

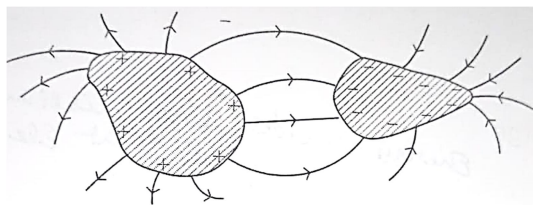
# NEW STANDARD ACADEMY

Semri Kothi Super Market, Raebareli

CLASS 12 (Academy) 28-04-2025

## PHYSICS

- Two metal objects of arbitrary shapes are shown in figure have charges of 20 pC and 20 pC., which result in a potential difference of 20 V between them



- What is the capacity of system?
  - If charges are changed to 200 pC and 200 pC. what will be the new capacitance of the system.
  - If charges are changed to 200 pC and 150 pC, then how capacity of the system changes?
- Does the maximum charge given to a metallic sphere depend on whether it is solid or hollow? Find an expression for the maximum charge hold by an isolated sphere? On what factors it depends?
  - What is dielectric strength of dry air? Can a sphere of radius 1 cm placed in air be given a charge of 1 C?
  - What maximum charge on a sphere of radius R. can be stored without being leak off in sparks?
  - Farad is a large unit What is the radius of a metal sphere with a capacity of 1  $\mu\text{F}$  How can the size of a sphere be reduced to one third without altering its capacity?
    - A radioactive source is in the form of a metal sphere of diameter 10m emits  $\alpha$ -particles at a rate of  $6.25 \times 10^6$  per sec. Assuming the rate of decay to be remained constant and source to be insulated, also assume that 80% of emitted  $\alpha$ -particles escape from the surface, calculate required time for potential of a sphere to reach 1V
    - What is the difference between dielectric strength and dielectric constant?

## CHEMISTRY

- Resistances of N/2 solution of an electrolyte in a cell was found to be 45 ohm. Calculate the equivalent conductivity of the solution if the electrodes are 2.2 cm apart and have an area of  $3.8 \text{ cm}^2$
- The resistance of 0.01 N NaCl solution is 200 ohm. Cell constant is  $1 \text{ cm}^{-1}$  Calculate the equivalent conductivity.
- In a cell the resistance of 0.01 M KCl solution and 0.01 M HCl solution comes out to be 150 ohm and 51.4 ohm respectively. If specific conductance of 0.01 M KCl solution is  $0.0014088 \text{ ohm}^{-1} \text{ cm}^{-1}$ , what is the molar conductivity of HCl solution ?
- Specific conductance of 0.1 M KCl solution is  $12.9 \times 10^{-3} \text{ ohm}^{-1} \text{ cm}^{-1}$  The resistance of this solution
- Molar conductance of a 1.5 M solution of an electrolyte is found to be 138.9  $\text{siemen cm}^2$  What would be the specific conductance of this solution ?

## BIOLOGY

- Name the hormones secreted by human placenta.
- Describe the hormonal control of the reproductive system in human male or female.
- Fertilisation is a physico-chemical process. Explain.
- A fertilized egg is a blue print of future development". Explain.
- How does the inguinal hernia develop ?
- What is colostrum? How is milk production hormonally regulated ?
- Give a schematic representation of oogenesis in humans. Mention the number of chromosomes at each stage. Correlate the life phases of the individual with the stages of the process.
- Give a schematic representation of spermatogenesis in humans.
  - At which stage of life does gametogenesis begin in human male and female respectively ?
  - Name the organs where gametogenesis gets completed in human male and female respectively.
- Draw a labelled diagram of a sectional view of human seminiferous tubule.
  - Differentiate between gametogenesis in human males and females on the basis of
    - time of initiation of the process.
    - products formed at the end of the process.
- Draw a labelled diagram of the microscopic structure of a human sperm.

## MATH

1. Consider the function  $f: R \rightarrow R$  defined by  $f(x) = 4x + 3$ . Show that it is invertible. Also find the inverse  $f^{-1}$ .

2. If the domain of the function

$$\sin^{-1}\left(\frac{3x-22}{2x-19}\right) + \log_e\left(\frac{3x^2-8x+5}{x^2-3x-10}\right)$$

is  $(\alpha, \beta]$ , then  $3\alpha + 10\beta$  is equal to

3. If the domain of the function  $f(x) = \frac{\sqrt{x^2-25}}{(4-x^2)} + \log_{10}(x^2+2x-15)$  is  $(-\infty, \alpha) \cup [\beta, \infty) \cup [\beta, \infty)$ , then  $\alpha^2 + \beta^2$  is equal to

4. If the domain of the function  $f(x) = \log_e\left(\frac{2x+3}{4x^2+x-3}\right) + \cos^{-1}\left(\frac{2x-1}{x+2}\right)$  is  $(\alpha, \beta]$  then the value of  $5\beta - 4\alpha$  is equal to

5. The domain of

$$F(x) = \sqrt{4x + 8^{\frac{2}{3}(x-2)} - 13} - 12^{(x-1)}$$

1. Evaluate the determinants

$$\begin{vmatrix} \cos \alpha \cos \beta & \cos \alpha \cos \beta & -\sin \alpha \\ -\sin \beta & \cos \beta & 0 \\ \sin \alpha \cos \beta & \sin \alpha \sin \beta & \cos \alpha \end{vmatrix}$$

2. Evaluate  $\begin{vmatrix} x & y & x+y \\ y & x+y & x \\ x+y & x & y \end{vmatrix}$

3. If  $x$  is a real number, then show that  $\begin{vmatrix} 1 & \sin x & 1 \\ -\sin x & 1 & \sin x \\ -1 & -\sin x & 1 \end{vmatrix}$  lies between

2 and 4 (both inclusive).

4. Find the cofactors of the elements of the third row of the determinant

$$\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix} \text{ and verify that } a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33} = 0.$$

5. Prove that  $\begin{vmatrix} 1 & a & b \\ -a & 1 & c \\ -b & -c & 1 \end{vmatrix} = 1 + a^2 + b^2 + c^2$ .