※ 考生請注意：本試題 ☑可 ☐不可 使用計算機

1. (6 points) Which of the following five objects requires the greatest change in momentum to stop moving?

	Object	mass (kg)	speed (m/s)
A.	electron	10^{-30}	10^{7}
B	oil tanker	10^{8}	10^{-1}
C	rain drop	10^{-4}	10
D	snail	10^{-2}	10^{-4}
E	Satellite	10	10^{4}

2. (6 points) A particle, held by a string whose other end is attached to a fixed point C, moves in a circle on a horizontal frictionless surface. If the string is cut, the angular momentum of the particle about the point C:

A. increases B. decreases C. does no change
D. changes direction but not magnitude E. none of these

3. (6 points) It is impossible for two particles, each executing simple harmonic motion, to remain in phase with each other if they have different:

A. masses B. spring constants C. amplitudes
D. periods E. kinetic energies

4. (6 points) Let S_I denote the change in entropy of a sample for an irreversible process from state A to state B. Let S_R denote the change in entropy of the same sample for a reversible process from state A to state B. Then

A. $S_I = S_R$ B. $S_I > S_R$ C. $S_I < S_R$
D. $S_I = 0$ E. $S_R = 0$

5. (6 points) Monochromatic light, at normal incidence, strikes a thin film in air, If λ denotes the wavelength in the film, what is the thinnest film in which the reflected light will be a maximum?

A. much less than λ B. λ C. $\lambda/2$
D. $3\lambda/4$ E. $\lambda/4$

(背面仍有題目,請繼續作答)

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6. (15 points) After a completely inelastic collision, two objects of the same mass and same initial speed are found to move away together at *1/2* their initial speed. Find the angle between the initial velocities of the objects.

7. (20 points) Consider the charging of a parallel-plate capacitor with circular plates of radius *55.0* nm. At what two radii *r* from the central axis of the capacitor is the magnitude of the induced magnetic field equal to *50%* of its maximum value?

8. (15 points) We wish to coat flat glass ($n=1.50$) with a transparent material ($n=1.25$) so that reflection of light at wavelength *600* nm is eliminated by interference. What minimum thickness can the coating have to do this?

9. (20 points) (a) A photon has an energy of *1.00* eV, and an electron has a kinetic energy of that same amount. What are their wavelengths? (b) Repeat for an energy of *1.00* GeV (hint, Relativity theory must be used for electron in this case).