Few Tricks and Tips for
Class-XII   Board Examination (2026)
Subject: PHYSICS
Chapter Name : Variation of a quantity

COMMON MISTAKES

1. let a relation $y = x^n$ is given, if x changes is very small, to find the variation y

$$\frac{dy}{dt} = n\left(\frac{dx}{dt} \times 100\right)\%$$

Example :

a) Electrostatic force between two charges is inversely proportional to square between the separation of the charges, if separation increases by 5%, find percentage change of force between the charges ?

$$F\alpha\frac{1}{x^2}$$
$$\therefore \frac{dF}{F} \times 100 = -2\frac{dx}{x}$$
$$= -2 \times 5\%$$
$$= -10\%$$

$\therefore$ decreases by 10% .

b) If q amount of charge given to a sphere, and radius of the sphere increases by 2%, find the percentage change of volume charge density of the sphere.

Charge density $(\sigma) = \dfrac{q}{\frac{4}{3}\pi r^3}$

$$\therefore \frac{d\sigma}{\sigma} = -3\frac{dr}{r}$$
$$\therefore \frac{d\sigma}{\sigma} = -3 \times 2\%$$
$$= -6\%$$

$\therefore$ Volume charge density decreases by 6% .

c) If resistance of a conductor increases by 3%, find the percentage change of heat produce in the conductor.

$$H = I^2 Rt$$

$$\therefore \frac{dH}{H} = \left(\frac{dR}{R} \times 100\right) \text{ percentage}$$

$$= 3\%$$

d) If a charge move perpendicularly with a magnetic field, and if velocity increases by 2%, find the percentage change of radius and time period ?

$$r = \frac{mv}{q\beta}$$
$$\frac{dr}{r} = \left(\frac{dv}{v} \times 100\right)\%$$
$$= 2\%$$

$$T = \frac{2\pi r}{v} = \frac{2\pi m}{q\beta}$$

Time period will remain same because time period does not depend on velocity.

e) If angular frequency of a A.C circuit increases by 4%, find the percentage of change of inductive reactance and capacitive reactance of the circuit.

$$X_L = \omega L \qquad \therefore \frac{dx_L}{X_L} = \left(\frac{d\omega}{\omega} \times 100\right)\%$$

$$X_C = \frac{1}{\omega C} \qquad \therefore \frac{dX_C}{X_C} = -\left(\frac{d\omega}{\omega} \times 100\right)\%$$

$$= -4\%$$

2. If $y = x^n$ is given, if change of x greater than 5%, to find the variation of y, the process is as follows.

Let x changes by a% (> 5%)

$x_i = 100$

$\therefore x_f = (100 + 100 \times a\%)$

$$\frac{\Delta y}{y} \times 100 = \frac{x_f - x_i}{x_i} \times 100$$

Example :

a) If two equal charges are placed at a certain separation, the potential energy of the system is U. If each charge increases by 10%, find the percentage change by potential energy of the system.

$$U_i = K\frac{q \times q}{r^2} \qquad\qquad q_i = q$$

$$q_f = q + \frac{q}{10} = \frac{11q}{10}$$

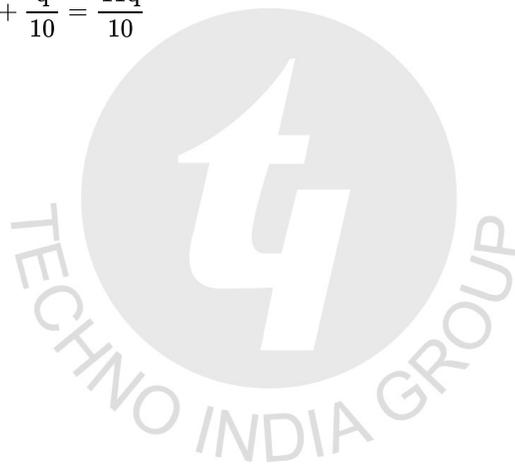$$U_f = \frac{k\frac{11q}{10} \times \frac{11q}{10}}{r^2}$$

$$= k\frac{121q^2}{100r^2}$$

% change of U

$$= \frac{U_f - U_i}{U_i} \times 100$$

$$= \frac{\frac{121}{100} - 1}{1} \times 100$$

$$= 21\%$$

b) An electron accelerate through a potential difference v, de Broglie wave length of electron is a. If potential difference increases by 45%. Find the percentage change of de Broglie wave length ?

$$\lambda \quad \alpha \quad \frac{1}{\sqrt{v}}$$

$$\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{v_2}{v_1}} = \sqrt{\frac{144v}{100v}} = \frac{12}{10}$$

$$\therefore \text{\% change} = \frac{\lambda_1 - \lambda_2}{\lambda_1} \times 100$$

$$= \frac{12 - 10}{12} \times 100$$

$$= \frac{100}{6}\%$$

$$= 16\frac{2}{3}\%$$