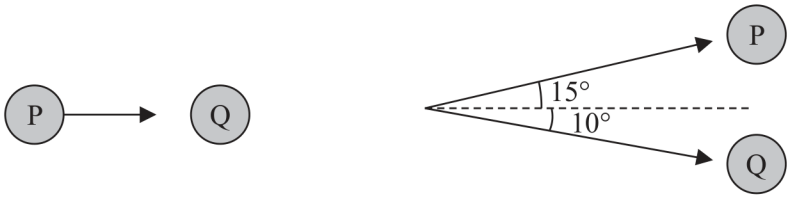
15 P and Q are identical spheres. Sphere P moves along a smooth horizontal surface and collides with sphere Q, which is initially stationary.

After the collision:

- sphere P moves off with a momentum of $0.096\,kg\,m\,s^{-1}$ in a direction of 15° to its initial direction.
- sphere Q moves off with a momentum of $0.14\,kg\,m\,s^{-1}$ in a direction of 10° as shown.



before the collision after the collision

(a) Use a scaled vector diagram to show that the magnitude of the total momentum of spheres P and Q after the collision is about $0.2\,kg\,m\,s^{-1}$.

(4)

Total momentum of spheres P and Q after the collision = ...

(b) State the principle of conservation of linear momentum.

(2)

(c) Calculate the initial velocity of sphere P.

mass of sphere P = 0.12 kg

(2)

Initial velocity of sphere P = ...

(Total for Question 15 = 8 marks)