

$$F = 3x^2 \hat{i} + (2xz - y) \hat{j} + z \hat{k}$$

along $x^2 = 4y$, $3x^3 = 8z$

$$\text{let } x = t \Rightarrow dx = dt$$

$$y = \frac{t^2}{4} \Rightarrow dy = \frac{t}{2} dt$$

$$z = \frac{3t^3}{8} \Rightarrow dz = \frac{9t^2}{8} dt$$

$$\int F \cdot d\mathbf{r} = \int_{t=0}^2 (3t^2) dt + \left(2t \times \frac{3t^3}{8} - \frac{t^2}{4} \right) \frac{t}{2} dt + \frac{3t^3}{8} \times \frac{9t^2}{8} dt$$

$$= \int_{t=0}^2 3t^2 + \frac{3t^5}{8} - \frac{t^3}{8} + \frac{27}{64} t^5 dt$$

$$\Rightarrow \left(\frac{3t^3}{3} + \frac{t^6}{16} - \frac{t^4}{32} + \frac{27}{64} \times \frac{t^6}{6} \right) \Big|_0^2$$

$$\Rightarrow 8 + \frac{64}{16} - \frac{16}{32} + \frac{9 \times 64}{64 \times 2} = 8 + 4 - \frac{1}{2} + \frac{9}{2} \Rightarrow \boxed{16} \text{ is option (B)}$$