

初級組 Junior

計算題 Problem for calculation 80%

1. 太陽與地球距  $1.5 \times 10^{11}$  m, 陽光經大氣散射損失 30%, 在地面測量, 陽光功率是  $1000 \text{ W/m}^2$ , 求太陽一年的質量損失. The distance of sun and earth is  $1.5 \times 10^{11}$  m. The loss of energy of sun light due to atmosphere dispersion is about 30%. The measured power of sun light on the ground is  $1000 \text{ W/m}^2$ , to find the loss of mass of sun for one year.
2. 均勻板(質量  $M$  長  $L$ )與平地之間沒有摩擦, 兩人(質量  $m_1$  和  $m_2$ ,  $m_1 > m_2$ ) 靜止地站在板的兩端, 兩人與板的摩擦良好, 如兩人向另一端走去時, 板也會作水平直線移動, 求那情形(兩人的速度)下, 板會不動? Uniform board (mass  $M$  length  $L$ ) has no friction with the ground, two people (masses  $m_1$  and  $m_2$ ,  $m_1 > m_2$ ) stand at rest on the end of each side. If the two walk to another ends, the board will move too in horizontal straight line. To find the speeds of two people in keeping the board not to move.
3. 從高  $H$  以速度  $v_1$  水平發射質點  $A$ , 而在地面與  $A$  相距  $D$  處, 同時迎面以速度  $v_2$  及仰角  $\phi$ , 發射另一質點  $B$ , 求兩質點相撞時與  $A$  發射點距離的表示式. Mass  $A$  is launched horizontally above the ground  $H$  with speed  $v_1$ , at a distance  $D$  to  $A$  on the ground, another mass  $B$  is launched with speed  $v_2$  and angle  $\phi$  at the same time to hit  $A$ , to find the expression of collision distance from the start point of  $A$ .
4. 單擺質量  $m$  長  $L$ , 懸垂在  $O$  點, 靜止後, 以  $v$  開始擺動, 但與置於  $O$  點同水平線上的另一質量  $m_1$  ( $m_1 = m$ ) 彈性碰撞後盪回,  $m_1$  則垂直向上升到  $O$  點水平線上高  $H$  處, 求  $v$  的表示式. Pendulum having mass  $m$  and length  $L$  is hanged at rest at  $O$  point but start to move with speed  $v$ , it elastically collides with another mass  $m_1$  ( $m_1 = m$ ) placed at the same level of the hanging point  $O$  and then drop back, but  $m_1$  moves up to a vertical height  $H$  above  $O$  point. To find the expression of  $v$ .
5. 求同步衛星的高度和速度的表示式. To find the expressions of height and speed of a geostationary satellite.

簡答題 Brief answer 20% 超多字數可被扣分

1. 列出 7 種基本物理單位. Give the 7 fundamental physical units.
2. 為什麼光子會被黑洞吸引? Why can black hole attract photon?
3. 為什麼超音速飛機形成音爆? Why does supersonic airplane form sonic boom?
4. 為什麼月球的一邊永遠面對地球? Why does the Moon always face to the earth by one side?
5. 為什麼潛深水時要慢慢上浮? Why do we need to float up slowly if we dive to deep sea?
6. 為什麼行星軌道的等面積定律是角動量守恆? Why do we say that the equal area law of planet orbit is equal to the conservation of angular momentum?
7. 什麼是理想氣體的 2 個條件? What are the 2 conditions of ideal gas?
8. 如何定義物理量溫度? 注意:不是溫標(C, K, F). How to define the physics quantity of temperature? Note: not the thermal scale (C, K, F).
9. 最近發現其他恆星有行星, 但科學家是不能直接觀察到那些的行星, 如何測量可得知? Recently, the planets in other stars are reported, but we can not observe directly of those planets, how to measure to know?
10. 為什麼原子鐘很精準, 誤差很少? Why is the atomic clock so accurate, so small deviation?