Class: XII	**Subject: Physics**	F.M: 75
Time: 3 Hrs		P.M: 27

(Answers to the numerical problems should be in SI system)

1) Attempt all the questions: [8x2=16]
   a) It is well known that water level rises to a certain inside a capillary tube when immersed in water surface. What will happen if the tube is not of sufficient length?
   b) Water from a wet cloth goes on evaporating when placed outside, which means water is going from a colder region (wet cloth) to the atmosphere (which is hot at the moment). Isn't it against the Second Law of Thermodynamics?
   c) It is said that a telescope does not remain a telescope if the eyepiece and objective are reversed. Is it true?
   d) When two electric wires carrying current in the same direction are held close together, they seem to attract each other, how?
   e) When a vacuum tube conducts, the rise of current is very rapid when the voltage across the collector and emitter is low, but the rate of rise decreases as the voltage goes on increasing, why?
   f) What are the actions you can perform to increase the intensity of X-rays from a Coolidge tube?
   g) What is the nature of the path followed by an electron which enters the space between two parallel electric plates – one negative and the other positive?
   h) When a person falls through air, his/her velocity is high; but if the fall is through water, the velocity is very less, why?

2) Attempt any four questions: [4x2=8]
   a) Why is the wave-like nature of matter observed only in atomic particles but not in normal life?
   b) Why do distant objects appear smaller than nearby objects?
   c) When current flows through a solenoid, its length decreases, why?
   d) Is it possible for a thermodynamic system to 'cool' even when energy is being supplied to it from outside?
   e) Define 'Electron Cloud'. Explain why electron remains as a cloud even after being ejected from the metal surfaces?
   f) What makes you think that almost the whole mass of the atom is concentrated at the central core called 'nucleus'? Explain on the basis of Rutherford's a-scattering experiment.

3) a) Derive an expression for terminal velocity of a small spherical ball dropped gently in a viscous liquid.   [4]
   b) When a capillary tube of diameter 10^{-3} m was dipped inside a clean liquid of density 1000 kg/m^3, it was found that the liquid rises to a height of 0.03 m in the tube. Calculate the surface tension of the liquid. ($g=9.8\,m/sec^2$)   [3]

4) a) Derive an expression for the efficiency of a Carnot Engine. On the basis of the derivation, prove that no heat engines can have efficiency of unity.   [4]
   b) A Carnot engine operates between the temperatures of 30 ^{o}C and 1000 ^{o}C and the manufacturer claims that its efficiency goes over 75%. Can the claim be true?   [3]

5) a) Derive Newton's method for determining the velocity of sound in air. Explain its deficiencies and the explanation used by Laplace to solve the deficiencies. [4]
  b) If the temperature of air becomes twice, find the number of times the velocity of sound in air would increase. [3]

6) a) Derive an expression for the magnification produced in an astronomical telescope when final image is at infinity. [4]
<div align="center">OR</div>
  Derive an expression for the magnification produced in a compound microscope. [4]
  b) In Young's double slit experiment, the separation of the slits is 0.3 mm apart and the third brighter fringe is at a distance of 10 mm from the central fringe on a screen 1m away from the slits. Find the wavelength of light used. [3]

7) a) Use Biot Savart Law to derive an expression for the magnitude of magnetic flux density at a point in the axis of a narrow circular coil. [4]
  b) A horizontal wire of length 5 cm and carrying a current of 2 A is placed in the middle of a long solenoid at right angles to its axis. The solenoid has 1000 turns per meter and carries a current 'I'. Calculate 'I' if the force on the wire is vertically downwards and equal to 10^{-4} N. [3]

8) a) Find an expression for the radius of nth orbit of hydrogen-like atom. Use the expression to find the ratio of the radii of first orbit, second orbit, and third orbit and so on. [4]
  b) A beam of protons is accelerated from rest by a potential difference of 2000 V and then enters a uniform magnetic field of flux density is 0.2 T which is perpendicular to the direction of the proton beam. Calculate the radius of the path which the beam describes. [Proton mass = 1.7×10^{-27} kg., electronic charge = 1.6×10^{-19} C.] [4]

9) Explain how would a 'Vacuum Tube Diode' behave when it is connected to a source of direct current. [4]
<div align="center">OR</div>
  Define a full wave vacuum tube rectifier. Explain its construction and working. [4]

10) Describe the Coolidge Tube method of producing X-rays, explaining the requirements clearly. [4]
<div align="center">OR</div>
  Explain the experiment performed by Millikan to determine the value of 'e'. Also derive the relation formulated by him for the purpose. [4]

"If you feel that education costs a lot of money, then try ignorance; and see how much it costs."

DON BOSCO COLLEGE
2nd Terminal Exam - 2060

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Stream: Science	**Class: XII**	**F. M.: 75**
Subject: Chemistry	**Time: 3 hrs.**	**P. M.: 27**

Group A

Attempt any <u>fifteen</u> questions: **[15x2=30]**

1. What is the limitation of hybridization on the structure of water molecule?
2. Why are haloalkanes O, P – director though they are deactivating towards electrophilic substitution?
3. What is Sand Meyer's reaction? Give one example.
4. What happens when Chlorobenzene is heated with chloral in the presence of conc. H_2SO_4?
5. Why is benzoic acid less soluble in water than acetic acid?
6. What is denaturing of alcohols? Why is it done?
7. Why do aldehydes give tollen's test but ketones don't? Give an example of tollen's test.
8. Identify A and B in the following reaction

$$(CH_3)_2CHOH \xrightarrow{PCl_5} A \underset{\Delta}{\xrightarrow{alc.KOH}} B$$
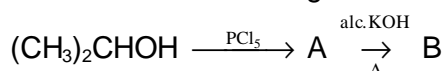
9. What are oxonium salts? Why do ethers form oxonium salts?
10. Give an example (with formula) each from aliphatic and aromatic aldehydes which give aldol condensation reaction.
11. How would you convert formaldehyde into acetophenone?
12. Find the equivalent weight of $KMnO_4$ in the given reaction
    $$KMnO_4 + H_2SO_4 + (COOH)_2 \rightarrow K_2SO_4 + MnSO_4 + CO_2 + H_2O$$
13. Why do you prefer phenolphthalein for the titration of strong base and weak acid?
14. What is solubility product principle?
15. What is E.C.E.?
16. State Faraday's second law of electrolysis.
17. pH of 10^{-8} HCl is not eight, justify.
18. What is the reason behind the consideration of Zn as non-transition element?
19. What happens when mercuric chloride reacts with excess of KI solution?
20. What is tempering of steel?

Group B

Attempt any <u>five</u> questions: **[5x5=25]**

21. How is diethyl ether prepared in the lab? How does it react with chlorine in the presence of light and in dark conditions?
22. Show your acquaintance with the following reactions:
    (i) Cannizzaro's reaction   (ii) Benzoin condensation.
23. Convert
    (i) aniline to benzaldehyde.
   (ii) ethyl iodide to methyl iodide.

24. Compound 'A' reacts with chlorine in the presence of sunlight to form chloroalkane 'B'. When 'B' is boiled with aq. KOH to form compound 'C'. 'C' gives propanoic acid on oxidation with acidified $K_2Cr_2O_7$. Identify A, B and C with concerned reactions.

25. Predict whether a precipitate will be formed or not on mixing 20 ml of 0.001 N NaCl solution with 80 ml of 0.01 N $AgNO_3$ solution. [K_{sp} for AgCl = 1.5×10^{-10}].

26. How many molecules of chlorine should be deposited from molten sodium chloride in one minute by a current of 3.0 ampere?

27. How is steel manufactured by Open Hearth process? Discuss its advantages over Bessemer's process.

Group C

Attempt any <u>two</u> questions: ***[10x2=20]***

28. a. How is anhydrous formic acid prepared in lab?
    b. What happens when
        (i) Formic acid is strongly heated.
        (ii) Formic acid is treated with acidified $KMnO_4$ solution.

29. a. Starting with propanol, how would you obtain ethanol?
    b. Consider the following reaction

$$A \underset{NH_3}{\overset{PCl_5}{\rightarrow}} B \underset{\Delta}{\overset{Br_2 / NaOH}{\rightarrow}} C \underset{\Delta}{\overset{HNO_2}{\rightarrow}} D$$
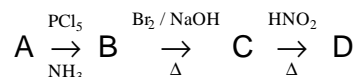
    The compound 'A' is a carboxylic acid. Calcium salt of 'A' on heating gives acetone. Identify A, B, C and D.

30. a. 1000 ml of HCl at NTP is dissolved in water. Calculate the volume of NaOH solution containing 42 gm/liter required to neutralize the acid completely.
    b. 1.5 liter of 1 M NaOH is mixed with one liter of 1 M HNO_3 solution. Calculate the strength of salt formed and pH of the resulting solution.

31. Write short notes on (any <u>two</u>):
        a. Extraction of mercury
        b. Rusting of iron.
        c. Victor Meyer's method for distinguishing 1^0, 2^0 and 3^0 alcohols.
        d. Bronsted – Lowry's theory of acids and bases

Best of Luck