| 考 試 科 目 | 普通物理（一） | 所　別 | 應用物理 8162. 8163 | 考 試 時 間 | 3 月 6 日（星期六）第 3 節 |

1. According to the sound level shown in Table 1, calculate the sound intensity produced by rock concert. (10 points)

Table 1

Source of Sound	β (dB)
Nearby jet airplane	150
Jackhammer; machine gun	130
Siren; rock concert	120
Subway; power mower	100
Busy traffic	80
Vacuum cleaner	70
Normal conversation	50
Mosquito buzzing	40
Whisper	30
Rustling leaves	10
Threshold of hearing	0

2. Briefly describe the operation principle of Atomizer shown in Figure 1. (10 points)
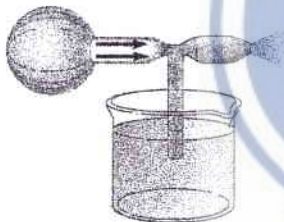

Figure 1

3. Using Figure 2 to briefly describe the Merry-Go-Round experiment. (10 points)
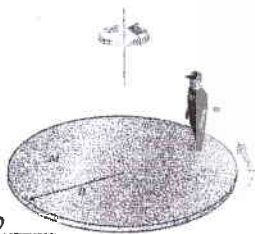

Figure 2

4. The potential energy associated with the force between two neutral atoms in a molecule can be modeled by the Lennard-Jones potential energy function $U(x)$ (shown in Figure 3), where x is the separation of the atoms. Write down the criterion for the existence of stable equilibrium. (10 points)
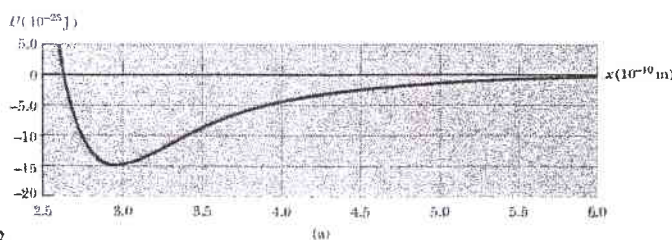

Figure 3

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5. A small sphere of mass m is attached to the end of a cord of length R and sent into motion in a vertical circle about a fixed point O as illustrated in Figure 4. What speed would the ball have as it passes over the top of the circle if the tension in the cord goes to zero instantaneously at this point? (10 points)
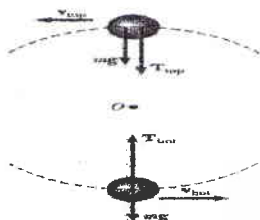

Figure 4

6. If an engine operates between 320°C and 32°C, what is its maximum thermodynamic efficiency? (10 points)

7. Find the entropy change of a system that undergoes a reversible, adiabatic process. (10 points)

8. Figure 5 illustrates amplitude versus frequency for a damped oscillator when a periodic driving force is present. Explain the physical meaning of the "quality factor" using these resonance curves. (10 points)
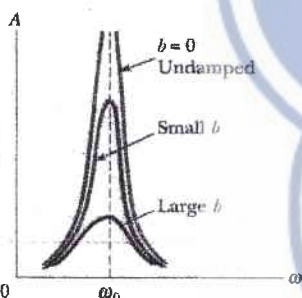

Figure 5

9. Briefly describe the first experiment (shown in Figure 6) to measure the universal gravitational constant G by Henry Cavendish in 1798. (10 points)
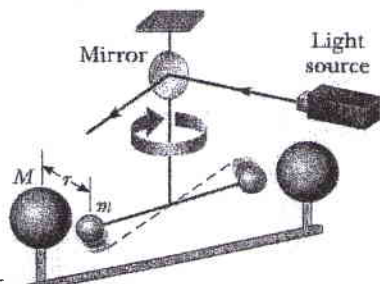

Figure 6

10. A middle C on a piano has a fundamental frequency of 262 Hz. What are the next two harmonics of this string? (10 points)

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