國立聯合大學 106 學年度

寒假轉學生招生考試試題紙

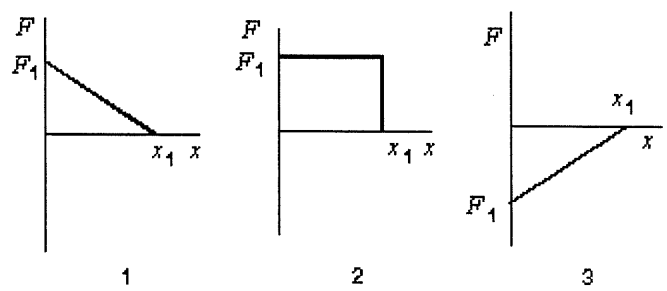
科目：普通物理　　第 1 頁共 3 頁

選擇題: 每題5分

1.) A 2-kg object is moving at 5 m/s. A 3-N force is applied in the direction of motion and then removed after the object has traveled an additional 3 m. The work done by this force is:

A) 20 J　B) 15 J　C) 9 J　D) 12 J　E) 18 J

2.) The graphs below show the magnitude of the force on a particle as the particle moves along the positive x axis from the origin to $x = x_1$. The force is parallel to the x axis and is conservative. The maximum magnitude F_1 has the same value for all graphs. Rank the situations according to the change in the potential energy associated with the force, greatest (or most positive) to least (or most negative).

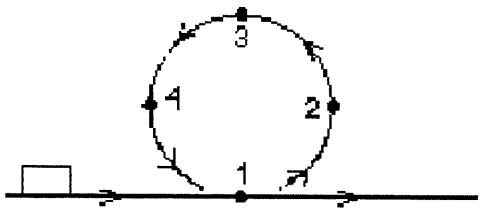


A) 1, 2, 3　B) 3, 1, 2　C) 2, 3, 1　D) 2, 1, 3　E) 3, 2, 1

3.) A particle experiences a conservative force given by $F = \alpha - \beta x^3$. Find the potential field the particle is in. (Assume that the zero of potential energy is located at x = 0.)

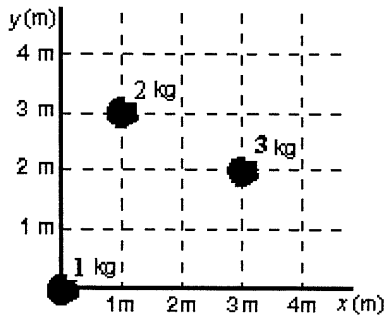
A) $U(x) = -\alpha x + (\beta/4)x^4$　B) $U(x) = -3\beta x^2$　C) $U(x) = \alpha x - (\beta/4)x^4$　D) $U(x) = 3\beta x^2$　E) $U(x) = \alpha x - 3\beta x^2$

4.) A rectangular block is moving along a frictionless path when it encounters the circular loop as shown. The block passes points 1,2,3,4,1 before returning to the horizontal track. At point 1:



A) its mechanical energy is a minimum　B) the forces on it are balanced　C) it is not accelerating
D) its speed is a minimum　E) it experiences a net upward force

5.) The x and y coordinates in meters of the center of mass of the three-particle system shown below are:



A) 0, 0　B) 1.3 m, 1.7 m　C) 2.0 m, 2.5 m　D) 1.8 m, 2.0 m　E) 2.2 m, 2.4 m

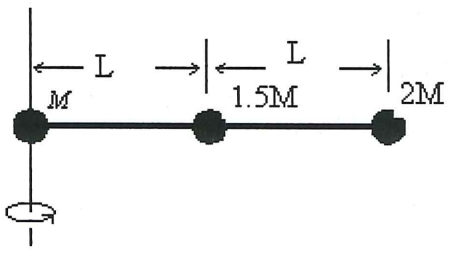
6.) A 600-N hunter gets a rope around a 300-N polar bear. They are stationary, 20 m apart, on frictionless level ice. When the hunter pulls the polar bear to him, the polar bear will move:

A) 1.0 m B) 6.7 m C) 11 m D) 13 m E) 18 m

7.) A wheel initially has an angular velocity of 24 rad/s but after 8.0s its angular velocity is 12 rad/s. If its angular acceleration is constant the value is:

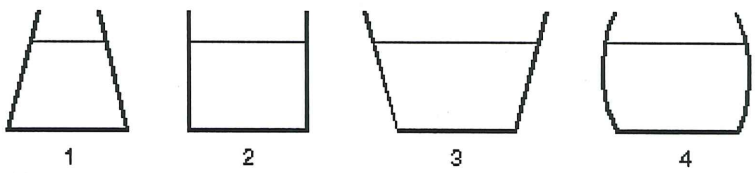
A) -0.5 rad/s^2 B) 0.5 rad/s^2 C) 4.5 rad/s^2 D) -4.5 rad/s^2 E) 6.0 rad/s^2

8.) Three balls, with masses of M, $1.5M$, and $2M$ are fastened to a massless rod of length $2L$ as shown. The rotational inertia about the left end of the rod is:



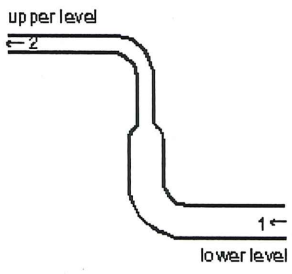
A) $ML^2/2$ B) $3.5ML^2$ C) $5.5ML^2/2$ D) $3ML^2/2$ E) $9.5ML^2$

9.) The vessels shown below all contain water to the same height. Rank them according to the pressure exerted by the water on the vessel bottoms, greatest to least.



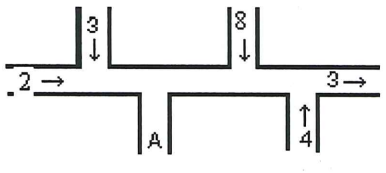
A) 1, 2, 3, 4 B) 3, 4, 2, 1 C) All pressures are the same D) 4, 3, 2, 1 E) 2, 3, 4, 1

10.) Water is pumped through the hose shown below, from a lower level to an upper level. Compared to the water at point 2, the water at point 1:



A) has greater speed and greater pressure B) has less speed and greater pressure C) has less speed and less pressure
D) has greater speed and less pressure E) has greater speed and the same pressure

11.) The diagram shows a pipe of uniform cross section in which water is flowing. The directions of flow and the volume flow rates (in cm^3/s) are shown for various portions of the pipe. The direction of flow and the volume flow rate in the portion marked A are:

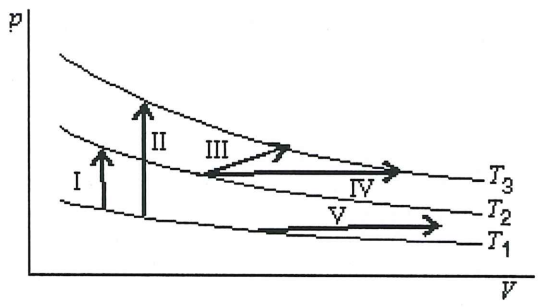


A) ↓ and 14 cm^3/s B) ↓ and 15 cm^3/s C) ↓ and 20 cm^3/s D) ↓ and 4 cm^3/s E) ↓ and 11 cm^3/s

12.) How many calories are required to change 0.75 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 °K.

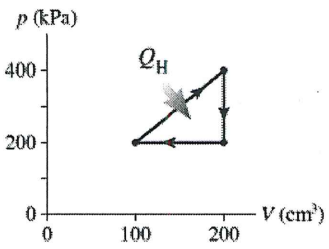
A) 100 B) 540 C) 620 D) 720 E) 900

13.) The diagram shows three isotherms for an ideal gas, with T_3-T_2 the same as T_2-T_1. It also shows five thermodynamic processes carried out on the gas. Rank the processes in order change in the internal energy of the gas, greatest to least.



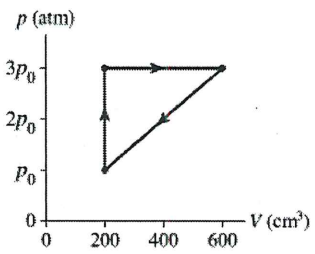
A) I, II, III, IV, V B) V, then I, III, and IV tied, then II C) V, I, then I, III, and IV tied, then II
D) IV, V, III, I, II E) II, then I, III, and IV tied, then V

14.) The figure shows a cycle for a heat engine for which Q_H =76 J. What is the thermal efficiency?



A) 11 % B) 6.6 % C) 26 % D) 13 % E) 22%

15.) A gas follows the pV trajectory shown in the figure. How much work is done per cycle by the gas if Po = 4.4 atm ?



(A) 710 J B) 360 J C) 180 J D) 890 J E) 980 J

16) A fluid in an insulated, flexible bottle is heated by a high resistance wire and expands. If 19 kJ of heat is applied to the system and it does 7 kJ of work, how much does the internal energy change?

A) 26 kJ B) 133 kJ C) -12 kJ D) 12 kJ E) 58 KJ

計算題：每題 10 分

17.) The equation of a transverse wave traveling along a very long string is $y = 6.0 \sin(0.020\pi x + 4.0\pi t)$, where x and y are expressed in centimeters and t is in seconds. Determine (a) the amplitude, (b) the wavelength, (c) the frequency, (d) the speed, (e) the direction of propagation of the wave, and (f) the maximum transverse speed of a particle in the string. (g) What is the transverse displacement at $x = 3.5$ cm when $t = 0.26$ s?

18.) A sinusoidal wave moving along a string is shown twice in Figure, as crest A travels in the positive direction of an x axis by distance $d = 6.0$ cm in 2.0 ms. The tick marks along the axis are separated by 10 cm and the vertical scale H = 10 mm. If the wave equation is of the form $y(x, t) = y_m \sin(kx \pm \omega t)$, what are (a) y_m, (b) k, (c) ω, and (d) the correct choice of sign in front of ω?