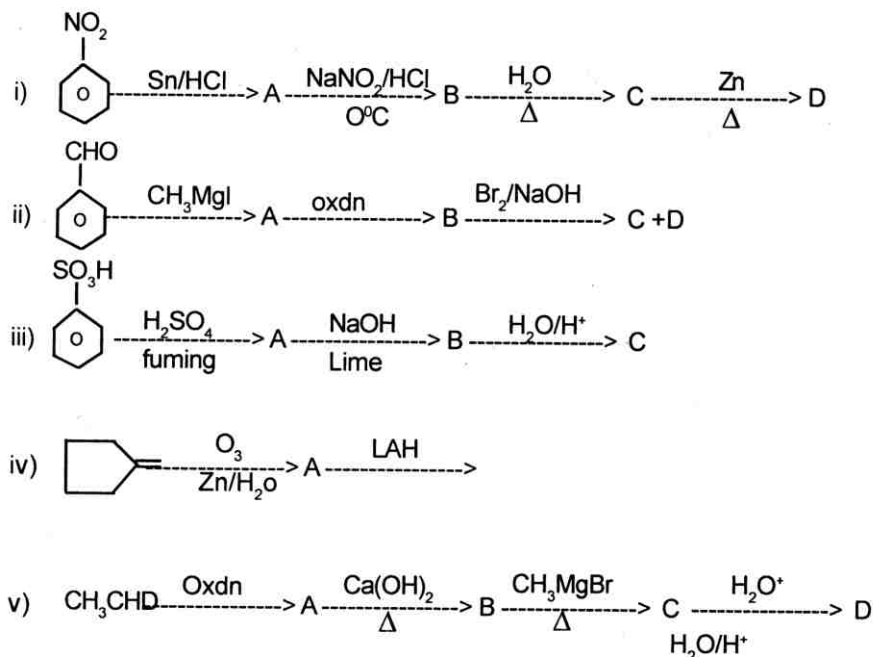
- 1. Kolbe's reaction
- 2. Reimer – Tiemann reaction
- 3. Iodoform test
- 4. Kharasch reaction
- 5. Gattermann's reaction
- 6. Sandmeyer's reaction

Q19 Arrange the following in the increasing order of the property indicated against each . Give reasons for your answer

- 1. $\text{CH}_3\text{CH}_2\text{OH}$, $\text{CF}_3\text{CH}_2\text{OH}$, $\text{CCl}_3\text{CH}_2\text{OH}$ - Acid strength

- 2-methyl 2-propanol, 1-butanol and 2-butanol – reactivity towards sodium
- Phenol, p-cresol, ethanol, p-nitrophenol, p-methoxyphenol – Acidity.
- Water, phenol, ethanol, benzoic acid – Acidity
- CH_3OH , $\text{CH}_3\text{CH}_2\text{OH}$, $(\text{CH}_3)_3\text{COH}$, $\text{CH}_3\overset{\text{HO}}{\underset{|}{\text{CH}}}-\text{CH}_3$ – Acidity

Q20 Identify A, B, C, D.



BIOLOGY

- Define health. Also name the factors which affect health.
- Differentiate between:
 - Primary and secondary response
 - T-cell and B-cell
 - Cell mediated and humoral immunity
 - Benign and malignant tumor
 - Active and passive immunity
 - Normal and cancer cells
- Write pathogens, nature of pathogen, diseases, symptom of disease and their mode of transmission for following diseases- Typhoid, pneumonia, common cold, malaria, amoebiasis, ascariasis, elephantiasis, ring worm and AIDS.
- Discuss lifecycle of plasmodium with the help of diagram.
- What do you understand by term 'immunity'? Differentiate between innate and acquired immunity.

6. Draw a well labeled diagram of antibody.
7. Define allergy. Also name the chemicals released during allergy and drugs used for the treatment of it.
8. Expand the term MALT. Discuss different lymphoid organs with their functions.
9. Draw a well labeled diagram showing replication of retrovirus.
10. Expand and write their functions of ELISA and NACO.
11. Discuss various methods for the detection and treatment of cancer.
12. Suggest the steps for the prevention of alcohol and drug abuse.
13. List harmful effects of alcohol and drug abuse.
14. Complete it-

DRUG	PLANT	CHEMICAL	EFFECT	MODE OF INGESTION
Opioid, heroin, smack	-	-	CNS	-
-	Cannabis sativa	-	-	-
-	Cocaine	-	-	-
Barbiturate	-	-	-	-
Morphine	-	-	-	-

15. Collect the relevant literature / data for the topic chosen in Bio Project. Study it, perform the necessary experiments (if required) and compile the project in a report form, which has to be submitted in AISSCE 2013 (a rough draft).

MATHS LOGARITHMIC DIFFERENTIATION DIFFERENTIATE FOLLOWING W.R.T. X

1. $y = (x^x)^x$ 2. $y = (x)^{x^x}$ 3. $y = \cos x^x$ 4. $y = \log[(\cos x)^x + e^{-x^2}]$
5. $y = (\log x)^x + x^{\log x}$ 6. $y = (\cos x)^{\sin x} + (\sin x)^{\sec x}$ 7. $x^y + y^x = a^b$ 8. $x^y = y^x$
9. $y = \frac{\sqrt{1-x^2}(2x-3)^{1/2}}{(x^2+2)^{2/3}}$ 10. $y = (\sqrt{x})^{\sqrt{x}}$ 11. $y = (\sin x)^{\sin x \sin x \dots}$ 12. $y = e^{x+e^{x+e^{x+\dots}}}$ 13. $y = a^{x^{x^{\dots}}}$

ANSWERS: 1. $(x^x)^x (2x \log x + x)$ 2. $(x)^{x^x} x^x \log x \left[\log x + 1 + \frac{1}{x \log x} \right]$ 3. $-x^x \sin x [1 + \log x]$

$$4. \frac{-2xe^{-x^2} + \log \cos x - x \tan x}{(\cos x)^x + e^{-x^2}} \quad 5. (\log x)^x \left\{ \log(\log x) + \frac{1}{\log x} \right\} + x^{\log x} \left\{ \frac{2 \log x}{x} \right\}$$

6. $(\cos x)^{\sin x} [-\tan x \sin x + \cos x \log \cos x] + (\sin x)^{\sec x} [\operatorname{cosec} x + \sec x \tan x \log \sin x]$
7. $\frac{-(x^{y-1}y + y^x \log y)}{(x^y \log x + y^{x-1}x)}$ 8. $\frac{y}{x} \left(\frac{x \log y - y}{y \log x - x} \right)$ 9. $\frac{\sqrt{1-x^2}(2x-3)^{1/2}}{(x^2+2)^{2/3}} \left[\frac{-x}{(1-x^2)} + \frac{1}{2x-3} - \frac{4x}{3(x^2+2)} \right]$
10. $\frac{y^2}{2x(1-y \log \sqrt{x})}$ 11. $\frac{4^x}{2x(1-y \log y)}$ 12. $\frac{\cos x}{2y-1}$ 13. $\frac{y^2 \log y}{x(1-y \log x \log y)}$

INVERSE DIFFERENTIATION

14. $y = \tan^{-1}(\sqrt{1+x^2} - x)$ 15. $y = \cot^{-1}(\sqrt{1+x^2} + x)$ 16. $y = \tan^{-1} \frac{\cos x}{1 + \sin x}$
17. $y = \tan^{-1} \left(\frac{a \cos x - b \sin x}{b \cos x + a \sin x} \right)$ 18. $y = \tan^{-1} \left(\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}} \right)$ 19. $y = \cos^{-1} \left(\frac{2 \cos x + 3 \sin x}{\sqrt{13}} \right)$
20. $y = \tan^{-1} \frac{4x}{1+5x^2} + \tan^{-1} \frac{2+3x}{3-2x}$ 21. $y = \sin^{-1} [x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2}]$ 22. $y = 2 \tan^{-1} \left(\sqrt{\frac{1-x}{1+x}} \right)$

- ANSWERS: 14. $\frac{-1}{2(1+x^2)}$ 15. $\frac{-1}{2}(1+x^2)$ 16. $-\frac{1}{2}$ 17. -1 18. $\frac{1}{2\sqrt{1-x^2}}$
19. 1 20. $\frac{-1}{25x^2+1}$ 21. $\frac{1}{\sqrt{1-x^2}} - \frac{1}{\sqrt{1-x}} \frac{1}{2\sqrt{x}}$ 22. $\frac{-1}{\sqrt{1-x^2}}$

DIFFERENTIATION

23. Differentiate $\tan^{-1} \left\{ \frac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}} \right\}$ with respect to $\cos^{-1} x^2$. Ans. $-\frac{1}{2}$
24. Differentiate $\sin^{-1} (2ax\sqrt{1-a^2x^2})$ with respect to $\sqrt{1-a^2x^2}$. Ans. $-2/ax$
25. Find the d.c. of $\tan^{-1} \sqrt{\frac{1-x^2}{1+x^2}}$ w.r.t. $\sin^{-1} \frac{2x}{1+x^2}$. Ans. $\frac{-x}{2} \sqrt{\frac{1+x^2}{1-x^2}}$
26. Differentiate $\cos^{-1} (4x^3 - 3x)$ with respect to $\tan^{-1} \left(\frac{\sqrt{1-x^2}}{x} \right)$. Ans. 3
27. Differentiate $\tan^{-1} \frac{\sqrt{1+x^2}-1}{x}$ w.r.t. $\sin^{-1} \frac{1-x^2}{1+x^2}$. Ans. $-\frac{1}{4}$

28. Differentiate $\sin^{-1} \sqrt{\frac{1+x}{2}}$ w.r.t. $\cot^{-1} \left(\frac{1-x}{1+x} \right)$. Ans. $\frac{(1+x^2)}{2\sqrt{1-x^2}}$
29. Find the d.c. of $\tan^{-1} \frac{2\sqrt{x}}{1-x^2}$ w.r.t. $\sin^{-1} \frac{2\sqrt{x}}{1+x^2}$. Ans. $\frac{\sqrt{1-x}}{1+x}$
30. If $y = \cot^{-1} \frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}}$, show that dy/dx is independent of x .
31. If $y = \tan^{-1} \left(\frac{5ax}{a^2 - 6x^2} \right)$ prove that $\frac{dy}{dx} = \frac{3a}{a^2 + 9x^2} + \frac{2a}{a^2 + 4x^2}$.
32. If $y = \frac{\cos x + \sin x}{\cos x - \sin x}$, show that $\frac{dy}{dx} = \sec^2 \left(\frac{\pi}{4} + x \right)$.
33. If $x^y = e^{x-y}$, prove that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$.
34. If $x^m y^n = (x+y)^{m+n}$, prove that $\frac{dy}{dx} = \frac{y}{x}$.
35. If $\sin y = x \sin(a+y)$, prove that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$.
36. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, show that $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$.
37. If $x\sqrt{1-y^2} + y\sqrt{1-x^2} = 1$, prove that $\frac{dy}{dx} = -\frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$.
38. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, show that $\frac{dy}{dx} = \frac{-1}{(x+1)^2}$.
39. If $\cos^{-1} \left(\frac{x^2 - y^2}{x^2 + y^2} \right) = \tan^{-1} a$, prove that $\frac{dy}{dx} = \frac{y}{x}$.
40. If $y = \tan^{-1} \left(\frac{2x}{1-x^2} \right) + \sec^{-1} \left(\frac{1+x^2}{1-x^2} \right)$, prove that $\frac{dy}{dx} = \frac{4}{1+x^2}$.
41. If $y = \tan \left(\frac{1}{2} \cos^{-1} \frac{1-u^2}{1+u^2} + \frac{1}{2} \sin^{-1} \frac{2u}{1+u^2} \right)$ and $x = \frac{2u}{1-u^2}$, then find the value of $\frac{dy}{dx}$. Ans. 1
42. If $\sqrt{y+x} + \sqrt{y-x} = c$, show that $\frac{dy}{dx} = \frac{y}{x} - \sqrt{\frac{y^2}{x^2} - 1}$.

43. If $x = \frac{e^t + e^{-t}}{2}$ and $y = \frac{e^t - e^{-t}}{2}$, find dy/dx . Ans. $\frac{x}{y}$
- 44 i. If $x = \frac{1-t^2}{1+t^2}$ and $y = \frac{2t}{1+t^2}$, find dy/dx . ii. If $y = \frac{1-t^2}{1+t^2}$ and $x = \frac{2t}{1+t^2}$, find dy/dx . Ans. i. $\frac{t^2-1}{2t}$ ii. $-\frac{x}{y}$
45. If $x = a \left[\cos t + \frac{1}{2} \log \tan^2 \frac{t}{2} \right]$ and $y = a \sin t$, prove that $dy/dx = \tan t$.
46. If $x = \cos^{-1} \frac{1}{\sqrt{1+t^2}}$ and $y = \sin^{-1} \frac{t}{\sqrt{1+t^2}}$, prove that $dy/dx = 1$.
47. If $y = f\left(\frac{2x-1}{x^2+1}\right)$ and $f(x) = \sin x^2$ then find $\frac{dy}{dx}$ Ans. $2 \sin \left(\frac{2x-1}{x^2+1}\right)^2 \times \left(\frac{1+x-x^2}{(x^2+1)^2}\right)$
48. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \dots + C_n x^n$, then prove that $C_1 + 2C_2 + \dots + n C_n = n \cdot 2^{n-1}$.
49. If $y = \frac{ax^2}{(x-a)(x-b)(x-c)} + \frac{bx}{(x-b)(x-c)} + \frac{c}{x-c} + 1$, show that $\frac{dy}{dx} = \frac{y}{x} \left(\frac{a}{a-x} + \frac{b}{b-x} + \frac{c}{c-x} \right)$.

PROBLEMS BASED ON SECOND DERIVATIVE

50. If $y = \tan^{-1} x$, show that $(1+x^2)y_2 + 2xy_1 = 0$
51. If $y = A \cos \log x + B \sin \log x$, prove that $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 0$
52. If $y = e^{\tan^{-1} x}$, prove that $(1+x^2)y_2 + (2x-1)y_1 = 0$
53. If $y = (\sin^{-1} x)^2$, prove that $(1-x^2)y_2 - xy_1 - 2 = 0$
54. If $y = e^{a \cos^{-1} x}$, show that $(1-x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - a^2 y = 0$.
55. If $x = a(1 - \cos \theta)$, $y = a(\theta + \sin \theta)$, prove that $\frac{d^2 y}{dx^2} = \frac{-1}{a}$ at $\theta = \frac{\pi}{2}$
56. If $x = a(\cos \theta + \sin \theta)$ and $y = a(\sin \theta - \theta \cos \theta)$. Where $0 < \theta < \frac{\pi}{2}$, prove that $\frac{d^2 y}{dx^2} = \frac{\sec^3 \theta}{a\theta}$
57. If $x = a(\cos \theta + \theta \sin \theta)$ and $y = a(\sin \theta + \theta \cos \theta)$ find $\frac{d^2 y}{dx^2}$. Ans. $\frac{d^2 y}{dx^2} = \frac{-a(3 \sin \theta + \theta \cos \theta)}{a(\theta \sin \theta + \cos \theta)}$

58. If $y = \tan x + \sec x$, prove that $\frac{d^2y}{dx^2} = \frac{\cos x}{(1 - \sin x)^2}$
59. If $x = \sin t$ and $y = \sin pt$, prove that $(1 - x^2)y_2 - xy_1 + p^2y = 0$.
60. If $(x - a)^2 + (y - b)^2 = c^2$ prove that $\frac{\left\{1 + \left(\frac{dy}{dx}\right)^2\right\}^{3/2}}{\frac{dy^2}{dx^2}}$ is a constant independent of a & b .
61. If $y = \left[x + \sqrt{x^2 + 1}\right]^n$ show that $(x^2 + 1)y_2 + xy_1 - n^2y = 0$.
62. If $y = x^x$, prove that $\frac{d^2y}{dx^2} - \frac{1}{y}\left(\frac{dy}{dx}\right)^2 - \frac{y}{x} = 0$. 63. If $y = e^{ax} \sin bx$, prove that, $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + (a^2 + b^2)y = 0$.
64. If $\cos x = \frac{1 - t^2}{1 + t^2}$ and $\sin y = \frac{2t}{1 + t^2}$. Prove that $\frac{d^2y}{dx^2}$ is independent of t .
65. Given that $\cos \frac{x}{2} \cdot \cos \frac{x}{4} \cdot \cos \frac{x}{8} \dots = \frac{\sin x}{x}$, prove that $\frac{1}{2^2} \sec^2 \frac{x}{2} + \frac{1}{2^4} \sec^2 \frac{x}{4} + \dots = \operatorname{cosec}^2 x - \frac{1}{x^2}$
66. If $y = [\log(x + \sqrt{x^2 + a^2})]^2$, prove that $(x^2 + a^2)y_2 + xy_1 = 2$.

APPLICATION OF DERIVATIVES

Normals & Tangents $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at (x_1, y_1) is

- Q.1 Prove that the equation of tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at (x_1, y_1) is $\frac{xx_1}{a^2} - \frac{yy_1}{b^2} = 1$
- Q.2 Show that the curves $2x = y^2$ and $2xy = K$ cut at right angles if $K^2 = 8$.
- Q.3 For curve $y = 4x^3 - 2x^5$. Find all the points at which tangent pass through origin.

RATE OF CHANGE OF QUANTITY

- Q.1 A ladder 13m. long leans against a wall. The foot of the ladder is pulled along with round away from the wall at the rate of 1.5 m/sec. How fast is the angle between the ladder and the ground is changing when the foot of ladder is 12m away from the wall.
- Q.2 A man is walking at the rate of 8 k.p.h towards the foot of the tower 60 m high. At what rate is he approaching the top when he is 80m from the top of the tower.
- Q.3 A particle moves along the curve. $6y = x^3 + 2$. Find the points on the curve at which y coordinate is changing 8 times as fast as $-x$ coordinate.
- Q.4 The volume of a sphere is decreasing at the rate of 12p cc/sec. Find the rates at which radius & surface area are changing at the instant when radius is 20 cm.

INCREASING - DECREASING

- Q.1** Find the intervals on which the given functions are increasing or decreasing ?
 $f(x) = -2x^3 - 9x^2 - 12x + 1$
- Q.2** Prove that $f(\theta) = \frac{4 \sin \theta}{2 + \cos \theta} - \theta$ is an increasing function in $\left[0, \frac{\pi}{2}\right]$.
- Q.3** Prove that the function $x^2 - x + 1$ is neither increasing nor decreasing on the interval $(0, 1)$.
- Q.4** Show that $f(x) = \tan^{-1}(\sin x + \cos x)$ is an increasing function of the interval $\left[0, \frac{\pi}{4}\right]$.

APPROXIMATION

Using differential calculus/approximation method find following up to decimal 6-digits.

$$\sqrt{0.009}, \sqrt[4]{15}; \sqrt[4]{255}, \sqrt{25.05}; \sqrt{0.037}$$

ROLLE'S THEOREM AND MEAN VALUE THEOREM

- Q.1** Verify Rolle's theorem
 $f(x) = \sin 4x + \cos 4x$ $\left[0, \frac{\pi}{2}\right]$
 $f(x) = x^3 - 6x^2 + 11x - 6$ $[1, 3]$
- Q.2** Using Lagrange's mean value theorem show that $\sin x < x$ for $x > 0$.

MAXIMA AND MINIMA

- Q.1** A window in the form of a rectangle is surmounted by semi-circular opening. The total perimeter of window is P m, find dimensions of the window to admit maxima light through whole opening.
- Q.2** The section of a corner window is rectangle surmounted by an equilateral triangle. Given that the perimeter is 12 metres, find the maximum amount of light that may be admitted.
- Q.3** Find the point on the curve $y^2 = 4x$ which is nearest to the point $(2, -8)$.
- Q.4** Find the volume of largest right circular cone that can be inscribed in a sphere of radius r .
- Q.5** Find the volume of largest right circular cylinder that can be inscribed in a sphere of radius r .
- Q.6** Find the volume of largest right circular cylinder that can be inscribed in a cone of radius r and height h .
- Q.7** Show that the volume of the greatest cylinder which can be inscribed in a cone of height h and semi vertical angle α is $\frac{4}{27} \pi h^3 \tan^2 \alpha$.
- Q.8** A point on the hypotenuse of a right triangle is at a distance 'a' and 'b' from the sides of the triangle. Show that the minimum length of the hypotenuse is $\left[a^{\frac{2}{3}} + b^{\frac{2}{3}}\right]^{\frac{3}{2}}$.

- Q.9 A jet of an enemy is flying along the curve $y=x^2+x$. A soldier is placed at the point (3,2). What is the nearest distance between the soldier and the jet ?
- Q.10 Prove that the radius of the right circular cylinder of greatest curved surface which can be inscribed in a given cone is half of that of the cone.
- Q.11 Find the area of the greatest isosceles triangle that can be inscribed in a given ellipse having its vertex coincident with one end of the major axis.
- Q.12 Show that the semi vertical angle of cone of maximum volume and given slant height is $\tan^{-1} \sqrt{2}$.
- Q.13 Show that the semi vertical angle of cone of maximum volume and given curved surface is $\sin^{-1} \frac{1}{\sqrt{3}}$.
- Q.14 Show that the semi vertical angle of cone of maximum volume and given surface is $\sin^{-1} \frac{1}{\sqrt{3}}$. A manufacturer plans to construct a cylindrical can to hold one cubic metre of liquid. If the cost of constructing top and bottom of the can is twice the cost of constructing the side, what are the dimensions of the most economical can?
- Q.15 If the sum of the lengths of the hypotenuse and another side of a right angled triangle is given, show that the area of a triangle is maximum when the angle is $\frac{\pi}{3}$.
- Q.16 Find sides of a rectangle with greatest area which can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
- Q.17 A wire of length 28m is to be cut into two pieces, one of the pieces is to be made into a square and the other into a circle, where should the wire be cut so that the combined area is minimum.
- Q.18 A given quantity of metal is to be cast into a solid half circular cylinder (ie., with rectangular base and semi-circular ends). Show that in order that the total surface area may be minimum, the ratio of the length of the cylinder to the diameter of its circular ends is $\pi:(\pi+2)$.

MULTIMEDIA AND WEB TECHNOLOGY

- Q1. Write the code to assign the values 100 & 3 to two variables name n1 & n2 & then find the sum, difference & product of n1 & n2. Also, find the quotient & remainder when n1 is divided by n2.
- Q2. W.A.P to print.
- ```

*
**

```
- Q3. W.A.P to print the factorial of a given number
- Q4. Prepare a web page that accepts name & D.O.B of the user. Create a button called msg, on the click event of this button call the producer which will compare the D.O.B entered by the user with current date, if it is same otherwise display the greeting msg. with the name otherwise display the appropriate message.

- Q5. Write the HTML code for creating the form given below and also write the VB script code for the click event of the "Calculated Cost" which will calculate the total cost of the items bought and displays it in an box. For e.g. if the user select T-shirt as the item and entes the number of items as 2 then the total cost will be Rs.600.

|                     |                      |
|---------------------|----------------------|
| Item bought         | <input type="text"/> |
| No. of Items bought | <input type="text"/> |
| Cost of item        | <input type="text"/> |
| Calculate Cost      | <input type="text"/> |

- Q6. Write a sub-routine that takes a character and as integer as parameter and prints the character given number of times.
- Q7. Write a function that takes the base and exponent as arguments and returns the power of the base to the exponent.
- Q8. Write a sub routine that checks to see whether a string passes as argument is a valid date. If not, then initialize the date to today's date. Use msg box to display the date.
- Q9. Write an ASP application to assign your name and apply the string function to find the first and last five character four your name?
- Q10. Write a program to enter any no. of numbers into an and arrange all the element in according order using bubble sort method.
- Q11. Write a program to find the Min & Max. element in an array of 10 no.
- Q12. Write a program to print a pyramid
- ```

1
22
333
4444

```
- Q13. Write a program to print the reverse of number 123456 and sum of its digits.

COMPUTER SCIENCE

- Q1. Declare a structure having following members: customer no., number of units consumed and bill. The bill is to be calculated according to the following conditions:

Units consumed	tariff
For the first 100 units	Rs.0.40 per unit
For the next 200 units	Rs.0.50 per unit
For the next 300 units	Rs.0.75 per unit
For the next 100 units	Rs.1.00 per unit
Beyond 1000 units	Rs.1.50 per unit

Write a program to calculate the bill and displaying the information of all the customers in the sorted order of customer no.

- Q2. Declare a structure to represent a complex number (a no. having real part & an imaginary part). Write a program to add , subtract , multiply and divide two complex numbers.

- Q3. Write a program to accept the name and total marks of 20 students in an array. Display the names of the students (including marks) securing highest and lowest marks using structure.
- Q4. (i) What is the difference between structure and arrays?
 (ii) What is the advantage of creating an array of structures instead of using individual variable names for each structure variable?
 (iii) Use typedef to define unsigned int , signed int & short int.
 (iv) What are the two ways of initializing members of a structure ?
- Q5. A class student has three data members : name , roll , marks of five subjects and member function to assign streams on the basis of table given below:
- | AVERAGE MARKS | STREAM |
|---------------|--------------|
| 96% or more | computer sc. |
| 91-95% | electronics |
| 86-90% | mechanical |
| 81-85% | electrical |
| 76-80% | chemical |
| 71-75% | civil |
- Q6. Let item list be a linear array of size N where each element of the array contains following fields. Item code item price and quantity. Declare a class with item list. data members & member functions will perform the following function
 (i) Appending an item to the list
 (ii) Given an item code , delete an item from the list
 (iii) Printing the total value of the stock
- Q7. Create a class called box whose constructor function is passed three double values, each of which represent the length of one side of a box . from the box class compute the volume of the box ans store the result in a double variable. Include a member function called vol() that displays the volume of each box object.
- Q8. (a) Define
 (i) abstract data type (ii) encapsulation (iii) data hiding
 (iv) function overloading (v) constructor overloading (vi) inheritance
 (b) What do you understand by a member function? How does a member function differ from an ordinary function ?
 (c) Define data members, member functions, private & public members with example?
 (d) What do you understand by constructor & destructor functions used in classes?
 How are these functions different from other member functions?
- Q.9 Attempt question no. 1, 2, 5, 6, 7 of CBSE question paper (Computer Science) from (2005-2012).

Note : Exempt output questions if based on pointers.

INFORMATICS PRACTICES

- Q1.** Answer the following questions based on Networking and Open Source:
- a) Which Protocol is used for the transfer of hypertext documents on the internet?
 - b) Which transmission medium should be used to transfer data across two continents at very high speed?
 - c) Two neighborhood schools, at a distance of 120 meters from each other, decide to join their LANs using UTP cable so that they can share their e-learning resources. But after joining their LANs they are not able to share the resources due to loss of signal in-between. Which device should they use so that signal is amplified in-between?
 - d) Which of the following software's are Open Source:
Linux, MS Windows 7, PhotoShop, MySql.
 - e) Distinguish between Open Source software and Proprietary software with reference to customizability of the software.
 - f) Name any four Indian scripts included in Unicode.
 - g) Sujata says that following numbers indicate an address:
208.77.188.166
What is the above address called? To which object/device is it assigned?
 - h) What are Network security measures? Name any two.
- Q2.** Answer the following questions based on Networking and Open Source
- a) India Marchants Co is planning in the office building to connect all computers, each spread over within distance of 45 Meters. Suggest the economical cable type having highspeed data transfer which can be used to connect these computers.
 - b) ABC Co is planning to connect their two different networks using different protocol
 - c) and having different size in terms of computer. Which device will you suggest them to installed for connection.
 - a. Router
 - b. Bridge
 - c. Gateway
 - d) Mrs Sangita purchased a NIC card. There is some number printed in the form of
i. 10 : B6 : 08 : 76 : 3E : AB. What does this number represents to? Explain the two
ii. parts?
 - e) Write any two significance of Unicode?
 - f) Which of the following is not a Open Source/Free Software:
 1. Mozilla
 2. PostgreSQL
 3. Tomcat
 4. Microsoft Office 2007
 - g) Define Proprietary Software?
 - h) Identify the type of Topology from the following:
 - a. if one node fails to pass data through itself, the entire networks fails and no traffic can flow.

- b. nodes are connected together in an arbitrary fashion. A link may or may not Connect two or more nodes.
- i) Define the following with reference to attacks to Network Security:
- Snooping
 - Eavesdropping.

TOPIC : MYSQL commands

Q3. Write SQL command for the questions on the basis of table MASTER

TABLE: MASTER

No.	Name	Age	Dept	Dateofjoin	Salary	Sex
1	Jugal	34	Computer	2007-1-10	12000	M
2	Sharmila	31	History	2008-3-24	20000	F
3	Sandeep	42	Maths	2006-12-12	30000	M
4	Sangeeta	35	History	2009-1-7	40000	F
5	Rakesh	42	Maths	2007-5-9	25000	M
6	Shyam	50	History	2008-6-27	30000	M
7	Shivom	44	Computer	2007-2-25	21000	M
8	Shakalkha	33	maths	2007-7-31	20000	F

- To show all information about the history dept.
- To list the name of females teacher who are in maths dept.
- To list the name of all teachers with their date of admission in ascending order.
- To display teachers name,salary,age for the male teachers only.
- To count the number of teachers with age > 23.
- To insert a new row in master table with the following date :
9,raja,26,computer,2005-5-13,2300,M

Q4. Write SQL commands for the ques a) to f) on the basis of table: FAMILY

NO.	NAME	Female members	Male members	Income	Occupation
1	Mishra	3	2	67000	Service
2	Gupta	4	1	150000	Business
3	Khan	6	3	48000	Mixed
4	Chaddha	2	2	125000	Business
5	Yadav	7	2	120000	Mixed
6	Joshi	3	2	1.14000	Service
7	Maurya	6	3	45000	Farming
8	rao	5	2	110000	service

- a) To select all the information of family whose occupation is service.
- b) To list the name of family where female members are more than 3.
- c) To list all name of family with income in ascending order.
- d) To display family name, male members and occupation of business family.
- e) To count the no. of family whose income is less than 110000
- f) To insert the record in the family table with the following data
9,d souza, 2, 1,115000,service

Q5. Consider the two tables given below

Table: SUPPLIER

S #	P name	S name	Qty.	Price	City
S1	Bread	Britannia	150	8.00	Delhi
S2	Cake	Britannia	250	20.00	Mumbai
S3	Coffee	Nescafe	170	45.00	Mumbai
S4	Chocolate	Amul	380	10.00	Delhi
S5	Souce	Kissan	470	36.00	Jaipur
S6	Maggi	Nestle	340	10.00	Kolkata
S7	Biscuit	Marie	560	21.00	Chennai
S8	Jam	Kissan	220	40.00	Delhi
S9	picnic		345	5.00	Kolkata

Table: PRODUCT

P #	P name	P city
P1	Bread	Delhi
P2	Cake	Delhi
P3	Coffee	Kolkata
P4	Sauce	Jaipur

- a) To display the Pname having same city and Pcity.
- b) To display the product name having city of SUPPLIER as Jaipur.
- c) To display the Pname,Sname having P# value 1
- d) To display the Pname and Pcity where qty is 340
- e) What will be the output of the following query
 Select Pname , p#
 From Supllier , Product
 Where city = Pcity ;

Q6. Consider the two tables given below:

TABLE: GRADUATE

Sno.	NAME	STIPEND	SUBJECT	AVERAGE	DIV.
1	Karan	400	PHY	68	1
2	Divakar	450	COMP.SC	68	1
3	Divya	300	CHEM	62	2
4	Arun	350	PHY	63	1
5	Sabena	500	MATHS	70	1
6	John	400	CHEM	55	2
7	Robert	250	PHY	64	1
8	Rubina	450	MATHS	68	1
9	Vikas	500	COMP.SC	62	1
10	Mohan	300	MATHS	57	2

TABLE: GUIDE

MAINAREA	ADVISOR
PHYSICS	VINOD
COMPUTER SC	ALOK
CHEMISTRY	RAJAN
MATHEMATICS	MAHESH

- To display the name, subject and advisor for all the graduates.
- To display the name, stipend and main area of all graduates who score average 68.
- To display the name and advisor of all the graduates whose name starts with R.
- To display the name, div. and advisor for all graduates whose subject is PHYSICS.
- To display the sno. And name along with their mainarea and advisor.
- To display the name whose average is greater than the average of DIVYA.
- To display the name of the graduate whose subject is same as that of graduate no. 2
- To display the name and average of all the graduates having minimum average in their subject.
- What will be the output of the following query.
 SELECT , NAME, ADVISOR
 FROM GRADUATE, GUIDE
 WHERE SUBJECT = MAINAREA;

MEDIA STUDIES

Making a Port folio

- Activity 16 and 18 of MEDIALITERACY
- Research online and try to read news reports on “DELHI GIRL GANG RAPE” case.
Develop a perspective of your own.
- Review a film adapted from a piece of literature.
- PHOTO FEATURE on the topic “WET”

PHYSICAL EDUCATION

- Q1. What is the difference between Physical Fitness and wellness? Explain.
- Q2. Explain the role of yoga in sports.
- Q3. What are anaerobic exercises? Explain by giving some examples.
- Q4. Describe some of the factors that effect physical fitness and wellness
- Q5. Make a sample draw of five teams in a league tournament.
- Q6. What are the objectives of intramural sports?
- Q7. Extramural sports supplement the needs of sportsmen in school and colleges. Discuss.
- Q8. Organizing runs for a cause are the most effective means of stirring the conscience of citizens for the cause. Discuss.
- Q9. How can individual help in preventing sports related accidents?
- Q10. What are the essential elements of a healthy or positive sports environment?
- Q11. What are the advantages of correct posture?
- Q12. Make a list of the postural deformities.
- Q13. What I Lordosis? What is the cause of lordosis and what remedial measures are required to minimize it?
- Q14. Yoga practice can play an important role in our lives. Discuss.
- Q15. Describe the elements of Yoga.