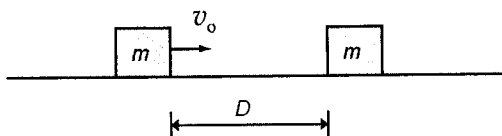


國立中央大學98學年度碩士班考試入學試題卷

所別：生物物理研究所碩士班 科目：普通物理 共      頁 第      頁

\*請在試卷答案卷(卡)內作答

1. (%15) Consider two blocks of the same mass  $m$  placed on a flat ground. And they are initially separated by a distance  $D$ , as is shown in the following figure. The initial velocity of the left block is  $v_0$  towards the right direction. After it hits the right block, the two blocks stick together. If the coefficient of kinetic friction for the ground is  $\mu$ , how far after the collision do the combined blocks travel before they stop?



Prob. 1

2. (%20) Consider two neutral atoms interacting with a potential  $U(r) = U_0 \left[ \frac{1}{r^4} - \frac{1}{r^2} \right]$ , where  $r$  is the distance between the centers of the two atoms (in the unit of angstroms), and  $U_0 = 20$  meV.
- (a) (%7) Please plot  $U(r)$  versus  $r$ , for the range  $0 < r < 5$ . (the plot just has to reflect the qualitative feature of the potential  $U(r)$ )
- (b) (%7) What is the distance such that the net force between the two atoms is zero?
- (c) (%6) And what is the binding energy?
3. (%15) Please explain about the term 'resonance' in oscillations, and give an example from either mechanical or electrical systems.
4. (%15) Please explain about the term "beat frequency", which is often observed in sound waves.
5. (%20) A tank of water with mass  $m_1$  grams at  $T_1$  °C is put in thermal contact with another tank of water with mass  $m_2$  grams at  $T_2$  °C. These two tanks are insulated from the outside so that heat can be exchanged only between these two tanks. If  $T_1 > T_2$
- (a) (%7) What is the final equilibrium temperature?
- (b) (%7) What is the total change of entropy?
- (c) (%6) Please tell whether your answer in (b) is positive or negative.
6. (%15) What is the capacitance of a parallel-plate capacitor, with area  $A$  for each plate, and distance between the plates  $d$ ? (assuming  $A$  is large enough such that the electric field between the plates is approximately uniform)

參考用