1) \( ^{32}S \) \( A = 32 \) \( Z = 16 \)

\[ B = a_1 \frac{A}{2^{1/3}} - a_2 \frac{Z^2}{2^{1/3}} - a_3 A^{1/3} - a_4 (A/2Z)^{2/3} A \]

| \( A \) | 32 |
| \( Z \) | 16 |
| 1 even-even, 0 even-odd, -1 odd-odd | 1 |

**Numerical coefficients**
- Volume term: 15.67
- Surface area term: 17.23
- Coulomb term: 0.75
- Exclusion Principle term: 93.2
- Even/odd-Even/odd term: 12
- Total Binding energy: 501.44

**Proton mass**: 938.2723 MeV/amu
**Neutron mass**: 939.5656 MeV/amu

**Nucleus mass neglecting binding**: 269.417592

**von Weizsacker prediction in MeV**: 29775.9888

**von Weizsacker prediction in amu**: 931.49432

**Sulfur actual mass**: 31.972071
**% difference**: -0.0195211
**Error in MeV**: -0.1818377

2) \( ^{8}Be \) \( Z=4, N=4 \)

\[ 2 \times ^{4}He \]

\( ^{8}Be \) is unstable

\( M = 8.005704 \text{ MeV/amu} \)
3) 11-31) neutron rich $\rightarrow$ prob $\beta$-decay to $^6Li$

$\Delta M(^{11}Be) - M(^6Li) = (6.018886 - 6.015121)u = 0.003765$

4) 11-43) $^{30}Si$ $\quad Z = 14, N = 16$ filled shell $\rightarrow J = 0$
$^{27}Al$ $\quad Z = 17, N = 20$ $n$ filled, $J_{\text{total}} = 7/2$ $\Rightarrow J = 3/2$
$^{55}Co$ $\quad Z = 27, N = 28$ $u$ filled $\quad J = 7/2$
$^{90}Zr$ $\quad Z = 40, N = 50$ filled $\quad J = 5/2$
$^{107}In$ $\quad Z = 49, N = 58$ $J^p = 9/2$ $u$ filled $\quad J = 9/2$

5) 11-55) $^{11}B$ $\quad Z = 5, N = 6$

If I assume the 2 $1p_{3/2}$ protons have $J = 0$, then $J = 1/2$. But it is possible that they have $J = 1$ in which case you could also have $J = 3/2$. 

[Diagram of nuclear states]
2nd excited state has $J = \frac{3}{2}$

could put the 1 proton in 1ds\frac{3}{2} state

but this looks energetically unfavorable

\[ \begin{array}{c|c}
\text{10} & \text{1s}\frac{3}{2} \\
\hline
\text{1p} & \text{1p}\frac{3}{2} \\
\text{1d} & \text{1d}\frac{3}{2} \\
\text{1f} & \text{1f}\frac{3}{2} \\
\end{array} \]

1\text{st excited state}

Assume 2 1s\frac{3}{2} neutrons make $J = 0$ then $J = \frac{1}{2}$

2\text{nd excited state}
6) \[ N(t) = N_0 e^{-\frac{t}{\tau}} \]
\[ \tau = \frac{5730 \text{ yr}}{0.693} = 8268 \text{ yr} \]
\[ \frac{dN}{dt} = -\frac{N}{\tau} \]

Luminosity \[ N_{\text{hf}} = \left( 19 \times \frac{\text{laund}}{129} \right) \times 6.0 \times 10^{22} \frac{\text{sec}^{-1}}{\text{molecule}} \times 1.3 \times 10^{-12} \]

(\text{It is mostly } 12 \text{C})

\[ \text{Expected decay} / \text{min} = \frac{6.5 \times 10^{10}}{8268 \text{ yr} \times \pi \times 10^7 \text{sec} \times 1 \text{mm} \times 10^2 \text{sec}} = \frac{15}{\text{min}} \]

16000yr old skeleton

\[ 15 / \text{min} \times e^{-\frac{10000}{8268}} = 6.6 / \text{minute} \]