

10. 靜止的電子(質量 m_e , 電荷 e)經一電壓為 $V = m_e c^2 / e$ 的電極加速後, 在相對論效應不可忽略的情況下, 該電

子的 de Broglie 波長為 (A) $\frac{h}{\sqrt{3}m_e C}$ (B) $\frac{h}{\sqrt{2}m_e C}$ (C) $\frac{h}{m_e C}$ (D) $\frac{\sqrt{2}h}{m_e C}$ (E) $\frac{\sqrt{3}h}{m_e C}$ 。

11. 一理想的雙原子分子(如 N_2 、 H_2)經過準穩定的絕熱膨脹(quasistatic adiabatic)後體積為原來的 32 倍, 則壓力為原來的 (A) $1/2^5$ (B) $1/2^3$ (C) $1/2^7$ (D) $1/3^5$ (E) $1/3^4$ 。

12. n mole 的理想氣體在定體積下, 溫度由 T_1 上升到 T_2 , 熵(entropy)的改變量為

(A) $nR \exp(T_2 - T_1)$ (B) $\frac{3nR}{2} \ln \frac{T_2}{T_1}$ (C) $\frac{3nR}{2} (T_2 - T_1)$ (D) $\frac{nR}{3} \frac{T_2}{T_1}$ (E) $\frac{nR}{3} \sqrt{T_2 - T_1}$ 。

13. 一 x-ray 與一電子作用, 經過康卜吞散射(Compton scattering)後, 散射光與原入射光夾角為 θ , 在何種狀況下, 散射光的波長最短?(A) $\theta = 135^\circ$ (B) $\theta = 90^\circ$ (C) $\theta = 0^\circ$ (D) $\theta = 180^\circ$ (E) $\theta = -90^\circ$ 。

14. In right figure, charge is placed on the piece of copper. How will the charge be distributed on the object?

- (A) Uniformly over the surface.
- (B) Uniformly throughout the volume.
- (C) With greatest density near point C on the surface.
- (D) With greatest density near point E on the flat surface.
- (E) With greatest density near point D in the interior.



15. A proton is projected toward a fixed nucleus of charge $+Ze$ with velocity v . Initially the two particles are very far apart. When the proton is a distance R from the nucleus its velocity has decreased to $1/2 v$. How far from the nucleus will the proton be when its velocity has dropped to $1/4 v$?

- (A) $1/16 R$ (B) $1/4 R$ (C) $1/2 R$ (D) $4/5 R$ (E) None of these.

16. Which of the following is an accurate statement?

- (A) An ammeter disturbs a circuit, whereas a voltmeter does not.
- (B) The resistance between the terminals of an ammeter should be as large as possible.
- (C) When one attaches a resistor to a galvanometer to construct a voltmeter, the current through the galvanometer is typically much less than that through the resistor.
- (D) An ammeter is constructed by placing a resistor in series with a galvanometer.
- (E) A "shunt" resistor is the name given the resistor placed in parallel with a galvanometer.

17. In right figure, the upper wire has two straight lines and a semicircular arc of radius 4.0 cm. The lower wire is parallel to the upper wire and separated by 10 cm. The upper wire carries a current of 10 A and the lower wire carries the return current. The magnitude of the magnetic field at the center of the semicircular arc P, in μT , is closest to: (A) 80 (B) 60 (C) 100 (D) 140 (E) 180.

