系所組別：生物醫學工程學系丁組

考試科目：普通物理　　考試日期：0223，節次：1

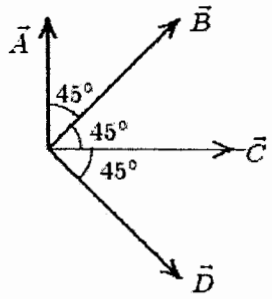
※ 考生請注意：本試題不可使用計算機

選擇題 (總共40題，每題2.5分，共100分，答錯倒扣 0.5分，計算題請將計算過程寫於答案後面)

請勿在本試題紙上作答，否則不予計分

1 A drag racing car starts from rest at t = 0 and moves along a straight line with velocity given by $v = bt^2$, where b is a constant. The expression for the distance traveled by this car from its position at t = 0 is: A. bt^3 B. $bt^3/3$ C. $4bt^2$ D. $3bt^2$ E. $bt^{3/2}$

2 Four vectors ($\vec{A}$, $\vec{B}$, $\vec{C}$, $\vec{D}$) all have the same magnitude. The angle θ between adjacent vectors is 45° as shown. The correct vector equation is:



A. $\vec{A}-\vec{B}-\vec{C}+\vec{D}=0$
B. $\vec{B}+\vec{D}-\sqrt{2}\vec{C}=0$
C. $\vec{A}+\vec{B}=\vec{B}+\vec{D}$
D. $\vec{A}+\vec{B}+\vec{C}+\vec{D}=0$
E. $(\vec{A}+\vec{C})/\sqrt{2}=-\vec{B}$

3 A large cannon is fired from ground level over level ground at an angle of 30^0 above the horizontal. The muzzle speed is 980m/s. Neglecting air resistance, the projectile will travel what horizontal distance before striking the ground? A. 4.3km B. 8.5km C. 43km D. 85km E. 170km

4 A particle moves at constant speed in a circular path. The instantaneous velocity and instantaneous acceleration vectors are: A. both tangent to the circular path B. both perpendicular to the circular path C. perpendicular to each other D. opposite to each other E. none of the above

5 A constant force of 8.0 N is exerted for 4.0 s on a 16-kg object initially at rest. The change in speed of this object will be: A. 0.5m/s B. 1m/s C. 2m/s D. 4m/s E. 8m/s

6 A 32-N force, parallel to the incline, is required to push a certain crate at constant velocity up a frictionless incline that is 30^0 above the horizontal. The mass of the crate is: A. 3.3kg B. 3.8kg C. 5.7kg D. 6.5kg E. 160 kg

7 A 5-kg concrete block is lowered with a downward acceleration of $2.8m/s^2$ by means of a rope. The force of the block on Earth is: A. 14 N, up B. 14 N, down C. 35 N, up D. 35 N, down E. 49 N, up

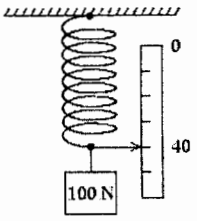
8 The speed of a 4.0-N hockey puck, sliding across a level ice surface, decreases at the rate of $0.61m/s^2$. The coefficient of kinetic friction between the puck and ice is: A. 0.062 B. 0.41 C. 0.62 D. 1.2 E. 9.8

(後面仍有題目，請繼續作答)

9 A 5.0-kg crate is on an incline that makes an angle of 30^0 with the horizontal. If the coefficient of static friction is 0.5, the maximum force that can be applied parallel to the plane without moving the crate is: A. 0 B. 3.3N C. 30N D. 46N E. 55N

10 A 2-kg object is moving at 3m/s. A 4-N force is applied in the direction of motion and then removed after the object has traveled an additional 5m. The work done by this force is:
A. 12 J B. 15 J C. 18 J D. 20 J E. 38 J

11 An ideal spring, with a pointer attached to its end, hangs next to a scale. With a 100-N weight attached, the pointer indicates "40" on the scale as shown. Using a 200-N weight instead results in "60" on the scale. Using an unknown weight X instead results in "30" on the scale. The weight of X is: A. 10N B. 20N C. 30N D. 40N E. 50N



12 A Texas Rangers 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. $mv^2/(2d)$

13 Two particles interact by conservative forces. In addition, an external force acts on each particle. They complete round trips, ending at the points where they started. Which of the following must have the same values at the beginning and end of this trip?
A. the total kinetic energy of the two-particle system
B. the potential energy of the two-particle system
C. the mechanical energy of the two-particle system
D. the total linear momentum of the two-particle system
E. none of the above

14 A 0.50-kg block attached to an ideal spring with a spring constant of 80N/m oscillates on a horizontal frictionless surface. The total mechanical energy is 0.12 J. The greatest extension of the spring from its equilibrium length is: A.1.5×10^{-3} m B.3.0×10^{-3} m C.0.039m D.0.054m E.18m

15 The potential energy of a body of mass m is given by $U = -mgx + 1/2(kx^2)$. The corresponding force is: A. $-mgx^2/2+kx^3/6$ B. $mgx^2/2-kx^3/6$ C. $-mg+kx/2$ D. $-mg+kx$ E. $mg-kx$

16 At the same instant that a 0.50-kg ball is dropped from 25m above Earth, a second ball, with a mass of 0.25 kg, is thrown straight upward from Earth's surface with an initial speed of 15m/s. They move along nearby lines and pass each other without colliding. At the end of 2.0 s the height above Earth's surface of the center of mass of the two-ball system is:
A. 2.9m B. 4.0m C. 5.0m D. 7.1m E. 10.4m

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17 The momentum of an object at a given instant is independent of its:
A. inertia B. mass C. speed D. velocity E. acceleration

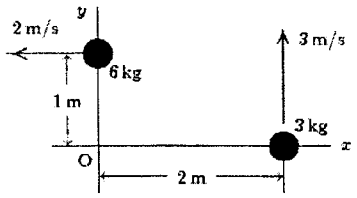
18 A 4.0-N puck is traveling at 3.0m/s. It strikes a 8.0-N puck, which is stationary. The two pucks stick together. Their common final speed is: A. 1.0m/s B. 1.5m/s C. 2.0m/s D. 2.3m/s E. 3.0m/s

19 A phonograph turntable, initially rotating at 0.75 rev/s, slows down and stops in 30 s. The magnitude of its average angular acceleration in rad/s^2 for this process is:
A. 1.5 B. 1.5π C. π/40 D. π/20 E. 0.75

20 To increase the rotational inertia of a solid disk about its axis without changing its mass:
A. drill holes near the rim and put the material near the axis B. drill holes near the axis and put the material near the rim C. drill holes at points on a circle near the rim and put the material at points between the holes D. drill holes at points on a circle near the axis and put the material at points between the holes E. do none of the above (the rotational inertia cannot be changed without changing the mass)

21 A hoop rolls with constant velocity and without sliding along level ground. Its rotational kinetic energy is: A. half its translational kinetic energy B. the same as its translational kinetic energy
C. twice its translational kinetic energy D. four times its translational kinetic energy E. one-third its translational kinetic energy

22 Two objects are moving in the x, y plane as shown. The magnitude of their total angular



momentum (about the origin O) is:
A. zero B. 6 kg·m^2/s C. 12 kg·m^2/s D. 30 kg·m^2/s E. 78 kg·m^2/s

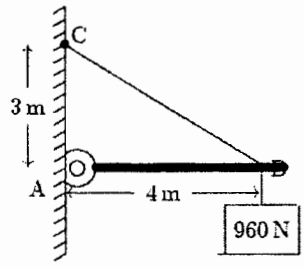
23 A 2.0-kg stone is tied to a 0.50-m long string and swung around a circle at a constant angular velocity of 12 rad/s. The net torque on the stone about the center of the circle is:
A. 0 B. 6.0N·m C. 12N·m D. 72N·m E. 140N·m

24 The location of which of the following points within an object might depend on the orientation of the object? A. Its center of mass B. Its center of gravity C. Its geometrical center
D. Its center of momentum E. None of the above

(後面仍有題目，請繼續作答)

25 In a Young' s double-slit experiment, a thin sheet of mica is placed over one of the two slits. As a result, the center of the fringe pattern (on the screen) shifts by an amount corresponding to 30 dark bands. The wavelength of the light in this experiment is 480nm and the index of the mica is 1.60. The mica thickness is: A. 0.090mm B. 0.012mm C. 0.014mm D. 0.024mm E. 0.062mm

26 The sound intensity 5.0m from a point source is 0.50W/m^2. The power output of the source is:



A. 720N B. 1200N C. 1280N D. 1600N E. none of these

27 An object at the surface of Earth (at a distance R from the center of Earth) weighs 90 N. Its weight at a distance 3R from the center of Earth is:
A. 10N B. 30N C. 90N D. 270N E. 810N

28 A long U-tube contains mercury (density = 14×10^3 kg/m^3). When 10 cm of water (density = 1.0×10^3 kg/m^3) is poured into the left arm, the mercury in the right arm rises above its original level by: A. 0.36 cm B. 0.72 cm C. 14 cm D. 35 cm E. 70 cm

29 The amplitude and phase constant of an oscillator are determined by:
A. the frequency B. the angular frequency C. the initial displacement alone
D. the initial velocity alone E. both the initial displacement and velocity

30 Any point on a string carrying a sinusoidal wave is moving with its maximum speed when:
A. the magnitude of its acceleration is a maximum
B. the magnitude of its displacement is a maximum
C. the magnitude of its displacement is a minimum
D. the magnitude of its displacement is half the amplitude
E. the magnitude of its displacement is one-fourth the amplitude

31 The coefficient of linear expansion of iron is 1.0×10^{-5} per C^0. The surface area of an iron cube, with an edge length of 5.0 cm, will increase by what amount if it is heated from 10^0C to 60^0 C? A. 0.0125 cm^2 B. 0.025 cm^2 C. 0.075 cm^2 D. 0.15 cm^2 E. 0.30 cm^2

32 A quantity of an ideal gas is compressed to half its initial volume. The process may be adiabatic, isothermal, or isobaric. Rank those three processes in order of the work required of an external agent, least to greatest. A. adiabatic, isothermal, isobaric B. adiabatic, isobaric, isothermal C. isothermal, adiabatic, isobaric D. isobaric, adiabatic, isothermal E. isobaric, isothermal, adiabatic

33 For all reversible processes involving a system and its environment: A. the entropy of the system does not change B. the entropy of the system increases C. the total entropy of the system and its environment does not change D. the total entropy of the system and its environment increases
E. none of the above

34 A neutral metal ball is suspended by a string. A positively charged insulating rod is placed near the ball, which is observed to be attracted to the rod. This is because: A. the ball becomes positively charged by induction B. the ball becomes negatively charged by induction C. the number of electrons in the ball is more than the number in the rod D. the string is not a perfect insulator E. there is a rearrangement of the electrons in the ball

35 An isolated charged point particle produces an electric field with magnitude E at a point 2m away from the charge. A point at which the field magnitude is E/4 is:
A. 1m away from the particle B. 0.5m away from the particle C. 2m away from the particle D. 4m away from the particle E. 8m away from the particle

36 A physics instructor in an anteroom charges an electrostatic generator to 25 μC, then carries it into the lecture hall. The net electric flux in $N \cdot m^2/C$ through the lecture hall walls is: A. 0 B. 25×10^{-6} C. 2.2×10^5 D. 2.8×10^6 E. can not tell unless the lecture hall dimensions are given

37 The resistance of a rod does NOT depend on: A. its temperature B. its material C. its length D. its conductivity E. the shape of its (fixed) cross-sectional area

38 A uniform magnetic field is in the positive z direction. A positively charged particle is moving in the positive x direction through the field. The net force on the particle can be made zero by applying an electric field in what direction? A. Positive y B. Negative y C. Positive x D. Negative x E. Positive z

39 The magnetic field a distance 2 cm from a long straight current-carrying wire is 2.0×10^{-5} T. The current in the wire is: A. 0.16A B. 1.0A C. 2.0A D. 4.0A E. 25A

40 A diffraction pattern is produced on a viewing screen by illuminating a long narrow slit with light of wavelength λ. If the slit width is decreased and no other changes are made:
A. the intensity at the center of the pattern decreases and the pattern expands away from the bright center B. the intensity at the center of the pattern increases and the pattern contracts toward the bright center C. the intensity at the center of the pattern does not change and the pattern expands away from the bright center D. the intensity at the center of the pattern does not change and the pattern contracts toward the bright center E. neither the intensity at the center of the pattern nor the pattern itself change