

- (1) 20% A wave is described by the following equation :

$$y(x,t) = 2 \sin \frac{2\pi}{3} (x - 2t)$$

- (a) Plot the wave profiles at $t=0, 1, 2$ (sec) , and determine the moving direction of this wave. (toward right or left ?)
- (b) Determine the moving velocity of this wave.
- (c) Determine the wavelength λ of this wave.
- (2) 20% There are three point charges Q_A , Q_B , and Q_C located at the three positions $A(0,a)$, $B(0,-a)$, and $C(b,0)$, respectively. Assume $Q_A = Q_B = Q$ and $Q_C = 2Q$, find the electric force exerted on Q_C by the other two charges.
- (3) 20% Use idea gas law to determine the volume of 1.00 mole of any gas at STP.
(Note : STP means pressure $P = 1.013 \times 10^5 \text{ N/m}^2$, temperature $T = 273.15 \text{ K}$.
Universal gas constant $R = 8.315 \text{ J/mol} \cdot \text{K}$)

(4) 玩陀螺時，會發現當旋轉軸傾斜時，旋轉軸不會因重力而倒地，反而會繞圓圈旋轉，為什麼？(20%)

(5) 站在一磅稱上量重量，如果地球自轉速度突然加快，請問你的重量指數會增加？減少？或不變？，為什麼？

另外，在相同條件下，但你在地球上不同位置，如在赤道上，及在北緯 60 度上，重量指數不一樣？為什麼？(20%)