Mount Abu Public School

SUMMER HOLIDAYS HOMEWORK

CLASS – XII (SCIENCE)

Dear Parent

Should we judge a dolphin by its ability to climb a tree?

We do not wear the Board exam marks on our sleeves? Right. But …. they do signify a simple thing: it quantifies the level of sincerity and sense of responsibility of a student as per the level of the complexity of the subjects each one studies. This sense of sincerity and responsibility should begin from the time the student steps in XII.

With mercury rising to unprecedented heights, it is that time of the year where Summer Vacations provide us a little respite from the scorching heat. At the same time it also allows students enough time for introspection, reviewing past performances, learning from mistakes, goal setting, planning strategically and tactically, identifying obstacles to success. Gearing up for this wonderful period of rejuvenation, let us prepare ourselves to utilize our time in many constructive ways. So, with the idea of fostering new learning experiences and to enhance individual inquisitiveness, the school has planned some to channelize the energies of the young MAPIANS.

Here are some guidelines for you to invigorate your ward while giving him the chance to enjoy this period of unrestrained fun.

- Learning doesn't stop when school is out.
- Work smart, not hard.
- For every hour of electronics time, you owe an hour of outside playtime.
- Reading is a must.
- Before you ask for a favor, do a chore.
- There's no sleeping all day or staying up all night.
- Be honest to a fault.
- Question every fact
- Do better today than you did yesterday.

Holiday Homework (for all subjects) must be submitted as per the mentioned dates.

- **5th July, Physics / Accountancy**
- **8th July, B.Studies / Chemistry**
- **10th July, English**
- **12th July, Mathematics/ I.P**
- **15th July, Optional/ Economics**

ENGLISH

- ***The following homework to be done on A4 size sheets and must be submitted in a transparent folder***

1. Read "CHIEF SEATTLE 'S SPEECH " and write the analysis for the same in not more than 100 words.
2. Read the prose 'The old man and the bridge" by Earnest Hemingway and critically analyze the character of the old man in not more than 100 words.

- ***The following homework to be done in your CLASS WORK REGISTER itself***
  1. Read the following poem and write down the message that the poem tries to put forth in not more than 100 words.

Nine Gold Medals

- (David Roth)
  The athletes had come from so many the countries
  To run for the gold and the silver and bronze
  Many weeks and months in training
  All building up to the games

  All round the field spectators were gathered
  Cheering on all the young women and men
  Then the final event of the day was approaching
  The last race about to begin

  The loudspeakers called out the names of the runners
  The one hundred metres the race to be run
  And nine young athletes stood there determined
  And poised for the sound of the gun

  The signal was given, the pistol exploded
  And so did the runners on hearing the sound
  But the youngest among them stumbled and staggered
  And he fell on his knees to the ground

  He gave out a cry of frustration and anguish
  His dreams and his efforts dashed in the dirt
  But as sure as I'm standing here telling the story
  Now it's a strange one, but here's what occurred

  The eight other athletes stopped in their tracks
  The ones who had trained for so long to compete

One by one they turned round and came back to help him
And lifted the lad to his feet

Then all nine runners joined hands and continued
The one hundred metres reduced to a walk
And the banner above that said "Special Olympics"
Could not have been nearer the mark

That's how the race ended, nine gold medals
They came to the finish line holding hands still
And the banner above and nine smiling faces
Said more than these words ever will
Said more than these words ever will

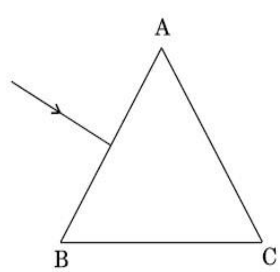
2. Draw a poster on the CONSERVATION OF WATER and SAVING OUR SPARROWS
3. **PRACTICE MANNUAL**- Attempt Q1 and Q2 of ADVERTISEMENTS, NOTICE, and LETTER TO THE EDITOR
4. Write down the notes and summary of the chapter **'INDIGO'**

PHYSICS

1) Complete all the given practical in physics practical file.
2) Complete physics investigatory project on the topic assigned to you.
3) Solve all the questions from NCERT of Chapter :9,10,1& 2 and also prepare one mark twenty questions from these chapters.
4) Solve all the questions of the given below.

(a) Show using a proper diagram how unpolarised light can be linearly polarised by reflection from a transparent glass surface.

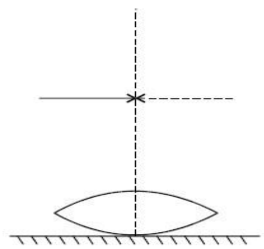
(b) The figure shows a ray of light falling normally on the face AB of an equilateral glass prism having refractive index 3/2 , placed in water of refractive index 4/3 . Will this ray suffer total internal reflection on striking the face AC ? Justify your answer.



(C) If one of two identical slits producing interference in Young's experiment is covered with glass, so that the light intensity passing through it is reduced to 50%, find the ratio of the maximum and minimum intensity of the fringe in the interference pattern.

(d) What kind of fringes do you expect to observe if white light is used instead of monochromatic light ?

2. A symmetric biconvex lens of radius of curvature R and made of glass of refractive index 1·5, is placed on a layer of liquid placed on top of a plane mirror as shown in the figure. An optical needle with its tip on the principal axis of the lens is moved along the axis until its real, inverted image coincides with the needle itself. The distance of the needle from the lens is measured to be x. On removing the liquid layer and repeating the experiment, the distance is found to be y. Obtain the expression for the refractive index of the liquid in terms of x and y.



3.

a) Draw a ray diagram to show image formation when the concave mirror produces a real, inverted and magnified image of the object.

b) Obtain the mirror formula and write the expression for the linear magnification.

c) Explain two advantages of a reflecting telescope over a refracting telescope.

d) Define a wavefront. Using Huygens' principle, verify the laws of reflection at a plane surface.

e) In a single slit diffraction experiment, the width of the slit is made double the original width. How does this affect the size and intensity of the central diffraction band ? Explain.

When a tiny circular obstacle is placed in the path of light from a distant source, a bright spot is seen at the centre of the obstacle. Explain why.

4. How does the angle of minimum deviation of a glass prism vary, if the incident violet light is replaced by red light ? Give reason.

5. Draw the intensity pattern for single slit diffraction and double slit interference. Hence, state two difference between interference and diffraction patterns.

6. Unpolarised light is passed through a polaroid P_1. When this polarised beam passes through another polaroid P_2 and if the pass axis of P_2 makes angle θ with the pass axis of P_1, then write the expression for the polarised beam passing through P2. Draw a plot showing the variation of intensity when θ varies from 0 to 2π.

a) Monochromatic light of wavelength 589 nm is incident from air on a water surface. If μ for water is 1.33, find the wavelength, frequency and speed of the refracted light.

b) A double convex lens is made of a glass of refractive index 1.55, with both faces of the same radius of curvature. Find the radius of curvature required, if the focal length is 20 cm.

7. a) Draw a ray diagram depicting the formation of the image by an astronomical telescope in normal adjustment.

b) You are given the following three lenses. Which two lenses will you use as an eyepiece and as an objective to construct an astronomical telescope? Give reason.

Lenses	Power (D)	Aperture (cm)
L_1	3	8
L_2	6	1
L_3	10	1

8. **a)** Define wavefront. Use Huygens' principle to verify the laws of refraction.

b) How is linearly polarised light obtained by the process of scattering of light ? Find the Brewster angle for air – glass interface, when the refractive index of glass = 1.5

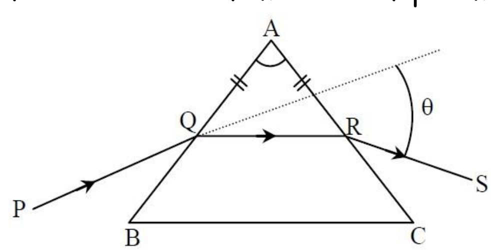
9. a) Draw a ray diagram to show the image formation by a combination of two thin convex lenses in

contact. Obtain the expression for the power of this combination in terms of the focal lengths of the lenses.

b) A ray of light passing from air through an equilateral glass prism undergoes minimum deviation when the angle of incidence is $\frac{3}{4}$ th of the angle of prism. Calculate the speed of light in the prism.

10. Why can't we see clearly through fog ? Name the phenomenon responsible for it.

11. A ray PQ incident on the refracting face BA is refracted in the prism BAC as shown in the figure and emerges from the other refracting face AC as RS such that AQ = AR. If the angle of prism A = 60^0 and refractive index of material of prism is $\sqrt{3}$, calculate angle θ.



12. **i)** Derive Snell's law on the basis of Huygen's wave theory when light is travelling from a denser to a rarer medium

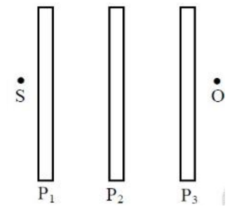
ii) Draw the sketches to differentiate between plane wavefront and spherical wavefront.

13. **i)** A screen is placed at a distance of 100 cm from an object. The image of the object is formed on the screen by a convex lens for two different location of the lens separated by 20 cm. Calculate the focal length of the lens used.

(ii) A converging lens is kept coaxially in contact with a diverging lens-both the lenses being of equal focal length. What is the focal length of the combination?

14. **(a)** Why does unpolarised light from a source show a variation in intensity when viewed through a polaroid which is rotated ? Show with the help of a diagram, how unpolarised light from sun gets linearly polarised by scattering.

(b) Three identical polaroid sheets P_1, P_2 and P_3 are oriented so that the pass axis of P_2 and P_3 are inclined at angles of 60^0 and 90^0 respectively with the pass axis of P_1. A monochromatic source S of unpolarized light of intensity I_0 is kept in front of the polaroid sheet P_1 as shown in the figure. Determine the intensities of light as observed by the observer at O, when polaroid P_3 is rotated with respect to P_2 at angles $\theta = 30^0$ and 60^0.



c) Derive an expression for path difference in Young's double slit experiment and obtain the conditions for constructive and destructive interference at a point on the screen.

d) The intensity at the central maxima in Young's double slit experiment is I_0. Find out the intensity at a point where the path difference is $\frac{\lambda}{6}, \frac{\lambda}{4}$ *and* $\frac{\lambda}{3}$.

CHEMISTRY

1. Complete your investigatory project which you have been already alloted (except the observation part if you haven't performed your project).

<u>PROJECT FILE SHOULD CONTAIN PAGES IN FOLLOWING ORDER:</u>

a. CERTIFICATE
b. ACKNOWLEDGEMENT
c. AIM OF PROJECT
d. INTRODUCTION
e. THEORY
f. APPARATUS REQUIRED
g. PROCEDURE
h. OBSERVATION
i. CONCLUSION
j. PRECAUTION
k. BIBLIOGRAPHY

**** STRICTLY ADHERE TO ABOVE MENTIONED ORDER**

2. Make a list of all the named reactions in chapter 10 and 11 and write them in your assignment register.
3. Write all the reaction mechanism in chapter 10 and 11 in your assignment register.
4. List five distinguish test with example studied till yet.
5. Questions of CHAPTER 2 and 3 is hereby attached.
6. All assignments should be done in separate register and copy of assignment sheet should be pasted.
7. Timely submission of assignment register is must.

SOLUTIONS

1	State Henry's law correlating the pressure of a gas and its solubility in a solvent and mention two applications of the law.
2	Calculate the temperature at which a solution containing 54 g of glucose, ($C_6H_{12}O_6$) in 250 g of water will freeze. (K_f for water =1.86 K mol kg^{-1})
3	State Raoult's law for solutions of volatile liquids. Taking suitable examples explain the meaning of positive and negative deviations from Raoult's law. OR Define the term osmotic pressure. Describe how the molecular mass of a substance can be determined by a method based on measurement of osmotic pressure?
4	Define osmotic pressure. How is it that measurement of osmotic pressures is more widely used for determining molar masses of macromolecules than the rise in boiling point or fall in freezing point of their solutions? OR Derive an equation to express that relative lowering of vapour pressure for a solution is equal to the mole fraction of the solute in it when the solvent alone is volatile.
5	Differentiate between molality and molarity of a solution. What is the effect of change in temperature of a solution on its molality and molarity?
6	(a) Define the following terms: (i) Mole fraction(ii) Van't Hoff factor (b) 100 mg of a protein is dissolved in enough water to make 100 mL of a solution. If this solution has an osmotic pressure 13.3 mm Hg at 25° C, what is the molar mass of protein? (R = 0.0821 L atm mol^{-1} K^{-1} and 760 mm Hg = 1 atm.) OR What is meant by: (i) Colligative properties (ii) Molality of a solution. (b) What concentration of nitrogen should be present in a glass of water at room temperature? Assume a temperature of 25° C, total pressure of 1 atmosphere and mole fraction of nitrogen in air of 0.78. [KH for nitrogen = 8.42×10^{-7} M/mm Hg]
7	Calculate the freezing point depression for 0.0711 m aqueous solution of sodium sulphate(Na2 SO4), if it is completely ionised in solution. If this solution actually freezes at – 0.320 °C, what is the value of Van't Hoff factor for it at the freezing point? (Kf for water is 1.86°C mol–1)
8	What is 'reverse osmosis'?
9	Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and why are they caused? Explain with one example for each type.

10	A solution prepared by dissolving 1.25 g of oil of winter green (methyl salicylate) in 99.0 g of benzene has a boiling point of 80.31°C. Determine the molar mass of this compound. (B.P. of pure Benzene = 80.10°C and Kb for benzene = 2.53°C kg mol–1)
11	A solution of glycerol ($C_3H_8O_3$; molar mass = 92 g mol-1) in water was prepared by dissolving some glycerol in 500 g of water. This solution has a boiling point of 100.42°C. What mass of glycerol was dissolved to make this solution? Kb for water = 0.512 K kg mol-1.
12	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.
13	What mass of NaCl (molar mass = 58.5 g mol–1) must be dissolved in 65 g of water to lower the freezing point by 7.5°C? The freezing point depression constant, Kf , for water is 1.86 K kg mol–1. Assume van't Hoff factor for NaCl is 1.87.
14	What mass of ethylene glycol (molar mass = 62.0 g mol–1) must be added to 5.50 kg of water to lower the freezing point of water from 0°C to – 10.0°C? (Kf for water = 1.86 K kg mol–1)
15	15 g of an unknown molecular substance was dissolved in 450 g of water. The resulting solution freezes at – 0.34°C. What is the molar mass of the substance? (Kf for water = 1.86 K kg mol–1).
16	(a) Differentiate between molarity and molality for a solution. How does a change in temperature influence their values? (b) Calculate the freezing point of an aqueous solution containing 10.50 g of MgBr2 in 200 g of water. (Molar mass of MgBr2= 184 g) (Kf for water = 1.86 K kg mol–1) OR (a) Define the terms osmosis and osmotic pressure. Is the osmotic pressure of a solution a colligative property? Explain. (b) Calculate the boiling point of a solution prepared by adding 15.00 g of NaCl to 250.00 g of water. (Kb for water = 0.512 kg mol–1), (Molar mass of NaCl = 58.44 g)
17	(a) State the following: (i) Henry's law about partial pressure of a gas in a mixture. (ii) Raoult's law in its general form in reference to solutions. (b) A solution prepared by dissolving 8.95 mg of a gene fragment in 35.0 mL of water has an osmotic pressure of 0.335 torr at 25°C. Assuming the gene fragment is a non-electrolyte, determine its molar mass. OR (a) Differentiate between molarity and molality in a solution. What is the effect of temperature change on molarity and molality in a solution? (b) What would be the molar mass of a compound if 6.21g of it dissolved in 24.0 g of

	chloroform form a solution that has a boiling point of 68.04°C. The boiling point of pure chloroform is 61.7°C and the boiling point elevation constant, Kb for chloroform is 3.63°C/m.
18	A 0.561 m solution of an unknown electrolyte depresses the freezing point of water by 2.93°C. What is Van't Hoff factor for this electrolyte? The freezing point depression constant (Kf) for water is 1.86°C kg mol–1.
19	A 1.00 molal aqueous solution of trichloroacetic acid (CCl_3COOH) is heated to its boiling point. The solution has the boiling point of 100.18°C. Determine the van't Hoff factor for trichloroacetic acid. (Kb for water = 0.512 K kg mol–1) OR Define the following terms: (i) Mole fraction (ii) Isotonic solutions (iii) Van't Hoff factor (iv) Ideal solution
20	Calculate the amount of KCl which must be added to 1 kg of water so that the freezing point is depressed by 2 K. (Kf for water = 1.86 K kg mol–1)
21	At 25°C the saturated vapour pressure of water is 3.165 kPa (23.75 mm Hg). Find the saturated vapour pressure of a 5% aqueous solution of urea (carbamide) at the same temperature. (Molar mass of urea = 60.05 g mol–1)
22	(a) Define any two of the following terms: (i) van't Hoff factor (ii) Mole fraction (iii) Ebullioscopic constant (b) State Raoult's law. OR The density of water of a lake is 1.25 g (mL)–1 and one kg of this water contains 92 g of Na+ ions. what is the molarity of Na+ ions in the water of the lake? (Atomic mass of Na = 23.00 u)
23	18 g of glucose, $C_6H_{12}O_6$ (Molar Mass = 180 g mol–1) is dissolved in 1 kg of water in a sauce pan. At what temperature will this solution boil? (Kb for water = 0.52 K kg mol–1, boiling point of pure water = 373.15 K)
24	Determine the osmotic pressure of a solution prepared by dissolving 2.5×10^{-2} g of K_2SO_4 in 2 L of water at 25°C, assuming that it is completely dissociated. (R = 0.082 L atm K^{-1} mol^{-1}, Molar mass of K_2SO_4 = 174 g mol^{-1}).
25	(a) State Raoult's law for a solution containing volatile components. How does Raoult's law become a special case of Henry's law? (b) 1.00 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. Find the molar mass of the solute. (Kf for benzene = 5.12 kg mol–1) OR (a) Define the following terms: (i) Ideal solution (ii) Azeotrope (iii) Osmotic pressure (b) A solution of glucose ($C_6H_{12}O_6$) in water is labelled as 10% by weight. What would be the molality of the solution? (Molar mass of glucose = 180 g mol–1)

26	Measurement of which colligative property is preferred for determination of molar mass of biomolecules?
27	Henry's law constant (kH) for the solution of methane in benzene at 298 K is 4.27 $\times 10^5$ mm Hg. Calculate the solubility of methane in benzene at 298 K under 760 mm Hg.
28	(i) Why is an increase in temperature observed on mixing chloroform and acetone? (ii) Why does sodium chloride solution freeze at a lower temperature than water?
29	What type of deviation is shown by a mixture of ethanol and acetone? What type of azeotrope is formed by mixing ethanol and acetone?
30	Calculate the mass of compound (molar mass = 256 g mol–1) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K (Kf = 5.12 K kg mol–1).
31	Define an ideal solution and write one of its characteristics.
32	Some liquids on mixing form 'azeotropes'. What are 'azeotropes'?
33	State Henry's law. What is the effect of temperature on the solubility of a gas in a liquid?
34	State Raoult's law for the solution containing volatile components. What is the similarity between Raoult's law and Henry's law?
35	(a) Define the following terms: (i) Molarity (ii) Molal elevation constant (Kb) (b) A solution containing 15 g urea (molar mass = 60 g mol–1) per litre of solution in water has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 180 g mol–l) in water. Calculate the mass of glucose present in one litre of its solution. OR (a) What type of deviation is shown by a mixture of ethanol and acetone? Give reason. (b) A solution of glucose (molar mass = 108 g mol–1) in water is labelled as 10% (by mass). What would be the molality and molarity of the solution? (Density of solution = 1.2 g mL–1)
36	(a) State Raoult's law for a solution containing volatile components. Name the solution which follows Raoult's law at all concentrations and temperatures. (b) Calculate the boiling point elevation for a solution prepared by adding 10 g of CaCl2 to 200 g of water. (Kb for water = 0.512 K kg mol–1, Molar mass of CaCl2 = 111 g mol–1) OR (a) Define the following terms: (i) Azeotrope (ii) Osmotic pressure (iii) Colligative properties (b) Calculate the molarity of 9.8% (w/w) solution of H SO 2 4 if the density of the solution is 1.02 g mL–1. (Molar mass of H2SO4 = 98 g mol–1)

Electrochemistry

1	Conductivity of 0.00241M acetic acid solution is 7.896X 10^{-5} S cm^{-1}. Calculate its molar conductivity in this solution. If ∧m °Λ_m^0 for acetic acid is 390.5 S cm^2 mol^{-1}, what would be its dissociation constant?	5
2	The conductivity of 0.20 M solution of KCl at 298 K is 0.0248 S cm-1. Calculate its molar conductivity in this solution.	2
3	(a) Depict the galvanic cell in which the following reaction takes place: Zn (s) + $2Ag^+$ (aq)→ Zn^{2+} (aq) + 2Ag(s). Also indicate that in this cell (i) which electrode is negatively charged. (ii) what are the carrier of the current in the cell. (iii) what is the individual reaction at each electrode. (b) Write the Nernst equation and determine the e.m.f. of the following cell at 298 K: Mg(s) | Mg^{2+} (0.001M) || Cu^{2+} (0.0001M) | Cu (s) (Given : E° = Mg^{2+} /Mg = - 2.375 V, E° = Cu^{2+} /Cu = 0.34 V) OR (a) Define conductivity and molar conductivity for the solution of an electrolyte. How do they vary when the concentration of electrolyte in the solution increases? (b) Three conductivity cells A, B and C containing solutions of zinc sulphate, silver nitrate and copper sulphate respectively are connected in series. A steady current of 1.5 amperes is passed through them until 1.45 g of silver is deposited at the cathode of cell B. How long did the current flow? What mass of copper and what mass of zinc got deposited in their respective cells? (Atomic mass : Zn = 65.4 u, Ag =108 u, Cu = 63.5 u)	5
4	(a) Define molar conductivity of a substance and describe how for weak and strong electrolytes, molar conductivity changes with concentration of solute. How is such change explained? (b) A voltaic cell is set up at 25 °C with the following half cells: Ag^+ (0.001 M) | Ag and Cu^{2+} (0.10 M) | Cu What would be the voltage of this cell? (E°cell = 0.46 V OR (a) State the relationship amongst cell constant of a cell, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution? (b) A voltaic cell is set up at 25°C with the following half-cells: Al | Al^{3+} (0.001 M) and Ni | Ni^{2+} (0.50 M) Calculate the cell voltage [E°Ni^{2+}/Ni = – 0.25 V, E°Al/Al^{3+} = – 1.66 V]	5
5	(b)) A voltaic cell is set up at 25°C with the following half-cells: Al | Al^{3+} (0.001 M) and Ni | Ni^{2+} (0.50 M) Calculate the cell voltage [EoNi^{2+}/Ni = – 0.25 V, E°Al/Al^{3+} = – 1.66 V]	3

	OR (a) Express the relationship amongst cell constant, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution. (b) Calculate the equilibrium constant for the reaction. $Fe + Cd^{2+} \rightarrow Fe^{2+} + Cd$ (Given: E^oCd^{2+}/Cd = – 0.40 V, E^oFe^{2+}/Fe = – 0.44 V]).	
6	(a) Define the term molar conductivity. How is it related to conductivity of the related solution? (b) One half-cell in a voltaic cell is constructed from a silver wire dipped in silver nitrate solution of unknown concentration. Its other half-cell consists of a zinc electrode dipping in 1.0 M solution of Zn(NO3)2. A voltage of 1.48 V is measured for this cell. Use this information to calculate the concentration of silver nitrate solution used. (Given : E° = Zn^{2+} /Zn = - 0.76 V and E° = Ag^{2+}/ Ag = 0 .80 V) **OR** (a) Corrosion is essentially an electrochemical phenomenon. Explain the reactions occurring during corrosion of iron kept in an open atmosphere. (b) Calculate the equilibrium constant for the reaction. $Fe + Cd^{2+} \rightarrow Fe^{2+} + Cd$ (Given: E^oCd^{2+}/Cd = – 0.40 V, E^oFe^{2+}/Fe = – 0.44 V]).	
7	A copper-silver cell is set up. The copper ion concentration in it is 0.10 M. The concentration of silver ion is not known. The cell potential measured 0.422 V. Determine the concentration of silver ion in the cell. (Given: E° = Ag^{2+}/ Ag = 0 .80 V and E° = Cu^{2+} /Cu = 0.34 V)	3
8	(a) State Kohlrausch law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch law. (b) Calculate Λ_m^0 for acetic acid. Given that Λ_m^0 (HCl) = 426 S cm2 mol–1 , Λ_m^0 (NaCl) = 126 S cm2 mol–1 , Λ_m^0 (CH3COONa) = 91 S cm2 mol–1	5
9	Express the relation among the cell constant, the resistance of the solution in the cell and the conductivity of the solution. How is the conductivity of a solution related to its molar conductivity?	2
10	Given that the standard electrode potential (E°) of metals are: K^+/ K = – 2.93 V, Ag^+ /Ag =0.80V, = Cu^{2+}/ Cu = 0.34 V, Mg^{2+} / Mg= 2.37V, Cr^{3+} / Cr= 0.74V, Fe^{2+}/ Fe = 0.44V	2

	Arrange these metals in an increasing order of their reducing power. OR Two half-reactions of an electrochemical cell are given below: MnO_4^-(aq) + 8H$^+$(aq) + 5e$^-$ → Mn^{2+}(aq) + 4H_2O(l), E° = + 1.51 V Sn^{2+}(aq) → Sn^{4+}(aq) + 2e–, E° = + 0.15V Construct the redox reaction equation from the two half-reactions and calculate the cell potential from the standard potentials and predict if the reaction is reactant or product favoured.	
11	Write the anode and cathode reactions occurring in a commonly used mercury cell. How is the overall reaction represented?	2
12	One half-cell in a voltaic cell is constructed from a silver wire dipped in silver nitrate solution of unknown concentration. The other half-cell consists of a zinc electrode in a 0.10 M solution of Zn (NO3)2. A voltage of 1.48 V is measured for this cell. Use this information to calculate the concentration of silver nitrate solution. (Given : E° = Zn^{2+} /Zn = - 0.76 V and E° = Ag^{2+}/ Ag = 0 .80 V)	3
13	Determine the values of equilibrium constant (KC) and ΔG° for the following reaction: Ni(s) + 2Ag$^+$(aq) → Ni^{2+}(aq) + 2Ag(s), E° = 1.05 V	2
14	Express the relation among the conductivity of solution in the cell, the cell constant and the resistance of solution in the cell.	1
15	(a) What type of a battery is lead storage battery? Write the anode and cathode reactions and the overall cell reaction occurring in the operation of a lead storage battery. (b) Calculate the potential for half-cell containing 0.10M $K_2Cr_2O_7$ (aq), 0.20MCr^{3+} (aq) and 1.0×10^{4}MH$^+$(aq) The half cell reaction is $Cr_2O_7^{2-}$(aq) + 14H$^+$(aq) + 6e– → 2Cr^{3+}(aq) + 7H2O(l) and the standard electrode potential is given as E° =1.33V. OR (a) How many moles of mercury will be produced by electrolysing 1.0 M. Hg(NO3)2 solution with a current of 2.00 A for 3 hours? (b) A voltaic cell is set up at 25° C with the following half-cells Al^{3+} (0.001 M) and Ni^{2+} (0.50 M). Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential. [E°Ni^{2+}/Ni = – 0.25 V, E°Al/Al^{3+} = – 1.66 V]	5

16	(a) What type of a battery is the lead storage battery? Write the anode and the cathode reactions and the overall reaction occurring in a lead storage battery when current is drawn from it. (b) In the button cells widely used in watches and other devices the following reaction takes place : $Zn(s) + Ag_2O + H_2O \rightarrow Zn^{2+} (aq) + 2Ag(s) + 2OH^-$ (aq). Determine $\Delta_r G°$ for the reaction. (Given : E° = Zn^{2+} /Zn = - 0.76 V and E° = Ag^+/ Ag = 0 .34 V) **OR** (a) Define molar conductivity of a solution and explain how molar conductivity changes with change in concentration of solution for a weak and a strong electrolyte. (b) The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1500Ω. What is the cell constant if the conductivity of 0.001 M KCl solution at 298 K is 0.146 × 10–3 S cm–1?	5
17	The molar conductivity of a 1.5 M solution of an electrolyte is found to be 138.9 S cm2 mol–1. Calculate the conductivity of this solution.	2
18	The electrical resistance of a column of 0.05 M NaOH solution of diameter 1 cm and length 50 cm is 5.55×10^3 ohm. Calculate its resistivity, conductivity and molar conductivity.	3
19	(a) Define the term molar conductivity and explain how molar conductivity changes with solution concentration for weak and strong electrolytes. (b) A strip of nickel metal is placed in a 1-molar solution of Ni(NO3)2 and a strip of silver metal is placed in a 1-molar solution of AgNO3. An electrochemical cell is created when the two solutions are connected by a salt bridge and the two strips are connected by wires to a voltmeter. (i) Write the balanced equation for the overall reaction occurring in the cell and calculate the cell potential (ii) Calculate the cell potential, E, at 25°C for the cell if the initial concentration of Ni(NO3)2 is 0.100 molar and the initial concentration of AgNO3 is 1.00 molar. [E°Ni^{2+}/Ni = – 0.25 V; E° = Ag^{2+}/ Ag = 0 .80 V, log 10–1 = – 1]?	5
20	Calculate the emf of the following cell at 298 K: Fe (s) | Fe2+ (0.001 M) || H+ (1M) | H2 (g) (1 bar), Pt (s) (Given E^0cell = + 0.44 V)	3
21	The standard electrode potential (E°) for Daniell cell is + 1.1 V. Calculate the ΔG° for the reaction Zn(s) +Cu2+ (aq) → Zn2+ (aq) + Cu(s)	2

22	Calculate the emf of the following cell at 25oC: Ag(s)/Ag+(10-3M) || Cu2+(10-1M) / Cu (s) Given E^0cell = + 0.46 V	3
23	Calculate emf and ΔG° for the following cell at 298 K: Mg(s) | $Mg^{2+}(10^{-3}$ M) | | $Cu^{2+}(10^{-4}$ M) | Cu(s) Given E^0Mg^{2+}/Mg = – 2.36 V and E^0Cu^{2+}/Cu = + 0.34 V	3
24	(a) Define the following terms: (i) Limiting molar conductivity (ii) Fuel cell (b) Resistance of a conductivity cell filled with 0.1 mol L–1 KCl solution is 100 Ω. If the resistance of the same cell when filled with 0.02 mol L–1KCl solution is 520 Ω, calculate the conductivity and molar conductivity of 0.02 mol L–1KCl solution. The conductivity of 0.1 mol L–1KCl solution is 1.29 × 10–2 Ω–1 cm–1 **OR** (a) State Faraday's first law of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of Cu2+ to Cu? (b) Calculate emf of the following cell at 298 K: Mg(s)/ Mg2+ (0.1M) || Cu2+ (0.01)/Cu(s) [Given E^0cell = 2.71 V, 1 F = 96500 C/ mol]	5
25	(a) Calculate ΔrG ofor the reaction Mg(s) + Cu2+(aq) → Mg2+(aq) + Cu(s) Given: E^0cell = 2.71V (b) Name the type of cell which was used in Apollo space programme for providing electrical power.	3
26	Define the following terms: (i) Fuel cell (ii) Limiting molar conductivity (∧m °)	2
27	Define the following terms: (i) Molar conductivity (∧m) (ii) Secondary batteries	2
28	A solution of Ni(NO3)2 is electrolysed between platinum electrodes using a current of 5.0 ampere for 20 minutes. What mass of nickel will be deposited at the cathode? (Given: At. Mass of Ni = 58.7 g mol–1, 1 F = 96500 C mol–1)	2
29	(i) Write two advantages of H2 – O2 fuel cell over ordinary cell. (ii) Equilibrium constant (Kc) for the given cell reaction is 10. Calculate Ecell ° . A(s) + B^{2+} (aq) ⇆ A^{2+}(aq) + B(s)	3

MATHEMATICS

"There is no end to education. It is not that you read a book, pass an examination, and finish with education. The whole of life, from the moment you are born to the moment you die, is a process of learning."

Do the following activities in the lab manual Mathematics from the prescribed book

Activity 1: To draw the graph of $\sin^{-1}x$, using the graph of sinx and demonstrate the concept of mirror reflection about the line y=x

Activity 2: To explore the principal value of the function sin-1x using a unit circle.

Activity 3: To find the analytically the limit of the function f(x) at x=c and also to check the continuity of the function at that point.

Activity 4: To verify Rolle's Theorem.

Activity 5: To verify Lagrange's Mean value theorem

Activity 6: To construct an open box of maximum volume from a given rectangular sheet by cutting a square from each corner.

Activity 7: to verify that amongst all the rectangles of the same perimeter, the square has the maximum area.

ASSIGNMENT FROM NCERT EXEMPLAR
CHAPTER - 2
INVERSE TRIGONOMETRIC FUNCTIONS

1. Evaluate : $\tan^{-1}\left(sin\left(\frac{\pi}{2}\right)\right)$.
2. Find the value of $\tan^{-1}\left(tan\ \frac{9\pi}{8}\right)$.
3. Evaluate : $\sin^{-1}\left[cos\left(\sin^{-1}\frac{\sqrt{3}}{2}\right)\right]$.
4. Find the value of sin $\left[2\ \cot^{-1}\left(\frac{-5}{12}\right)\right]$.
5. Evaluate : cos $\left[\sin^{-1}\frac{1}{4}+\ \sec^{-1}\frac{4}{3}\right]$.
6. Prove that: $2\ \sin^{-1}\frac{3}{5}-\ \tan^{-1}\frac{17}{31}=\frac{\pi}{4}$.
7. Prove that $\cot^{-1}7 + \cot^{-1} 8 + \cot^{-1} 18 = \cot^{-1} 3$.
8. Find the value of $\sin\left(2\ \tan^{-1}\frac{2}{3}\right)+cos\ (\tan^{-1}\sqrt{3})$.
9. Find the value of x which satisfy the equation $\sin^{-1} x + \sin^{-1} (1 - x) = \cos^{-1} x$.

10. Solve the equation $\sin^{-1} 6x + \sin^{-1} 6\sqrt{3}\, x = -\frac{\pi}{2}$.

11. Find the value of $\tan^{-1}\left(\tan\frac{5\pi}{6}\right) + \cos^{-1}\left(\cos\frac{13\pi}{6}\right)$.

12. Prove that $\cot\left(\frac{\pi}{4} - 2\cot^{-1} 3\right) = 7$.

13. Solve the following equation $\cos(\tan^{-1} x) = \sin(\cot^{-1}\frac{3}{4})$.

14. Prove that $\tan^{-1}\left(\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right) = \frac{\pi}{4} + \frac{1}{2}\cos^{-1} x^2$.

15. Prove that $\sin^{-1}\frac{8}{17} + \sin^{-1}\frac{3}{5} = \sin^{-1}\frac{77}{85}$.

16. Show that $\tan\left(\frac{1}{2}\sin^{-1}\frac{3}{4}\right) = \frac{4-\sqrt{7}}{3}$ and justify why the other value $\frac{4+\sqrt{7}}{3}$ is ignored?

CHAPTER – 3

MATRICES

1. If $\begin{bmatrix} 2x & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix} \begin{bmatrix} x \\ 8 \end{bmatrix} = 0$, find the value of x.

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

3. Let $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$. then show that $A^2 - 4A + 7I = 0$. Using this result calculate A^5 also.

4. If a matrix has 28 elements, what are the possible orders it can have? What if it has 13 elements?

5. If possible, find BA and AB, where $A = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}, B = \begin{bmatrix} 4 & 1 \\ 2 & 3 \\ 1 & 2 \end{bmatrix}$.

6. Show that A′A and AA′ are both symmetric matrices for any matrix A.

7. If $A = \begin{bmatrix} 0 & -x \\ x & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $x^2 = -1$, then show that $(A + B)^2 = A^2 + B^2$.

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

CHAPTER – 4

DETERMINANTS

1. If $\Delta = \begin{vmatrix} 1 & x & x^2 \\ 1 & y & x^2 \\ 1 & z & x^2 \end{vmatrix}$, $\Delta_1 = \begin{vmatrix} 1 & 1 & 1 \\ yz & zx & xy \\ x & y & z \end{vmatrix}$, then prove that $\Delta + \Delta_1 = 0$.

2. If x = -4 is a root of $\Delta = \begin{vmatrix} x & 2 & 3 \\ 1 & x & 1 \\ 3 & 2 & x \end{vmatrix} = 0$, then find the other two roots.

3. Evaluate : $\begin{vmatrix} 3x & -x+y & -x+z \\ x-y & 3y & z-y \\ x-z & y-z & 3z \end{vmatrix}$.

4. Evaluate: $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$

5. Prove that: $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$ = $(a - 1)^3$.

6. If A= $\begin{bmatrix} 4-x & 4+x & 4+x \\ 4+x & 4-x & 4+x \\ 4+x & 4+x & 4-x \end{bmatrix}$ and |A|=0 Then find values of x.

7. If A = $\begin{bmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{bmatrix}$, find A^{-1}.

8. Using matrix method, solve the system of equations 3x + 2y – 2z = 3, x + 2y + 3z = 6, 2x – y + z = 2.

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

   y + 2z = 7, x – y = 3, 2x + 3y + 4z = 17.

10. If A = $\begin{bmatrix} x & 5 & 2 \\ 2 & y & 3 \\ 1 & 1 & z \end{bmatrix}$, xyz = 80, 3x + 2y + 10z = 20, then A adj. A = $\begin{bmatrix} 81 & 0 & 0 \\ 0 & 81 & 0 \\ 0 & 0 & 81 \end{bmatrix}$.

CHAPTER – 5
CONTINUITY AND DIFFERENTIABILITY

1. If f(x) = $\begin{cases} \frac{x^3+x^2-16x+20}{(x-2)^2}, & x \neq 2 \\ k & x = 2 \end{cases}$ is continuouse at x = 2, find the value of k.

2. Differentiate $\sqrt{tan\,\sqrt{x}}$ w.r.t x.

3. Find $\frac{dy}{dx}$, if y = $\tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right), -\frac{1}{\sqrt{3}} < x < \frac{1}{\sqrt{3}}$.

4. If y = $\sin^{-1}\left\{x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2}\right\}$ then find $\frac{dy}{dx}$.

5. If x = a $\sec^3\theta$ and y = a $\tan^3\theta$, find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{3}$.

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

7. Verify Rolle's theorem for the function, f(x) = sin 2x in [0, $\frac{\pi}{2}$].

8. Let f(x) = $\begin{cases} \frac{1-cos\,4x}{x^2}, & if\ x < 0 \\ a, & if\ x = 0 \\ \frac{\sqrt{x}}{\sqrt{16+\sqrt{x}}-4}, & if\ x > 0 \end{cases}$, for what value of a, f is continuous at x = 0?

9. Find $\frac{dy}{dx}$, if y = $x^{\tan x} + \sqrt{\frac{x^2+1}{2}}$.

10. If x = sint and y = sin pt, prove that $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + p^2 y = 0$.

11. If $x^m . y^n = (x + y)^{m+n}$, prove that:- (i) $\frac{dy}{dx} = \frac{y}{x}$ and (ii) $\frac{d^2y}{dx^2} = 0$.

12. Differentiate $\tan^{-1} \frac{\sqrt{1-x^2}}{x}$ with respect to $\cos^{-1} (2x\sqrt{1-x^2})$

13. find the value of k so that the function f is continuous at the indicated point:

$$f(x) = \begin{cases} \frac{\sqrt{1+kx}-\sqrt{1-kx}}{x}, & if -1 \le x < 0 \\ \frac{2x+1}{x-1}, & if\ 0 \le x \le 1 \end{cases} \quad \text{at } x = 0$$

14. find the values of a and b such that the function f defined by $f(x) = \begin{cases} \frac{x-4}{|x-4|} + a, & if x < 4 \\ a + b, & if\ x = 4 \\ \frac{x-4}{|x-4|} + b, & if\ x > 4 \end{cases}$

is a continuous function at x = 4.

CHAPTER – 6

APPLICATION OF DERIVATIVES

1. For the curve $y = 5x - 2x^3$, if x increase at the rate of 2 units/sec, then how fast is the slope of curve changing when x = 3?

2. Determine for which values of x, the function $y = x^4 - \frac{4x^3}{3}$ is increasing and for which values, it is decreasing.

3. Show that the function $f(x) = 4x^3 - 18x^2 + 27x - 7$ has neither maxima nor minima.

4. Using differentials, find the approximate value of $\sqrt{0.082}$.

5. Find all the points of local maxima and local minima of the function $f(x) = -\frac{3}{4}x^4 - 8x^3 - \frac{45}{2}x^2 + 105.$

6. Find the equation of all the tangents to the curve $y = \cos(x + y)$, $-2\pi \le x \le 2\pi$, that are parallel to the line $x + 2y = 0$.

7. Show that the equation of normal at any point on the curve $x = 3\cos\theta - \cos^3\theta$, $y = 3\sin\theta - \sin^3\theta$ is $4(y\cos^3\theta - x\sin^3\theta) = 3\sin 4\theta$.

8. Find the area of greatest rectangle that can be increased in an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

9. An isosceles triangle of vertical angle 2θ is inscribed in a circle of radius a. show that the area of triangle is maximum when $\theta = \frac{\pi}{6}$.

10. If the area of a circle increases at a uniform rate, then prove that perimeter varies inversely as the radius.

11. The volume of a cube increases at a constant rate. Prove that the increase in its surface area varies inversely as the length of the side.

12. Find the condition that the curves $2x = y^2$ and $2xy = k$ intersect orthogonally.

13. At what points on the curve $x^2 + y^2 - 2x - 4y + 1 = 0$, the tangents are parallel to the y – axis?

14. Show that $f(x) = \tan^{-1}(\sin x + \cos x)$ is an increasing function in $\left(0, \frac{\pi}{4}\right)$.

15. If the sum of the lengths of the hypotenuse and a side of a right angled triangle is given, show that the area of the triangle is maximum when the angle between them is $\left(\frac{\pi}{3}\right)$

16. An open box with square base is to be made of a given quantity of card board of area c^2. show that the maximum volume of the box is $\frac{c^3}{6\sqrt{3}}$ cubic units.

17. If the sum of the surface areas of cube and a sphere is constant, what is the ratio of an edge of the cube of the diameter of the sphere, when the sum of their volumes is minimum?

MULTIPLE QUESTIONS (NCERT EXEMPLAR PROBLEMS)

1. The principal value branch of $\sec^{-1}$ is

a. $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$ b. $[0, \pi] - \left\{\frac{\pi}{2}\right\}$ c. $(0, \pi)$ d. $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

2. The principal value of the expression $\cos^{-1}[\cos(-680^0)]$ is

a. $\frac{2\pi}{9}$ b. $\frac{-2\pi}{9}$ c. $\frac{34\pi}{9}$ d. $\frac{\pi}{9}$

3. If $\tan^{-1} x = \frac{\pi}{10}$ for some $x \in R$, then the value of $\cot^{-1} x$ is

a. $\frac{\pi}{5}$ b. $\frac{2\pi}{5}$ c. $\frac{3\pi}{5}$ d. $\frac{4\pi}{5}$

4. The principal value of $\sin^{-1}\left(\frac{-\sqrt{3}}{2}\right)$ is

a. $-\frac{2\pi}{3}$ b. $-\frac{\pi}{3}$ c. $\frac{4\pi}{3}$ d. $\frac{5\pi}{3}$

5. The greatest and least values of $(\sin^{-1} x)^2 + (\cos^{-1} x)^2$ are respectively

a. $\frac{5\pi^2}{4}$ and $\frac{\pi^2}{8}$ b. $\frac{\pi}{2}$ and $\frac{-\pi}{2}$ c. $\frac{\pi^2}{4}$ and $\frac{-\pi^2}{4}$ d. $\frac{\pi^2}{4}$ and 0.

6. If $\sin^{-1} x + \sin^{-1} y = \frac{\pi}{2}$, then value of $\cos^{-1} x + \cos^{-1} y$ is

a. $\frac{\pi}{2}$ b. π c. 0 d. $\frac{2\pi}{3}$

7. The value of the expression $\sin[\cot^{-1}(\cos(\tan^{-1} 1))]$ is

a. 0 b. 1 c. $\frac{1}{\sqrt{3}}$ d. $\sqrt{\frac{2}{3}}$

8. Which of the following is the principal value branch of $\operatorname{cosec}^{-1} x$?

a. $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ b. $(0, \pi) - \left\{\frac{\pi}{2}\right\}$ c. $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ d. $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$

9. If $3\tan^{-1} x + \cot^{-1} x = \pi$, then x equals

a. 0 b. 1 c. -1 d. $\frac{1}{2}$

10. If $\cos\left(\sin^{-1}\frac{2}{5} + \cos^{-1} x\right) = 0$, then x is equal to

a. $\frac{1}{5}$ b. $\frac{2}{5}$ c. 0 d. 1

11. The value of $\cos^{-1}\left(\cos\frac{3\pi}{2}\right)$ is equal to

a. $\frac{3\pi}{2}$ b. $\frac{5\pi}{2}$ c. $\frac{\pi}{2}$ d. $\frac{7\pi}{2}$

12. The value of the expression $2\sec^{-1} 2 + \sin^{-1}\left(\frac{1}{2}\right)$ is

a. $\frac{\pi}{6}$ b. $\frac{5\pi}{6}$ c. 1 d. $\frac{7\pi}{6}$

13. If $\sin^{-1}\left(\frac{2a}{1+a^2}\right) + \cos^{-1}\left(\frac{1-a^2}{1+a^2}\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, where a, x ∈] 0, 1, then the value of x is

a. 0 b. $\frac{a}{2}$ c. a d. $\frac{2a}{1-a^2}$

14. The value of the expression $\tan\left(\frac{1}{2}\cos^{-1}\frac{2}{\sqrt{5}}\right)$ is

a. $2 + \sqrt{5}$ b. $\sqrt{5} - 2$ c. $5 + \sqrt{2}$ d. $\frac{\sqrt{5}+2}{2}$

15. If A and B are two matrices of the order 3 × m and 3 × n. respectively, and m = n, then the order of matrix (5A – 2B) is

a. m × 3 b. 3 × 3 c. m × n d. 3 × n

16. if $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then A^2 is equal to

a. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ b. $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$ c. $\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$ d. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

17. If A is matrix of order m × n and B is a matrix such that AB′ and B′A are both defined, then order of matrix B is

a. m × m b. n × n c. m × n d. n × m

18. if A and B are matrices of same order, then (AB′ - BA′) is a

a. skew symmetric matrix

b. null matrix

c. symmetric matrix

d. unit matrix

19. If A is a square matrix such that $A^2 = I$, then $(A - I)^3 + (A + I)^3 - 7A$ is equal to

a. A b. I – A c. I + A d. 3A

20. For any two matrices A and B, we have

a. AB = BA b. AB ≠ BA c. AB= 0 d. none of these

21. If x , y ∈ R, then the determinant $\Delta = \begin{vmatrix} \cos x & -\sin x & 1 \\ \sin x & \cos x & 1 \\ \cos(x+y) & -\sin(x+y) & 0 \end{vmatrix}$ lies in the interval

a. $[-\sqrt{2}, \sqrt{2}]$ b. [-1, 1] c. $[-\sqrt{2}, 1]$ d. $[-1. -\sqrt{2}]$

22. The value of determinant $\begin{vmatrix} a-b & b+c & a \\ b-a & c+a & b \\ c-a & a+b & c \end{vmatrix}$

a. $a^3 + b^3 + c^3$ b. 3 bc c. $a^3 + b^3 + c^3 - 3abc$ d. none of these

23. The value of determinants $\begin{vmatrix} b^2-ab & b-c & bc-ac \\ ab-a^2 & a-b & b^2-ab \\ bc-ac & c-a & ab-a^2 \end{vmatrix}$ equals

a. abc(b-c) (c-a) (a-b) b. (b-c) (c-a) (a-b) c. (a+b+c)(b-c) (c-a) (a-b) d. None of these

24. The maximum value of $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1+\cos\theta & 1 & 1 \end{vmatrix}$ is (θ is a real number)

a. $\frac{1}{2}$ b. $\frac{\sqrt{3}}{2}$ c. $\sqrt{2}$ d. $\frac{2\sqrt{3}}{4}$

25. If A = $\begin{bmatrix} 2 & \lambda & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{bmatrix}$, then A^{-1} exists if

a. λ = 2 b. λ ≠ 2 c. λ ≠ -2 d. none of these

26. If x, y, z are all different from zero and $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix}$ = 0, then value of $x^{-1} + y^{-1} + z^{-1}$ is

a. x y z b. $x^{-1}\ y^{-1}\ z^{-1}$ c. –x-y-z d. -1

27. The function f(x) = $\begin{cases} \frac{\sin x}{x} + \cos x, & if\ x \neq 0 \\ k, & if\ x = 0 \end{cases}$ is continuous at x = 0, then the value of k is

a. 3 b. 1 c. 2 d. 1.5

28. The function f(x) = [x] denotes the greatest integer function, continuous at

a. 4 b. -2 c. 1 d. 1.5

29. The function f(x) = $|x| + |x+1|$ is

a. Continuous at x = 0 as well as x = 1

b. Continuous at x = 1 but not at x = 0

c. Discontinuous at x = 0 as well as at x = 1

d. Continuous at x = 0 but not at x = 1

30. The value of k which makes the function defined by f(x) = $\begin{cases} \sin\frac{1}{x}, & if\ x \neq 0 \\ k, & if\ x = 0 \end{cases}$, continuose at x = 0 is

a. 8 b. 1 c. -1 d. none of these

31. If u = $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ and y = $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$, then $\frac{du}{dv}$ is

a. $\frac{1}{2}$ b. x c. $\frac{1-x^2}{1+x^2}$ d. 1

32. The value of c in Mean value theorem for the function f(x) = x(x – 2), x ∈ [1. 2] is

a. $\frac{3}{2}$ b. $\frac{2}{3}$ c. $\frac{1}{2}$ d. $\frac{3}{2}$

33. The set of points where the function f given by f(x) = $|2x-1|$ sinx is differentiable is

a. R b. R - $\left\{\frac{1}{2}\right\}$ c. (0, ∞) d. none of these

34. If y = log $\left(\frac{1-x^2}{1+x^2}\right)$, then find $\frac{dy}{dx}$ is equal to

a. $\frac{4x^3}{1-x^4}$ b. $\frac{-4x}{1-x^4}$ c. $\frac{1}{4-x^4}$ d. $\frac{-4x^3}{1-x^4}$

35. If x = t^2 , y = t^3 , then $\frac{d^2y}{dx^2}$ is

a. $\frac{3}{2}$ b. $\frac{3}{4t}$ c. $\frac{3}{2t}$ d. $\frac{3}{2t}$

36. The value of c on Rolle's theorem for the function f(x) = x^3 - 3x in the interval [0, $\sqrt{3}$] is

a. 1 b. -1 c. $\frac{3}{2}$ d. $\frac{1}{3}$

37. For the function f(x) = x + $\frac{1}{x}$, x ∈ [1, 3], the value of c for mean value theorem is

a. 1 b. 2 c. $\sqrt{3}$ d. none of these

38. The tangent to the curve given by x = e^t . cost, y = e^t . sin t at t = $\frac{\pi}{4}$ makes with xc – axis an angle :

a. 0 b. $\frac{\pi}{4}$ c. $\frac{\pi}{3}$ d. $\frac{\pi}{2}$

39. The equation of the normal to the curve y = sin x at (0, 0) is:

a. x = 0 b. y = 0 c. x + y = 0 d. x – y = 0

40. The sides of an equilateral triangle are increasing at the ratio of 2 cm/sec. the rate at which the area increases, when side is 10 cm is:

a. 10 cm^2 /s b. $\sqrt{3}$ cm^2 /s c. 10 $\sqrt{3}$ cm^2 /s d. $\frac{10}{3}$ cm^2 /s

41. The equation of normal to the curve $3x^2 - y^2 = 8$ which is parallel to the line x + 3y = 8 is

a. 3x – y = 8 b. 3x + y + 8 = 0 c. x + 3y $\pm$8 = 0 d. x + 3y = 0

42. If $y = x^4 - 10$ and if x changes from 2 to 1.99, what is the change in y

a. .32 b. .032 c. 5.68 d. 5.968

43. The points at which the tangents to the curve $y = x^3 - 12x + 18$ are parallel to x – axis are:

a. (2, -2), (-2, -34) b. (2, 34), (-2, 0) c. (0, 34), (-2, 0) d. (2,2), (-2, 34)

44. The two curves $x^3 - 3xy^2 + 2 = 0$ and $3x^2 y - y^3 - 2 = 0$ intersect at an angle of

a. $\frac{\pi}{4}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{2}$ d. $\frac{\pi}{6}$

45. $y = x (x - 3)^2$ decreases for the values of x given by :

a. 1 < x< 3 b. x < 0 c. x > 0 d. 0< x < $\frac{3}{2}$

46. Which of the following functions is decreasing on $\left(0, \frac{\pi}{2}\right)$

a. sin 2x b. tan x c. cos x d. cos 3x

47. if x is real, the minimum value of $x^2 - 8x + 17$ is

a. -1 b. 0 c. 1 d. 2

48. The smallest value of the polynomial $x^3 - 18x^2 + 96x$ in [0,9] is

a. 126 b. 0 c. 135 d. 160

Note: Do all the Exemplar questions neatly in separate school notebook

BIOLOGY

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

- Cover page
- Index
- Acknowledgement
- Certificate
- Introduction
- Details about the project
- Annexure
- Bibliography

2. Prepare 1 mark 20 questions from each chapter 1-5. Submit in the form of typed hard copy.

COMPUTER SCIENCE

Q1. Choose any one topic for the project from the list given below::

- Player Information System
- Payroll System
- Student Management System
- Billing System(Any)
- Banking
- Hotel Management System
- Hospital Management
- Mobile Billing System
- Student Fee Management System
- Library Management System
- School Information System etc.

Complete the Project in C++ and submit the CD along with the proper project report.
Layout of the project:

- Cover Page (including name of the project, name of the student, roll no and class)
- Index
- Acknowledgement
- Content
- Output
- Bibliography

Assessment Criteria: Content, Originality, & Presentation

Q2. Programs to be compiled till Chapter-6 in the Practical file (as per the instructions already given)

PHYSICAL EDUCATION

- Write 2 practical's in Physical Education Practical File (Samar Publication).
  Practical 1. American Alliance for Health, Physical Education, Recreation & Dance (***AAHPERD***)
  Practical 2. Any one team game (Football, Basketball and Cricket)
- **Project Work**
  Perform 10 asanas given in your book (chapter 3). From every disease perform two asanas and make sure there should not be any repetition of asana. Take your own picture, print it and paste it in your project file.