

國立高雄大學 112 學年度 第 1 學期理學院

普通物理學基礎能力 會考試題

考試日期：113.1.8(星期一)

考試時間：17：00-19：00

系所：_____ 姓名：_____ 學號：_____

規定事項：

1. 請攜帶學生證（或有照片之證件）準時應考，以便身分核對。
2. 應試時請依當日公告之座位表入座。
3. 遲到逾 20 分鐘者，不得入場；已入場應試者，60 分鐘內不得出場。
4. 答案卡應以 2B 鉛筆作答，攜帶軟性品質較佳之橡皮擦備用。
5. 禁止使用電子產品（如：手機）
6. 電子計算器：僅限簡易型電子計算機（限僅有數字鍵 0~9 及 $+$ $-$ $\times$ $\div$ $\sqrt{}$ $\%$ M 等功能）”

<第一部份-基礎題型 1-20 共 20 題，每題 2.5 分，共 50 分>

1. An airplane makes a gradual 90° turn while flying at a constant speed of 200 m/s. The process takes 20.0 seconds to complete. For this turn the magnitude of the average acceleration of the plane is:
(A) Zero
(B) 40 m/s^2
(C) 20 m/s^2
(D) 14 m/s^2
(E) 10 m/s^2
2. The inertia of a body tends to cause the body to:
(A) speed up
(B) slow down
(C) resist any change in its motion
(D) fall toward the Earth
(E) decelerate due to friction
3. A 1000 kg elevator is rising and its speed is increasing at 3 m/s^2 . The tension in the elevator cable is:
(A) 6800 N
(B) 1000 N
(C) 3000 N
(D) 9800 N
(E) 12800 N
4. A horizontal force of 12 N pushes a 0.50 kg book against a vertical wall. The book is initially at rest. If $\mu_s = 0.6$ and $\mu_k = 0.80$, the acceleration of the book in m/s^2 is:
(A) 0
(B) 9.4 m/s^2
(C) 9.8 m/s^2
(D) 14.4 m/s^2
(E) 19.2 m/s^2
5. Uniform circular motion is the direct consequence of:
(A) Newton's third law
(B) a force that is always tangent to the path

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- (C) an acceleration tangent to the path
(D) a force of constant magnitude that is always directed away from the same fixed point
(E) a force of constant magnitude that is always directed toward the same fixed point
6. The weight of an object on the moon is one-sixth of its weight on the Earth. The ratio of the kinetic energy of a body on the Earth moving with speed V to that of the same body moving with speed V on the moon is:
(A) 6:1
(B) 36:1
(C) 1:1
(D) 1:6
(E) 1:36
7. A Boston Red Sox baseball player catches a ball of mass m that is moving toward him with speed v . While bringing the ball to rest, his hand moves back a distance d . Assuming constant deceleration, the horizontal force exerted on the ball by his hand is:
(A) mv/d
(B) mvd
(C) mv^2/d
(D) $2mv/d$
(E) $mv^2/(2d)$
8. A 0.2 kg rubber ball is dropped from the window of a building. It strikes the sidewalk below at 30 m/s and rebounds up at 20 m/s. The magnitude of the impulse due to the collision with the sidewalk is:
(A) 10.0 N · s
(B) 6.0 N · s
(C) 2.0 N · s
(D) 19.6 N · s
(E) 9.8 N · s
9. Three particles are placed in the xy plane. A 30 g particle is located at (3, 4) m, and a 40 g particle is located at (-2, -2) m. Where must a 20 g particle be placed so that the center of mass of the three-particle system is at the origin?
(A) (-3, -1) m (B) (+1, +3) m (C) (+3, -1) m (D) (-1, -3) m (E) (-0.5, -2) m

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10. A spring ($k = 200 \text{ N/m}$) is suspended with its upper end supported from a ceiling. With the spring hanging in its equilibrium configuration, an object (mass = 2.0 kg) is attached to the lower end and released from rest. What is the speed of the object after it has fallen 4.0 cm ?
- (A) 90 cm/s
(B) 83 cm/s
(C) 96 cm/s
(D) 79 cm/s
(E) 57 cm/s
11. A 2.0 kg block sliding on a rough horizontal surface is attached to one end of a horizontal spring ($k = 250 \text{ N/m}$) which has its other end fixed. The block passes through the equilibrium position with a speed of 2.6 m/s and first comes to rest at a displacement of 0.20 m from equilibrium. What is the coefficient of kinetic friction between the block and the horizontal surface?
- (A) 0.32
(B) 0.45
(C) 0.58
(D) 0.19
(E) 0.26
12. Two masses, M_A and M_B , with $M_B = 2M_A$, are released at the same time and allowed to fall straight down. Neglect air resistance. When we compare their kinetic energies after they have fallen equal distances, we find that
- (A) $K_B = K_A$
(B) $K_A = 4K_B$
(C) $K_B = 4K_A$
(D) $K_A = 2K_B$
(E) $K_B = 2K_A$
13. A horizontal disk with a radius of 10 cm rotates about a vertical axis through its center. The disk starts from rest at $t = 0$ and has a constant angular acceleration of 2.1 rad/s^2 . At what value of t will the radial and tangential components of the linear acceleration of a point on the rim of the disk be equal in magnitude?
- (A) 0.55 s (B) 0.63 s (C) 0.69 s (D) 0.59 s (E) 0.47 s

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14. A car of mass 1000 kg moves with a speed of 50 m/s on a circular track of radius 100 m. What is the magnitude of its angular momentum (in kgm^2/s) relative to the center of the race track?
- (A) 5.0×10^6
(B) 2.5×10^4
(C) 2.5×10^6
(D) 5.0×10^2
(E) 5.0×10^3
15. An object attached to one end of a spring makes 40 vibrations in 10s. Its period is:
- (A) 4 Hz
(B) 10 s
(C) 0.25 Hz
(D) 4 s
(E) 0.25 s
16. The displacement of a string is given by $y(x, t) = y_m \sin(2kx + \omega t)$, the wavelength of the wave is:
- (A) $4\pi k/\omega$
(B) k/ω
(C) $2\omega k$
(D) π/k
(E) $2k/\pi$
17. A fire whistle emits a tone of 150 Hz. Take the speed of sound in air to be 300 m/s. The wavelength of this sound is about:
- (A) 0.5 m
(B) 1.5 m
(C) 2.0 m
(D) 3.0 m
(E) 300 m
18. The sound intensity 4.0 m from point source is 0.80 W/m^2 . The power output of the source is:
- (A) 40 W (B) 126 W (C) 160 W (D) 320 W (E) 506 W

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19. How many calories are required to change ten gram of 0°C ice to 100°C steam? The latent heat of fusion is 80 cal/g and the latent heat of vaporization is 540 cal/g. The specific heat of water is 1.00 cal/g.

- (A) 7200 cal
- (B) 6200 cal
- (C) 720 cal
- (D) 620 cal
- (E) 540 cal

20. An object is undergoing simple harmonic motion. Throughout a complete cycle it:

- (A) has constant speed
- (B) has varying amplitude
- (C) has varying period
- (D) has varying acceleration
- (E) has varying mass

<第二部份：進階題型 1-10 共 10 題，每題 5 分，共 50 分>

1. When a 40 N force, parallel to the incline and directed up the incline, is applied to a crate on a frictionless incline that is 30° above the horizontal, the acceleration of the crate is 2.0 m/s^2 , up the incline. The mass of the crate is:

- (A) 3.8 kg
- (B) 4.1 kg
- (C) 5.8 kg
- (D) 6.2 kg
- (E) 10 kg

2. A 0.2 kg stone is attached to a string and swung in a circle of radius 0.6 m on a horizontal and frictionless surface. If the stone makes 150 revolutions per minute, the tension force of the string on the stone is:

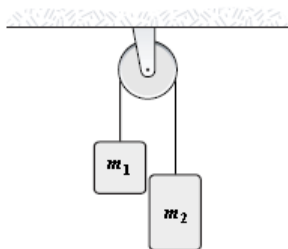
- (A) 0.03 N
- (B) 0.2 N
- (C) 0.9 N
- (D) 1.96 N
- (E) 30 N

3. A 50 N force acts on a 2 kg crate that starts from rest. When the force has been acting for 2 s the rate at which it is doing work is:

- (A) 75 W
- (B) 100 W
- (C) 1000 W
- (D) 2500 W
- (E) 5000 W

4. Two blocks, $m_1 = 1.0$ kg and $m_2 = 2.0$ kg, are connected by a light string as shown in the figure. If the radius of the pulley is 1.0 m and its moment of inertia is $5.0 \text{ kg}\cdot\text{m}^2$, the acceleration of the system is

- (A) $(1/6)g$
- (B) $(3/8)g$
- (C) $(1/8)g$
- (D) $(1/2)g$
- (E) $(5/8)g$



5. A wheel rotating about a fixed axis with a constant angular acceleration of 2.0 rad/s^2 turns through 2.4 revolutions during a 2.0 s time interval. What is the angular velocity at the end of this time interval?

- (A) 9.5 rad/s
- (B) 9.7 rad/s
- (C) 9.3 rad/s
- (D) 9.1 rad/s
- (E) 8.8 rad/s

6. A 5.0 g particle moving 60 m/s collides with a 2.0 g particle initially at rest. After the collision each of the particles has a velocity that is directed 30° from the original direction of motion of the 5.0 g particle. What is the speed of the 2.0 g particle after the collision?

- (A) 72 m/s
- (B) 87 m/s
- (C) 79 m/s
- (D) 94 m/s
- (E) 67 m/s

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7. The rotational inertia of a uniform thin rod about its end is $ML^2/5$, where M is the mass and L is the length. Such a rod is hung vertically from one end and set into small amplitude oscillation. If $L = 1.5$ m this rod will have the same period as a simple pendulum of length:
- (A) 30 cm
 - (B) 40 cm
 - (C) 60 cm
 - (D) 90 cm
 - (E) 150 cm
8. Standing waves are produced by the interference of two traveling sinusoidal waves, each of frequency 100 Hz. The distance from the 2nd node to the 7th node is 80 cm. The wavelength of each of the two original waves is:
- (A) 40 cm
 - (B) 32 cm
 - (C) 24 cm
 - (D) 16 cm
 - (E) 8 cm
9. A source emits sound with a frequency of 1200 Hz. It is moving at 40 m/s toward a stationary reflecting wall. If the speed of sound is 340 m/s an observer at rest directly behind the source hears a beat frequency of:
- (A) 28 Hz
 - (B) 118 Hz
 - (C) 141 Hz
 - (D) 240 Hz
 - (E) 286 Hz
10. A slab of material has area A , thickness L , and thermal conductivity k . One of its surfaces (P) is maintained at temperature T_1 and the other surface (Q) is maintained at a lower temperature T_2 . The rate of heat flow from P to Q is:
- (A) $kA(T_1 - T_2)/L^2$
 - (B) $kL(T_1 - T_2)/A$
 - (C) $kA(T_1 - T_2)/L$
 - (D) $k(T_1 - T_2)/(LA)$
 - (E) $LA(T_1 - T_2)/k$