2. Mars Max 25 points

H) Give the areographic (Martian) latitude of the observer : $\varphi =$ **22.5 °** **[2]**

I) Give the altitudes of upper h_u and lower h_l culmination of :

Pollux (β Gem) : $h_u =$ **61° ± 0.5°**; $h_l =$ **-50° ± 1° (calculated)** **[1+2]**

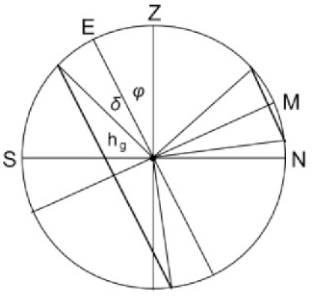
Deneb (α Cyg) $h_u =$ **32° ± 0.5°** ; $h_l =$ **13° ± 0.5°** **[1+1]**

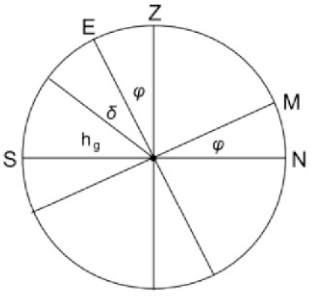
J) Give the areocentric (Martian) right ascension and declination of :

Regulus (α Leo) $\delta =$ **-22.5° ± 0.5°** , from culmination: $h_u =$ **45° ± 0.5°** **[2]**

Toliman (α Cen) $\delta =$ **-48° ± 0.5°,** from culmination: $h_u =$ **19.5° ± 0.5°** **[2]**

K) Sketch diagrams to illustrate your working in questions (I) and (J) above : **[2+2]**





L) On the map of the sky, mark (with a cross) and label ("M") the Martian North Pole **[2]**

M) Give the azimuth of the direction in which the observer moved away from the Martian base :

$A =$ **330°-180° = 150 °.** **[2]**

N) Estimate the location of the base on Mars, and circle the appropriate description : **[3]**

a. near the Equator *b.* **near the northern Tropic circle**

c. near the northern Arctic circle *d.* near the North Pole

O) The time axis below shows the Martian year and the seasons in the northern hemisphere. Mark the date represented by the planetarium display on the axis. **[3]**

