General Instructions

a)   All the questions are compulsory.
b)   There are 26 questions in total.
c)   Questions 1 to 5 are very short answer type questions & carry 1 mark each.
d)   Questions 6 to 10 carry two marks each.
e)   Questions 11 to 22 carry three marks each.
f)   Questions 23 is value based questions carry four marks.
g)   Question24 to 26 carries five marks each.
h)   There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and in five marks question. You have to attempt only one of the choices in such questions.
i)   Use of calculators is not permitted. However, you may use log tables if necessary.

1.   Define the term electric dipole moment. Is it a scalar or a vector quantity?   1

2.   From the following, identify the electromagnetic waves having the (i) Maximum (ii)   1
     Minimum frequency.   (i) Radio waves (ii) Gamma-rays (iii) Visible light (iv)
     Microwaves (v) Ultraviolet rays, and (vi) Infrared rays

3.   Define angle of dip.   1

4.   Define eddy current.   1

5.   Define work function.   1

6.   You are given 'a' resistors, each of resistance 'r'. These are first connected to get   2
     minimum possible resistance. In the second case, these are again connected differently
     to get maximum possible resistance. Compute the ratio between the minimum and
     maximum values of resistance so obtained.

7.   Define self inductance and give its S.I unit. On what factors self inductance of long   2
     solenoid depends?

8.   Derive the formula of radius of circular path of charged particle when it is projected in   2
     magnetic field perpendicular to it.

9.   A parallel plate capacitor with air between the plates has a capacitance of 8 pF. The   2
     separation between the pates is now reduced by half and the space between them is
     filled with a medium of dielectric constant5. Calculate the value of capacitance of the
     capacitor in the second case.

10. Derive the root mean square value of alternating current.   2

OR

An air cored coil L and a bulb B are connected in series to the ac mains as shows in the given figure. The bulb glows with some brightness. How would the glow of the bulb change if an iron rod were inserted in the coil? Give reasons in support of your answer.
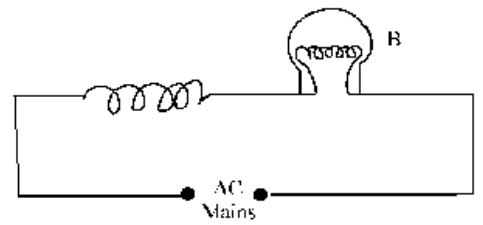
11. Define the terms half-life period and decay constant of a radioactive substance. Their Establish the relationship between the two. 3

12. Which famous experiment verifies the wave nature of matter? Describe it with the required diagram. 3

13. Derive the mirror equation. 3

14. An electric dipole of dipole moment is placed in a uniform electric field. Write the expression for the torque experienced by the dipole. Show with the help of diagram, the orientation of the dipole in the field for which the torque is (i) Maximum (ii) Half the maximum value (iii) Zero. 3

OR

Two capacitors with capacity C_1 and C_2 are charged to potential V_1 and V_2 respectively and then connected in parallel. Calculate the common potential across the combination, the charge on each capacitor, the electrostatic energy stored in the system and the change in the electrostatic energy from its initial value.

15. Explain the terms (i) electrical conductivity (ii) drift velocity 3

16. Which two main considerations are kept in mind while designing the 'objective' of an astronomical telescope? Obtain an expression for the angular magnifying power and the length of the tube of an astronomical telescope in its 'normal adjustment' position. 3

17. Derive the Einstein photo electric equation. 3

18. Define displacement current and derive its formula. 3

19. State Bohr's postulates of atomic model and using it derive expression of radius of an orbit. 3

20. What do you mean by elements of earth's magnetism? Explain them with the required diagram. 3

21. Write the relation between the angle of incidence (i), the angle of emergence (e), the angle of prism (A) and the angle of deviation (δ) for rays undergoing refraction through a prism. What is the relation between 'e' and 'i' for rays undergoing minimum deviation? Using this relation, write the expression for the refractive index (μ) of the 3

material of a prism in terms of 'A' and the angle of minimum deviation

22. Prove that an ideal capacitor, in an AC circuit does not dissipate any power.   3

OR

Derive an expression for the impedance of an ac circuit consisting of an inductor and a resistor.

23. Rahul after having lived in US for 12years returned back to India. He had a discussion   4 with his cousin Sumit on domestic power supply in US and in India. In US domestic power supply is at 110v, 50Hz, whereas in India it is 220V, 50Hz. Rahul was stressing that US supply is better than Indian supply. Both went to Sumit's father an electrical Engineer and asked his opinion on the issue. He explained that both the supplies have advantages as well as disadvantages.

A. What values are used by Rahul and Sumit?

B. Write one advantage and one disadvantage of 220V supply over 110V supply.

24. Explain the principle of a potentiometer. Describe how you will determine the internal   5 resistance of a primary cell using potentiometer.

OR

(a) Define EMF of cell and derive the formula for the equivalent EMF and internal resistance for the parallel combination of two cells with EMF E_1 and E_2 and internal resistances r_1 and r_2 respectively. (b) State kirchoff laws of circuit analysis.

25. What are coherent sources of light? State two conditions for two light sources to be   5 coherent. Derive a mathematical expression for the width of interference fringes obtained in Young's double slit experiment with the help of a suitable diagram.

OR

State Huygens' principle. Using the geometrical construction of secondary wave- lets, explain the refraction of a plane wave front incident at a plane surface. Hence verify Snell's law of refraction.

Illustrate with the help of diagrams the action of (i) convex lens and (ii) concave mirror on a plane wave front incident on it.

26. Draw a neat and labelled diagram of a cyclotron. State the underlying principle and   5 explain how a positively charged particle gets accelerated in this ma chine. Show mathematically that the cyclotron frequency does not depend upon the speed of the particle.

OR

State the Biot - Savart law for the magnetic field due to a current carrying element. Use this law to obtain a formula for magnetic field at the centre of a circular loop of radius R carrying a steady current I. Sketch the magnetic field lines for a current loop clearly indicating the direction of the field.

Instructions- 1) Attempt all the questions. Use of log table is permissible.

2) Q.No. 1 to 5 are each of 1 Mark. Ans.them in about 10-15 words.

3) Q.No. 6 to 10 are each of 2 Marks. Ans .them in about 20-30words.

4) Q.No. 11 to 22 are each of 3 Mark. Ans .them in about 30-40 words.

5) Q.No. 23 isof 4 Mark.It is value based question.

6) Q.No. 24 to26 are each of 5 Marks. Ans. them in about 50-60 words.

1.Write the formula of orthophosphoric & metaphosphoricAcid .

2. Write the IUPAC name of following compound $CH_3 (CH_2)_2CH (Br) CH_2 COOH$

3. What is meant by selectivity & activity of catalyst?

4. Write shorts notes on sandmeyor reaction.

5. what type of colloid is formed when a liquid is dispersed in a solid. Give an example?

6. i) Arrange the following compound in decreasing order of acidic strength : Phenol ,

Formic acid , Acetic Acid

ii) Write the mechanism of hydration of Ethane to form Alcohol   (1+1)

7. Ag crystallizes with FCC unit cell with side length 409 pm calculate radius of Ag atom .

8. Draw the str. Of $H_2 S_2 O_7$ & $(HPO_3)_3$

9. The conductivity of0.2M KCl sol^nat 298 K is 0.0248 Scm^{-1} Calculate its molar

conductivity?

10. State the hydrisation, magnetic behavior& geometry of $[Cr(CO)_6]$ on the basis of

valance bond theory.

11. i) What type of semiconductor is formed when Si doped with As?

   ii) ZnO is white but it turns yellow on heating, explain why?

   iii) What are Schotty defects? (3x1)

12. i) Write Nernst Eq. & calculate EMF of following cell –

Sn(s) /Sn^{+2}(0.05 M)II H^+(0.02M)/H_2(g)1bar [Given $E^0_{Sn^{+2}/Sn}$= -o.14 V]

ii) How many e- flow through a metallic wire if a current of 0.5 A is passed for 2h ?   (2+1)

13. i) What is spectrochemical series Explain the difference between weak& strong field

ligand?

ii) Explain Linkage isomerism with example?   (2+1)

14. Write short notes on following –

i) Dialysis ii) Bredig arc method   iii) Kraft Temperature

OR

14. i)What type of sol is Smoke? Write its dispersed phase & dispersion medium.

ii) Differentiate between Physiosorption & Chemisorptions.

iii) What is collodion?   (3x1)

15. The rate constant for the first order decomposition of H_2O_2 is given by the equation:

$\log k= 14.34 -1.25x10^4 K/T$

Calculate Ea for the reaction & at what temp. Will its half life be 256 min?

16. Among the following compound which is more reactive towards SN^2 reaction, towards β elimination reaction, & which is optically active-

   2-Chloro pentane,   2-bromo 2- methyl butane,   1-bromopentane

   Also give explanation of your answer.

17. Explain the following –

i) Mond Process of Ni refining (also write reaction) ii) column chromatography for purification of rare elements. Iii) Extraction of Au by cyanide process.

18. How would you obtain i) Benzoquinone from phenol

ii)p- bromo aniline from Aniline   iii) Aniline from Benzoic Acid

19. Write the Str.& name of monomer of following monomer –

Nylon-6 , Nylon66, Buna –S, terelene , Teflon, Natural Rubber.

20. Explain the following with one example of each –

i) Cationic detergent   ii) Anti fertility drug   iii) Artificial Sweeteners

21 Give reason for the following – i) PCl_5 is more covalent than PCl_3

 ii) Fe on reaction with HCl forms Fe Cl_2 not $FeCl_3$.

iii) H_3PO_2 is stronger reducing agent than H_3PO_3

22. i) Arrange these in decrease order of pK_b –

   $C_2H_5NH_2$, CH_3NH_2 , $C_6H_5NH_2$, $(C_2H_5)_2NH$,

ii) Identify A,B,C, & D in the following sequence of reaction-

A $^{NaOH /Br2}$ B $^{NaNO2 /HCl}$ C   D   ⬡

23. After watching programme on T.V. about the presence of carcinogenic pot.bromate & Potassium iodide in bread & other bakery products, Parul a XII class student decided to make others aware about this. She consulted school Principal & requested to stop the selling bakery items in school canteen. The Principal took immediate action, & instruct canteen manager to replace these bakery items with fresh fruits.

i) What value shown by Paul?

ii) What is meant by carcinogenic chemical?

iii) Which polysaccharide present in bread?

iv) Name two water soluble vitamins.

24.i)Account for the following –

a) Transition metals form alloy.   b) Zn, Cd & Hg are soft metals

c) E^0 value for Mn^{3+}/Mn^{2+} is highly positive (+1.57 V) as compared to Cr^{3+}/Cr^{2+}

ii) Describe similarity & dissimilarity of lanthanoids & Actinoids (two –two each)

OR

i)Account for the following – a)How is the variability in oxidation state of Transition metals different from that of p- block elements?

b) Out of Cu^+ & Cu^{++} which ion is unstable in aqueous soln. & why

c) Orange color of $Cr_2O_7^{-2}$ ion changes to yellow when treated with alkali why?

ii) Explain lanthanoid contraction. What are its consequences?

25. i) Explain +ve& -ve deviation of non ideal Sol^n & also draw its graph.

ii) Calculate maximum molarity of CuS in aq.Sol^n,i f $K_{s.p}$ value of CuS is $6x10^{-16}$

OR

i) Why some times we get abnormal molecular mass using colligative properties? Explain it.

ii) Calculate amount of $CaCl_2$ (i=2.47) to be dissolved in 2.5 L water so that osmotic pr. Is 0.75 atm. At 27^0 C. (2+3)

26. i) Distinguish between the following by chemical test - a) Acetophenone & benzoquinone b) Phenol & benzoic acid

ii) Account for the following –   a)

Aldehydes are more reactive than ketone.

a) Aniline does not undergo Friedel craft Reaction .

b) Carboxylic acid has higher b.p. than alcohol.

OR

i)How will you convert the following- a) benzoic acid to benzaldehyde

b) Acetophenone to benzoic acid

c) Ethanoic acid to 2- hydroxyethanoic acid

ii) An organic compound contains 69.7% Carbon 11.63% H & rest Oxygen. The molecular mass of the compound is 86 It does not reduce tollens reagent & not formsaddition compound with NaHCO3 & give +ve iodoform test. On vigorous oxidation it gives ethanoic acid & propanoic acid. Identify compound & write its structure.