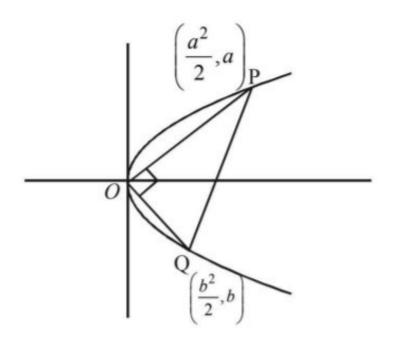
**9.** Let *P* and *Q* be distinct points on the parabola  $y^2 = 2x$  such that a circle with *PQ* as diameter passes through the vertex *O* of the parabola. If *P* lies in the first quadrant and the area of the triangle  $\triangle OPQ$  is  $3\sqrt{2}$ , then which of the following is (are) the coordinates of *P*? (JEE Adv. 2015)

(a) 
$$(4, 2\sqrt{2})$$
 (b)  $(9, 3\sqrt{2})$   
(c)  $\left(\frac{1}{4}, \frac{1}{\sqrt{2}}\right)$  (d)  $(1, \sqrt{2})$ 

Solution: -

**So (a, d)** Let point P in first quadrant, lying on parabola  $y^2 = 2x$ be  $\left(\frac{a^2}{2}, a\right)$ . Let Q be the point  $\left(\frac{b^2}{2}, b\right)$ . Clearly a > 0.



 $\therefore$  PQ is the diameter of circle through P, O, Q

$$\therefore \quad \angle POQ = 90^\circ \Rightarrow \frac{a}{a^2/2} \times \frac{b}{b^2/2} = -1 \Rightarrow ab = -4$$

 $\Rightarrow$  b is negative.

Also ar.  $\triangle POQ = 3\sqrt{2}$ 

$$\Rightarrow \frac{1}{2} \begin{vmatrix} 0 & 0 & 1 \\ \frac{a^2}{2} & a & 1 \\ \frac{b^2}{2} & b & 1 \end{vmatrix} = 3\sqrt{2}$$