Lecture 8. Solutions to Problems.

1. $J^\pi = \frac{3}{2}^+,\ \frac{5}{2}^+,\ \frac{9}{2}^+$.

2.

$$|(d_{5/2})^3; J = 9/2^+\rangle = \sqrt{\frac{3}{14}}|(d_{5/2})^2(2^+),\, d_{5/2}; J = 9/2^+\rangle - \sqrt{\frac{11}{14}}|(d_{5/2})^2(4^+),\, d_{5/2}; J = 9/2^+\rangle$$

3.

$$\begin{aligned} |(f_{7/2})^3; J = 11/2^-\rangle = \quad & -\tfrac{1}{3}\sqrt{\tfrac{5}{2}}|(f_{7/2})^2(2^+), f_{7/2}; J = 11/2^-\rangle \\ & +\sqrt{\tfrac{13}{66}}|(f_{7/2})^2(4^+), f_{7/2}; J = 11/2^-\rangle \\ & +\tfrac{2}{3}\sqrt{\tfrac{13}{11}}|(f_{7/2})^2(6^+), f_{7/2}; J = 11/2^-\rangle \end{aligned}$$

4. $E(3/2^+) = 310$ keV.

5. $E(5/2^-) = 0.366$ MeV;
   $E(3/2^-) = 1.185$ MeV;
   $E(9/2^-) = 1.948$ MeV;
   $E(11/2^-) = 1.797$ MeV;
   $E(15/2^-) = 3.120$ MeV .

6. $J_f^\pi = 1/2^+,\ 3/2^+,\ 5/2^+,\ 7/2^+$ states in ^{19}Ne ($l_p = 0, 2$).

7. $S^{1/2} = \sqrt{2/3}$.

8. $S^{1/2} = \sqrt{3}/2$.