

國立中央大學八十七學年度碩士班研究生入學試題卷

所別： 光電科學研究所 不分組 科目：

普通物理

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1. A 20-kg particle is moving in the direction of the positive x-axis with a speed of 200 meters/sec when, due to an internal explosion, it breaks into three parts. One part, whose mass is 10 kg, moves away from the point of explosion with a speed of 100 meters/sec along the positive y-axis. A second fragment, with a mass of 4.0 kg, moves along the negative x-axis with a speed of 500 meters/sec. (a) What is the velocity of the third (6.0-kg) particle? (b) How much energy was released in the explosion? Ignore effects due to gravity. (10%)
2. Derive the relation $L = I\omega$ for the angular momentum of a rigid body confined to rotate about a fixed axis. (10%)
3. The pressure in a traveling wave is given by the equation
$$p = 3.5 \sin \pi (x + 200 t)$$
where x is in meters, t in seconds, and p in nt/meter^2 . Find (a) the pressure amplitude, (b) the frequency, (c) the wavelength, (d) the speed of the wave, and (e) direction of propagation. (10%)
4. Derive an expression for B at a distance r from the center of a long cylindrical wire of radius R , where $r < R$. The wire carries a current i_0 , distributed uniformly over the cross section of the wire. Assume that the wire itself has no intrinsic magnetic effects. (10%)
5. Certain characteristic wavelengths in the light from a galaxy in the constellation Virgo are observed to be increased in wavelength, as compared with terrestrial sources, by about 0.4%. What is the radial speed of this galaxy with respect to the earth? Is it approaching or receding? (10%)
6. How can you prove electric current in metal is a flow of electron? Explain your answer. (10%)
7. State all you know about : (20%)
 - (1) laser
 - (2) optical fiber
8. Explain how each of the following phenomenon happens: (20%)
 - (1) blue sky,
 - (2) rainbow,
 - (3) mirage (海市或蜃樓),
 - (4) double refraction

