46. The equation of the hyperbola with vertices at $(0, \pm 6)$ **and eccentricity** $\dfrac{5}{3}$ **is _____ and its foci are _____.**

Ans:

Given, vertices are $(0, \pm 6)$

On comparing it with $(0, \pm b)$

Let the equation of hyperbola be:

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$$

Also given $e = \dfrac{5}{3}$

Now,

$$a^2 = b^2 \left(e^2 - 1\right)$$

$$a^2 = (6)^2 \left(\left(\frac{5}{3}\right)^2 - 1\right) = 64$$

So, the equation of hyperbola is:

$$\frac{x^2}{64} - \frac{y^2}{36} = -1$$

Then foci is $= (0, \pm be) = \left(0, \pm \frac{5}{3} \times 6\right) = (0, \pm 10)$