(Q1) Calculate average over all direc^n of $\vec{r}$:

$$\langle (\vec{R}\cdot\vec{a})\,\vec{r}\rangle \quad ; \quad |\vec{r}| = R \ . \ \& \ \vec{a} \text{ is a fixed vector}$$

Any $\langle (\vec{r}\cdot\vec{a})\vec{r}\rangle = \langle r_i\, a_i\, r_j\rangle = a_i \langle r_i r_j\rangle$

$$= a_i R^2 \langle \frac{r_i}{R} \frac{r_j}{R}\rangle = a_i R^2 \langle n_i\, n_j\rangle$$

$$= \frac{a_i R^2}{3}\, \delta_{ij}$$

$$= \frac{a_i R^2}{3}$$

$\therefore \ \langle (\vec{r}\cdot\vec{a})\,\vec{r}\rangle = \dfrac{R^2\, \vec{a}}{3}$