

- (1) 質量為 m 的石頭從地面 ($y = 0$) 以初速度為 $\vec{v}_0 = v_0 \hat{y}$ 往上運動，則為 $\vec{v} = -v/2 \hat{y}$

時石頭離地面的高度為 (g 是重力加速度) :

A stone of mass m moves upward from the ground ($y=0$) with initial velocity $\vec{v} = v \hat{y}$. When the stone's velocity $\vec{v} = -v/2 \hat{y}$, its height is (g is the gravity acceleration) :

(a) $v_0^2/2g$ (b) $-v_0^2/5g$ (c) $3v_0^2/8g$ (d) $-v_0^2/3g$

(e) 以上皆非 None of the above.

- (2) 質量為 M 的靜止物體突然炸開為兩塊質量相同的產物，則這兩塊產物的運動

夾角 θ 為 :

An object (Mass M) at rest is suddenly exploded into two equal pieces, the angle θ of the products is :

(a) $\pi/2$ (b) π (c) $\pi/4$ (d) 0 (e) 以上皆非 None of the above.

- (3) 物體在地球表面上運作拋物線運動，如果它在地面 ($z=0$) 出發，而且初速

$\vec{v}(t=0) = v_1 \hat{x} + v_2 \hat{z}$ ，則物體回到地面的時間 t 為 (g 是重力加速度) :

An object is moving on a parabola trajectory under the influence of gravity. If it started from the ground ($z=0$) with initial velocity $\vec{v}(t=0) = v_1 \hat{x} + v_2 \hat{z}$, then the time t for it to return to the ground is (g is the gravity acceleration):

(a) $2v_2/g$ (b) $2v_1/g$ (c) $4v_2/g$ (d) $\sqrt{v^2}/g$ (e) $\sqrt{v_1 v_2}/g$.

- (4) 電荷 Q 以初速 $\vec{v} = v_1 \hat{x} + v_2 \hat{z}$ 在均勻磁場 $\vec{B} = B_0 \hat{z}$ 中運動，則 Q 的運動軌跡為 :

A charge Q with initial velocity $\vec{v} = v_1 \hat{x} + v_2 \hat{z}$ is moving in a uniform B field

$\vec{B} = B_0 \hat{z}$. The trajectory of this motion is:

- (a) 橢圓 Elliptical (b) 直線 A straight line (c) 圓 A circle (d) 拋物線 Parabola
(e) 螺旋線 Spiral.

- (5) Kepler 第二運動定律的敘述為”行星再繞太陽運動時，他單位時間掃過的面積是一個定值”。這個結果是由於：

Kepler's second law states that "The planet goes around the sun by sweeping equal area in the same amount of time". This result is due to :

- (a) 能量守恆 Energy conservation
- (b) 動量守恆 Momentum conservation
- (c) 動量不守恆 Non-conservation of momentum
- (d) 角動量不守恆 Non-conservation of angular momentum
- (e) 以上皆非 None of the above.

- (6) 物體在地球表面從高度 h_1 以速率 v_1 往下掉，則當 $v = 2v_1$ 時物體的高度 h_2 為：

Something is dropping down at a height h_1 to a lower height h_2 with initial speed v_1 . When the speed of it becomes $v = 2v_1$, then the height h_2 is:

- (a) $3v_1^2/2g$ (b) $h_1 - 3v_1^2/2g$ (c) $h_1 + 3v_1^2/2g$ (d) $3v_1^2/2g - h_1$
- (e) $3v_1^2/g - h_1$.

- (7) 質量為 m 的物體 A 在有摩擦力的平面上撞上了一個靜止的物體 B (其質量也是 m)。如果在撞上的那一剎那 A 的速率為 v_1 ，而且摩擦力為 f ，B 在碰撞後沿 A 原來的運動方向移動，則 B 可以走的距離為：

An object A is sliding on a frictional surface and collides with another object B which is at rest. Assuming m being the mass for both objects and f is the magnitude of friction force, if at the time of collision A's speed is v_1 and B move along the direction which A move along before the collision, then how far can B move after collision:

- (a) mv_1^2/f (b) $mv_1^2/2f$ (c) $2mv_1^2/f$ (d) $mv_1^2/4f$ (e) $f/2mv_1^2$

- (8) 兩個彈簧(一樣的彈性常數 k)一起拉一個物體(質量為 m)，並使物體作簡諧運動。如果在最大位移 X_0 時，一根彈簧突然斷掉，則這個物體在後來的運動中最大的位移為：

Two springs of the same force constant k is pulling a mass m and the object is oscillating. If at a later time when the object is having maximum displacement X_0 one of the spring is broken and the object only experiences the force of one spring. The amplitude of the oscillation after breaking off one spring is: (a) $2X_0$ (b) $X_0/2$ (c) X_0 (d) $X_0/4$ (e) 以上皆非 None of the above.

(9) 在溫度 $T=0^{\circ}\text{C}$ 時 1 莫爾(mole)的裡想氣體之能量為：

(波茲曼常數 $k_B = 1.38 \times 10^{-23} \text{ J/K}$, Avogadro constant $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$)

One mole of ideal gas at temperature $T=0^{\circ}\text{C}$ has energy E

(The Boltzmann constant is $k_B = 1.38 \times 10^{-23} \text{ J/K}$, Avogadro constant $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$)

(a) $3.4 \times 10^3 \text{ J}$ (b) 500 J (c) 1 eV (d) 280.6 J (e) $6.023 \times 10^{23} \text{ J}$.

(10) 雙原子氣體的比熱為：

The molar specific heat of diatomic gas is:

(a) $7R/2$ (b) $R/2$ (c) $2R/3$ (d) $5R/2$ (e) R .

(11) n 莫爾的理想氣體等溫膨脹，其體積由 V_0 膨脹為 $2V_0$ ，則氣體對外界所作的功為：

n mole of ideal gas is isothermal expanded from V_0 to $2V_0$. The work done by the gas to the environment is:

(a) nRT (b) $-nRT \ln 2$ (c) $-nRT \ln(1/2)$ (d) $(RT)^n$
(e) 以上皆非 None of the above.

(12) 對裡想氣體的等容比熱 C_v 及等壓比熱 C_p 而言，以下何者為正確？

For the specific heats C_v at fixed volume and C_p at fixed pressure, which of the following statements is correct?

(a) $C_v < C_p$ (b) $C_v = C_p$ (c) $C_v > C_p$ (d) $C_v = 2C_p$ (e) $C_v = C_p/2$.

(13) 波有干涉現象，它發生的正確原因是來自於以下哪一個敘述？

The interference phenomenon of wave is due to which of the following statement?

(a) 波可以疊加 wave can be superimposed
(b) 波的強度可以相加 Intensity of wave is additive
(c) 波在介質中運動 Wave is moving in medium
(d) 波速不變 the speed of wave is a constant
(e) $f\lambda = v$.

(14) 兩個電荷(電量為 Q)在平面上，它們的座標分別為 $(a,0,0)$ 和 $(-a,0,0)$ ，則在 y 軸上任何一點 $(0, y, 0)$ 的電位為：

Two particles of the same charge Q are located at $(a,0,0)$ and $(-a,0,0)$, the electric potential at any point $(0, y, 0)$ on the y -axis is:

(a) $\frac{Q}{4\pi\epsilon_0\sqrt{a^2+y^2}}$ (b) 0 (c) $\frac{Q}{2\pi\epsilon_0\sqrt{a^2+y^2}}$ (d) $\frac{Q}{4\pi\epsilon_0(a^2+y^2)}$

(e) 以上皆非 None of the above.

(15) 兩個電阻與並聯在一起($R_1 > R_2$)，再與一個電池(電動勢為 V_0)連成通路，則在每一個電阻上所消耗的功率分別為 P_1 與 P_2 。以下何者正確？

Two resistors R_1 and R_2 in parallel are connected to a battery with electromotive force V_0 . If $R_1 > R_2$ which of the below statement is correct for the powers of these resistors P_1 and P_2 ?

(a) $P_1 > P_2$ (b) $P_1 = P_2$ (c) $P_1 = R_1 V_0^2$ (d) $P_1 < P_2$

(e) 以上皆非 None of the above.

(16) 電荷 Q 在均勻的電場及磁場中運動，如果電場與磁場平行，而且電荷由靜止開始運動，則電荷運動的軌跡為：

A charge Q is moving in Uniform electric E and magnetic field B . If E and B are parallel and the charge starts at rest then the motion is:

- (a) 雙曲線 hyperbolic
- (b) 等加速度運動 Linear accelerated
- (c) 圓周運動 uniform circular motion
- (d) 拋物線 parabolic
- (e) 以上皆非 None of the above.

(17) 質量為 m 帶電量為 q 的電荷在均勻磁場 $\vec{B} = B\hat{z}$ 中運動，如果電荷的初速度與磁場垂直，則 q 的運動周期 T 為：

A charged Q of mass m moves in a uniform magnetic field $\vec{B} = B\hat{z}$. If the initial speed is perpendicular the B field the period T of the is motion is:

(a) $\frac{qE}{m}$ (b) $\frac{q^2 m}{E}$ (c) qB (d) $\frac{qE}{2m}$ (e) $q\pi m B$.

- (18) 一塊小磁鐵在一根長度為 ℓ 空心的銅管中由靜止往下掉，如果忽略空氣阻力，則他到達管底時與自由落體比較，以下敘述何者錯誤？

A small piece of magnet is falling through a hollow copper tube with length ℓ . By neglecting the friction of air and comparing with free fall, at the bottom of the tube which of the statement is incorrect?

- (a) 兩者速度不相等 Two motions have different speeds
 (b) 在管中的磁鐵速度比較快 the magnet in the tube moves faster
 (c) 在管中的磁鐵速度比較慢 the magnet in the tube moves slower
 (d) 重力位能一樣 the gravitational potential are the same
 (e) 管中的磁鐵有受到外力 the magnet in the tube feels magnetic force.
- (19) 將一個電容 $C = 1\mu F$ 的電容器用 $30V$ 來充電，則它可以儲存的能量為：
 A capacitor $C = 1\mu F$ is charging with a battery of $30 V$. The energy storages in the capacitor is:
- (a) $3 \times 10^{-5} J$ (b) $9 \times 10^{-4} J$ (c) $4.5 \times 10^{-4} J$ (d) $1.5 \times 10^{-5} J$
 (e) 以上皆非 None of the above

- (20) 兩個相同的平行板電容器 $C_1 = C_2 = 1\mu F$ 。如果一開始時各有電荷分別為 $Q_1 = 1\mu C$, $Q_2 = 0.5 \mu C$ ，如果把帶有相同電荷符號的帶電板互相連接，則連接之後電容器上的電壓為：
 Two parallel plate capacitors $C_1 = C_2 = 1\mu F$ carry charges $Q_1 = 1\mu C$, $Q_2 = 0.5 \mu C$ respectively. If the plates of the sign of charge are connected together, the electric potential on the capacitors is:

- (a) $0.75V$ (b) $1.5V$ (c) $2V$ (d) $3V$ (e) 以上皆非 None of the above.

- (21) 如果一個電路中有電阻 R 、電容器 C 及感應線圈 L 串聯在一起，則他們對應的阻抗 Z 為： $(\omega$ 為電流的頻率)

A circuit with Resistor R , Capacitor C and Inductor L connecting in parallel has the Impedance Z equals to: (ω is the frequency of current.)

(a) $R + \omega L$ (b) $R - \omega L + 1/\omega C$ (c) $\sqrt{R^2 - (\omega L - 1/\omega C)^2}$

(d) $\sqrt{R^2 + (\omega L + 1/\omega C)^2}$ (e) $\sqrt{R^2 + (\omega L - 1/\omega C)^2}$.

(22) 收音機選擇電台的功能是靠共振現象來完成，而共振頻率由電路中的電容 C 與電感 L 來決定。如果 $L=1\text{mH}$ ，而電台頻率 $f = 10^6 \text{ Hz}$ ，則對應的 C 約為：

The channel selection of radio is by using resonance effect. This is done by adjusting the capacitance and induction in the circuit. If $L=1\text{mH}$ and the frequency of the radio station is $f = 10^6 \text{ Hz}$ then the corresponding capacitance is approximately equal to:

- (a) 10^{-9} F (b) $1\mu\text{F}$ (c) 1pF (d) 10^{-3} F (e) 以上皆非 None of the above.

(23) 一個變壓器的輸入電壓及輸出電壓分別為 200V 與 5V，如果輸入的電流為 1mA，則輸出的電流為：

A transformer is connected with input voltage and output voltage 200V and 5 V respectively. If the input current is 1mA then then the output current must be:

- (a) 0.4A (b) $0.25\mu\text{A}$ (c) 0.04A (d) $400\mu\text{A}$ (e) 25A.

(24) 燈泡的功率為 60W，如果光的頻率為 $f = 10^{15} \text{ Hz}$ ，則燈泡在一秒中所發射的光子數約為 (Planck constant $h = 6.626 \times 10^{-34} \text{ Js}$)：

The light bulb has power 60W, if the frequency of emitted light is $f = 10^{15} \text{ Hz}$ then the number of photons emitted per second is approximately (Planck constant $h = 6.626 \times 10^{-34} \text{ Js}$)：

- (a) 10^{10} (b) 10^{15} (c) 10^{23} (d) 10^3 (e) 10^{19} .

(25) 氫原子中的電子由 $n=3$ 往 $n=2$ 能階躍遷，則所放出的光子波長 λ 為何？

The electron of the Hydrogen atom in the $n=3$ state is going down to the $n=2$ state. The photon released by the atom has the wave length $\lambda = ?$

- (a) 656.3nm (b) 468.1nm (c) 41.02nm (d) 364.6nm (e) 410.2nm .

題號	1	2	3	4	5	6	7	8	9	10
答案	C	B	A	E	E	B	B	C	A	D
題號	11	12	13	14	15	16	17	18	19	20
答案	C	A	A	C	D	B	A	B	C	A
題號	21	22	23	24	25	26	27	28	29	30
答案	E	A	C	E	A					