國立高雄大學106學年度第1學期
理學院普通物理學基礎能力會考試題
系級：　　學號：　　姓名：

1. The change in kinetic energy of a 1.25-kg projectile that rises 12.8m is
   (A) -16 J
   (B) -102 J
   (C) -157 J
   (D) 102 J.
2. What's the change in potential energy of a 70-kg mountaineer going from sea level to the 8850-m summit of Mr. Everest?
   (A) 8850 J
   (B) 6.2×10^5 J
   (C) 3.0×10^6 J
   (D) 6.1×10^6 J.
3. A 45.0-kg crate is dragged at constant velocity 8.20 m across a horizontal floor with a rope making a 30 degree angle above the horizontal. The coefficient of kinetic friction is 0.250. Find the work done by friction. Give your answer in Joules.
   (A) -790 J
   (B) 790 J
   (C) 2050 J
   (D) -2050 J.
4. A force $F_x = 4x+12$ (in N, with x in m) acts on an object in one-dimensional motion. Find the work done by that force in moving an object from $x = 0$ to $x = 5.0$ m .
   (A) 32 J
   (B) 320 J
   (C) 110 J
   (D) 125 J.
5. A crane lifts a 750 kg girder 8.85 m. How much work does the crane do lifting with an upward acceleration of 1.20 m/s ^{2}?
   (A) 8250 J
   (B) 7.3×10^4 J
   (C) 5.7×10^3 J
   (D) 7500 J.
6. A cat jumps to a 1.15-m-high dresser, leaving the floor at 45° above the horizontal. What is the minimum speed must it have?
   (A) 4.915 m/s
   (B) 4.747 m/s
   (C) 5.256 m/s
   (D) 6.714 m/s.

7. A golf ball with mass 45.9g leaves the ground at 42.6m/s. It subsequently hits the ground at 31.9m/s. How much work was done by air resistance?
   (A) -18.29 J
   (B) 182.9 J
   (C) -128.9 J
   (D) 18.29 J.
8. Mars has mass 6.42×10^{23}kg and radius 3.37×10^{6}m. What's the gravitational acceleration at the surface of Mars?
   (A) 3.8 m/s^2
   (B) 6.2 m/s^2
   (C) 4.9 m/s^2
   (D) 9.8 m/s^2.
9. A satellite is in a 7000-km-radius circular orbit around Earth. If the satellite moves to a new orbit with period twice that of the original, the new radius is
   (A) 10000 km
   (B) 11100 km
   (C) 14000 km
   (D) 19800 km.
10. Ignoring air resistance, a ball dropped from rest at altitude 250km strikes the ground with speed
   (A) 1500 m/s
   (B) 2200 m/s
   (C) 2800 m/s
   (D) 3400 m/s.
11. How much work is done by pressure in forcing 3.0 m^3 of water through a pipe having an internal diameter of 13 mm if the difference in pressure at the two ends of the pipe is 1.0 atm?
   (A) 1.0×10^5 J
   (B) 3.0×10^5 J
   (C) 3.5×10^5 J
   (D) 3.9×10^5 J
12. Water is moving with a speed of 5.0 m/s through a pipe with a cross-sectional area of 4.0 cm^2. The water gradually descends 12 m as the pipe cross-sectional area increases to 8.0 cm^2. If the pressure at the upper level is 1.5×10^5 Pa, what is the pressure at the lower level?
   (A) 2.8×10^5 Pa
   (B) 3.6×10^5 Pa
   (C) 4.2×10^5 Pa
   (D) 5.7×10^5 Pa
13. An oscillating block-spring system has a mechanical energy of 2.00 J and an amplitude of 10.0 cm. Find the spring constant.

(A) 100 N/m
(B) 200 N/m
(C) 300 N/m
(D) 400 N/m

14. A body undergoes simple harmonic motion of amplitude 4.25 cm and period 0.200 s. The magnitude of the maximum force acting on it is 10.0 N. What is the mass?
(A) 0.122 kg
(B) 0.238 kg
(C) 0.354 kg
(D) 0.471 kg

15. A thin uniform rod (mass=0.90 kg) swings about an axis that passes through one end of the rod and is perpendicular to the plane of the swing. The rod swings with a period of 1.5 s. What is the length of the rod?
(A) 0.26 m
(B) 0.45 m
(C) 0.84 m
(D) 0.96 m

16. A string fixed at both ends is 7.50 m long and has a mass of 0.120 kg. It is subjected to a tension of 96.0 N and set oscillating. What is the speed of the waves on the string?
(A) 77.5 m/s
(B) 85.8 m/s
(C) 96.3 m/s
(D) 102.5 m/s

17. A wave has an angular frequency of 110 rad/s and a wave-length of 1.50 m. Calculate the speed of the wave.
(A) 8.4 m/s
(B) 16.2 m/s
(C) 20.1 m/s
(D) 26.3 m/s

18. What is the intensity at radial distances 2.50 m from an isotropic point source of sound that emits energy at the rate 12.0 W, assuming no energy absorption by the surrounding air?
(A) 0.153 W/m^2
(B) 0.342 W/m^2
(C) 0.441 W/m^2
(D) 0.635 W/m^2

19. A violin string 15.0 cm long and fixed at both ends oscillates in its n=1 mode. The speed of waves on the string is 280 m/s. What are the frequency of the emitted sound wave?
(A) 233 Hz (B)466 Hz (C)933 Hz (D)1866 Hz

20. Two sounds differ in sound level by 3.00 dB. What is the ratio of the greater intensity to the smaller intensity?
(A) 2
(B) 3
(C) 4
(D) 5

21. At an instant when a particle of mass 80 g has a velocity of 25 m/s in the positive *y* direction, a 75-g particle has a velocity of 20 m/s in the positive *x* direction. What is the speed of the center of mass of this two-particle system at this instant?
(A) 16 m/s
(B) 45 m/s
(C) 23 m/s
(D) 20 m/s

22. Two bodies with masses m_1 and m_2 are both moving east with velocities of magnitudes v_1 and v_2, where v_1 is less than v_2. The magnitude of the velocity of the center of mass of this system of two bodies is
(A) less than v_1.
(B) equal to v_1.
(C) equal to the average of v_1 and v_2.
(D) greater than v_1 and less than v_2.

23. Two cars start at the same point, but travel in opposite directions on a circular path of radius *R*, each at speed *v*. While each car travels a distance less than *R/2*, one quarter circle, the center of mass of the two cars
(A) remains at the initial point.
(B) travels along a diameter of the circle at speed $v' < v$.
(C) travels along a diameter of the circle at speed $v' = v$.
(D) travels along a diameter of the circle at speed $v' > v$.

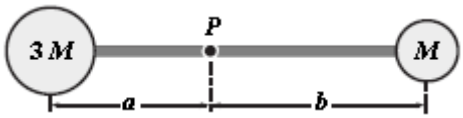
24. If you know the impulse that has acted on a body of mass *m* you can calculate
(A) its initial velocity.
(B) its final velocity.
(C) its final momentum.
(D) the change in its velocity.

25. A 6.0-kg object moving 2.0 m/s in the positive *x* direction has a one-dimensional elastic collision with a 4.0-kg object moving 3.0 m/s in the opposite direction. What is the total kinetic energy of the two-mass system after the collision?
(A) 30 J
(B) 62 J
(C) 20 J
(D) 44 J

26. A wheel rotating about a fixed axis has an angular position given by $\theta = 3.0 - 2.0t^3$, where θ is measured in radians and t in seconds. What is the angular acceleration of the wheel at $t = 2.0$ s?
(A) -1.0 rad/s^2
(B) -24 rad/s^2
(C) -2.0 rad/s^2
(D) -4.0 rad/s^2

27. When a wheel is rolling without slipping, the magnitude of its velocity relative to the ground is greatest at
(A) the point in contact with the ground.
(B) the point at the center of the wheel.
(C) the point at the top of the wheel opposite to the point in contact with the ground.
(D) the point farthest forward from the center of mass of the wheel.

28. The rigid body shown is rotated about an axis perpendicular to the paper and through the point P. If $M = 0.40$ kg, $a = 30$ cm, and $b = 50$ cm, how much work is required to take the body from rest to an angular speed of 5.0 rad/s? Neglect the mass of the connecting rods and treat the masses as particles.
(A) 2.9 J
(B) 2.6 J
(C) 3.1 J
(D) 3.4 J



29. Stars originate as large bodies of slowly rotating gas. Because of gravity, these clumps of gas slowly decrease in size. The angular velocity of a star increases as it shrinks because of
(A) conservation of angular momentum
(B) conservation of linear momentum
(C) conservation of energy
(D) the law of universal gravitation

30. A hockey puck traveling at speed v on essentially frictionless ice collides elastically with one end of a straight stick lying flat on the ice. In this collision
(A) momentum is conserved.
(B) angular momentum is conserved.
(C) energy is conserved.
(D) all of the above are conserved.

31. The Newton (N) is the SI unit of force which is equal to
(A) kgm/s
(B) kgms^2
(C) kgm^2/s
(D) kgm/s^2

32. A car runs with a speed of 60 miles per hour (60ml/hr). How to express this speed in SI units:
(A) 60 m/s (B) 19 m/s (C) 27 m/s (D) 34 m/s

33. A Boeing 777 aircraft runs from rest and takes off at 295km/h with an acceleration of 2.80 m/s^2. What is the distance that it runs at the runway from rest to takeoff?
(A) 1.0 km
(B) 1.1 km
(C) 1.2 km
(D) 1.3 km.

34. If you drop a ball from the top floor of the Tower of Pisa which is 58.4 m above the ground. How much time does the ball take to fall to the ground?
(A) 3.45 s
(B) 4.45 s
(C) 5.45 s
(D) 6.45 s.

35. If you throw a ball vertically straight up from the ground at a speed 12.6 m/s. what will be the maximum height does the ball reach?
(A) 7.1 m
(B) 8.1 m
(C) 9.1 m
(D) 10.1 m.

Problem 36 to 38: A batter hits a ball with a bat. The ball leaves the bat at a speed of 23.8 m/s and an angle 60^o above the horizontal.

36. How much time does the ball takes to fall to ground?
(A) 2.2 s (B) 3.2 s (C) 4.2 s (D) 5.2 s

37. What is the maximum height that the ball can reach?
(A) 11.7 m (B) 21.7 m (C) 31.7 m (D) 41.7 m.

38. How far does the ball go horizontally?
(A) 20.0 m
(B) 30.0 m
(C) 40.0 m
(D) 50.0 m

Problem 39 and 40: Assume that the Earth circularly orbits the Sun. The distance between the Earth and the Sun is 1.50×10^{11}m.

39. What is the Earth's orbit speed? (A) 1×10^4 m/s (B) 2×10^4 m/s (C) 3×10^4 m/s (D) 4×10^4 m/s

40. What is the Earth's centripetal acceleration
(A) 4.96×10^{-3} m/s^2
(B) 5.96×10^{-3} m/s^2
(C) 6.96×10^{-3} m/s^2
(D) 7.96×10^{-3} m/s^2