1) GC are large ($\sim 300\,000$) clusters, and old, and few.

2) $2 M_\odot \longrightarrow$ H. burning $\rightarrow$ He burning $\rightarrow$ WD

$10 M_\odot \longrightarrow$ H, He, C, Ne, O, Si, reduced, cc SN $\rightarrow$ BH / NS

3) $\tau(2 M_\odot) \simeq 1$ Gyr

$\tau(10 M_\odot) \simeq 15$ Myr.

4) GC are old and all stars are born at the same time, the stars we do observe now have low mass to still be alive

3'

1) Direct capture and resonant capture are the two mechanisms

2) $Q = 7296.4$ keV

3) $T_6 = 100 \Rightarrow E_0 = 151.4$ keV

$\mu_{amu} = 0.975$ $\Delta = 83.4$ keV

4) $E_x^{min} = Q + E_0 - \Delta/2 = 7406.1$ keV

$E_x^{max} = Q + E_0 + \Delta/2 = 7489.5$ keV

5) $E_x = 7440$ keV $\rightarrow E_R = 143.6$ keV $\quad 3/2^+ \rightarrow \ell = 2$

$E_x = 7462$ keV $\rightarrow E_R = 145.6$ keV $\quad 11/2^+ \rightarrow \ell = 6$

$E_x = 7466$ keV $\rightarrow E_R = 169.6$ keV $\quad 5/2^- \rightarrow \ell = 3$

6) $^{30}Si(0^+) + p(1/2^+) \Rightarrow J = 1/2$, $\pi = (+)$

$E_x = 7440$ keV is most likely to contribute since its orbital angular momentum is the lowest, and here the centrifugal

12' barrier is the lowest.

a) $\omega\gamma = \frac{2J_R+1}{(2J_{target}+1)(2J_p+1)} \frac{\Gamma_p \Gamma_\gamma}{\Gamma_p+\Gamma_\gamma}$

1) a) $\Gamma_p \ll \Gamma_\gamma \Rightarrow \Gamma_p+\Gamma_\gamma \simeq \Gamma_\gamma \Rightarrow \omega\gamma \propto \omega\Gamma_p$.
The proton width should be determined

1) b) $(^3He,d) \longrightarrow C^2S_p \longrightarrow \Gamma_p = C^2S_p \Gamma_{s.p.}$

c) 500 nA 3 h $5\,10^{17}$ at/cm^2 $\varepsilon = 9.6\,10^{-4}$ $N_{comptage} = 16200$ evts

$$\Rightarrow 16200 = \frac{500\,10^{-9}}{1.6\,10^{-19}} \cdot \frac{1}{s^{-1}} \times \underbrace{5\,10^{17}}_{at/cm^2} \times \sigma \times \varepsilon \times \underbrace{3\times 3600}_{s}$$

$$\Rightarrow \sigma = 10^{-27}\ cm^2$$

$$\Rightarrow \boxed{\sigma = 1\,mb}$$

18'

2eq