BOTTOM-LINE ANSWERS PHYS30101 January 2016

Q1:
(a) Tunnelling probability ~ 0.09.
(b) $P(\hbar/2)=1/5$ and $P(-\hbar/2)=4/5$. Expectation of $S_y=2\hbar/5$.
(c) Shift is zero to first order.

Q2:
(c) $L_+\psi=-(x+iy)\hbar A\exp[-\beta(x^2+y^2+z^2)]$
(d) $\ell=1$

Q3:
(a) Expression for energetic separation= $A_L\hbar^2 J$
(b) L=1

Q4:
$\alpha_z=(1/\sqrt{2})(\alpha_y+\beta_y)$
$\beta_z=(-i/\sqrt{2})(\alpha_y-\beta_y)$

The result parts (not including explanation):
(i) Spies measure opposite spin components with 100% probability.
(ii) Spies measure opposite spin components with 50% probability and the same spin component with 50% probability.