# 高雄醫學大學九十一學年度學士後西醫學系招生考試試題

## 科目：物理

### 一、選擇題（單選題，每題答對4分，答錯倒扣1分，未作答者，不給分亦不扣分）

(D) 1.A 300N weight, 5m long rigid uniform ladder is leaning against a smooth vertical wall. A 750N weight man stands on a rung 4m up along the ladder from its base as shown in fig.1. What is the minimum coefficient of the statical friction between the ladder and the floor required to keep the system in equilibrium? The angle is $53.1^\circ$ on a horizontal beam. ($\cos53.1^\circ = 0.6$, $\sin53.1^\circ = 0.8$)

(A)0.22 (B)0.42 (C)0.46 (D)0.54 (E)1.90

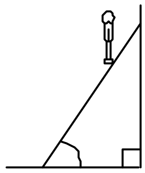


Fig 1

(C) 2.An imaginary closed surface S of radius R is centered on the origin. A positive charge is originally at the origin, and the flux through hte surface is $\Phi_e$. The positive charge is slowly moved from the origin to a point R/2 away from the origin. Now the flux is ______.

(A) $4\Phi_e$ (B)$2\Phi_e$ (C) $\Phi_e$ (D) $\Phi_e/2$ (E) $\Phi_e/4$

(E) 3.An incompressible fluid flows through a horizontal pipe. At one point in the pipe the pressure in the fluid is $p_1$ and the fluid speed is $v_1$. Further down the pipe pressure is $p_2$ and the flued speed is $2v_1$. What can be concluded about $p_1$ and $p_2$?

(A) $p_1 = p_2$ (B) $p_1 = 2p_2$ (C) $p_1 = 3p_2$ (D) $p_1 = 4p_2$ (E)only that $p_1 > p_2$

(E) 4.A diffraction grating just resolves the wavelengths 400.0 nm and 400.1 nm in the first order. The number of slits in the grating is ______.

(A)400 (B)1000 (C)2500 (D)3000 (E)4000

(E) 5.A clear sheet of polaroid is placed on top of a simmilar sheets so that their polarizing axes make an angle of $30^\circ$ with each other. The ratio of the intensity of emerging light to incident unpolarized light its ______. ($\cos 30^\circ = \frac{\sqrt{3}}{2}, \sin 30^\circ = \frac{1}{2}$)

(A)1/4 (B)1/3 (C)1/2 (D)3/4 (E)3/8

(B) 6.What is the intensity ratio of sound for the heavy truck at 1.5m(90dB) to normal conversation at 1m(60dB)?

(A)1.5 (B)$10^3$ (C)0.67 (D)$10^{30}$ (E)$110^{-3}$

(D) 7.What is the ratio of the shortest wavelength of the Balmer series to the shortest wavelength of the Lyman series in the spectrum of the Hydrogen atom?

(A)2 (B)5 (C)3 (D)4 (E)9

(D) 8.Some sunglasses are coated on one side with a thin film of $MgF_2$ to reduce reflection from the glass surface. The index of refraction of $MgF_2$ is 1.38; that of the glass is 1.50. What is the least coating thickness that eliminates (via interference) the reflections in the range of the visible spectrum ($\lambda$ = 550nm)? Assume that the light is approximately perpendicular to the glass surface.

(A)40nm (B)60nm (C)80nm (D)100nm (E)120nm

(C) 9.The two headlights of a car are 1.4m apart. At what maximum distance will the eyes resolve them? Assume that the pupil diameter is 5.0mm, and use a wavelength of 550 nm for the light. (Consider only diffraction effects.)

(A)3km (B)5km (C)10km (D)15km (E)20km

(D) 10.A flute (which we treat as a pipe open at both ends) is 60cm long. How far from the mouthpiece should a hole be uncovered for the fundamental frequency to be 330Hz? (The speed of sound is 330m/s).

(A)35cm (B)40cm (C)45cm (D)50cm (E)55cm

(B) 11.An ideal monatomic gas undergoes a quasistatic expansion to one-third of its initial pressure. Find the ratio of the final volume to the initial volume if the process is adiabatic. ($\gamma = Cp / Cv = 5/3$ for ideal monatomic gas, $\log 3 = 0.5$)

(A)$10^{-0.1}$ (B)$10^{0.3}$ (C)$10^{0.5}$ (D)$10^{0.6}$ (E)$10^{0.7}$

(C) 12.A block with mass m = 250g is fastened to a spring with spring constant k = 85N/m. The system is excited to oscillate. Assume that there is a velocity-dependent damping force $F_d = -bv$ in the system with b = 70g/s. How long does it take for the amplitude of the damped oscillation to drop to half its initial value? (ln2 = 0.693)

(A)3s (B)4s (C)5s (D)6s (E)7s

(B) 13.A thin rod whose length L is 10cm and whose mass m is 100g, suspended at its midpoint from a long wire. Its period $T_a$ of angular SHM (Simple Harmonic Motion) is measured to be 2.50 s. An irregularly shaped object is then hung from the same wire and its period $T_b$ is found to be 5.0s. What is the rotational inertia of the irregular object about its suspension axis? (The rotational inertia for a rod is $\frac{1}{12}mL^2$)

(A) $1.73\times10^{-4}\,kg\cdot m^2$ (B) $3.30\times10^{-4}\,kg\cdot m^2$ (C) $4.62\times10^{-4}\,kg\cdot m^2$

(D) $6.12\times10^{-4}\,kg\cdot m^2$ (E) $7.64\times10^{-4}\,kg\cdot m^2$

(B) 14.In high-speed motion through air, the resisting force is approximately $F = cv^2$. For a human body falling through air in a spread-eagle position, c is about 0.25kg/m. An 80kg sky diver jumps out of an airplane and reaches terminal speed before opening the parachute. What is the terminal speed?

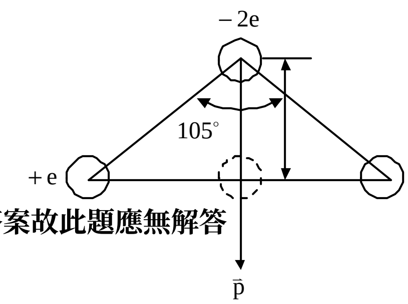
(A)49m/s (B)56m/s (C)72m/s (D)84m/s (E)98m/s

**(無解)** 15.A neutral water molecule ($H_2O$) in its vapor state has an electric dipole moment of magnitude $6.2\times10^{-30}$ Cm. How far apart are the molecule's center of positive and negative charge?

(A)1.9pm (B)2.9pm (C)3.9pm (D)4.9pm (E)5.9pm

**說明：** $\vec{p} = 2e\vec{\ell}$

$$\ell = \frac{p}{2e} = \frac{6.3\times10^{-30}\,c\cdot m}{2\times1.6\times10^{-19}\,c}$$
$$= 1.97\times10^{-11}\,m$$
$$= 19.7\,pm$$




**但第 15 題之五個答案中無此答案故此題應無解答**

(B) 16.In a mass spectrometer, the initally stationary ion is accelerated by the electric field due to a potential V. The ion enters a separator chamber in which a uniform magnetic field B is perpendicular to the path of the ion. The magnetic field causes the ion to move in a semicircle, striking a photographic plate at distance x from the entry slit. Suppose that B = 80mT and V = 1000 Volts, and ion of charge q = $+1.60\times10^{-19}$ C strikes the plate at x = 1.63m, what is the mass of the ion?

(A)185.7u (B)204.9u (C)224.6u (D)241.5u (E)267.8u

(A) 17.Consider a parallel-plate capacitor of plate area A and plate separation. A potential difference Vo is applied between the plates. The battery is then disconnected, and a dielectric slab of thickness b and dielectric constant k is placed between the plates. Assuming A = 100cm$^2$, d = 1.00cm, Vo = 90V, b = 0.8cm, k = 2.00. What is the capacitance with the slab in place?

($\epsilon_0 = 8.85\times10^{-12}\,C^2/N\cdot m^2$)

(A)14.8pF (B)16.8pF (C)17.9pF (D)20.9pF (E)21.9pF

(A) 18.A 200g top spinning at 20 rev/s makes an angle of 30$^\circ$ to the vertical and precesses at a rate of 1 rev per 10.0s. If its CM (Center of Mass) is 4.0cm from its tip along its symmetry axis, what is the moment of inertia of the top?

(A) $1.00\times10^{-3}\mathrm{kg\cdot m^2}$ (B) $2.04\times10^{-3}\mathrm{kg\cdot m^2}$ (C) $3.06\times10^{-3}\mathrm{kg\cdot m^2}$

(D) $4.08\times10^{-3}\mathrm{kg\cdot m^2}$ (E) $6.62\times10^{-3}\mathrm{kg\cdot m^2}$

(D) 19.A phone cord is 4.00m long. The cord has a mass of 0.200kg. If a transverse wave pulse travels from the receiver to the phone box in 0.100s, what is the tension in the cord?

(A)50.0N (B)60.0N (C)70.0N (D)80.0N (E)90.0N

(D) 20.A thermodynamic system undergoes a process in which its internal energy decreases by 500J. If at the same time, 220J of work is done on the system, what is the thermal energy transferred to or from it?

(A)280J (B)−280J (C)720J (D)−720J (E)1220J

(A) 21.A dipole for which $p=3.8\times10^{-30}\mathrm{C\cdot m}$ is in a uniform field $E=7\times10^{4}\mathrm{N/C}$. What is the external work needed to rotate the dipole from alignment with the field to angle 60$^\circ$ to the field? ($\cos60^\circ=0.5; \sin60^\circ=0.9$)

(A) $1.33\times10^{-25}\mathrm{J}$ (B) $2.39\times10^{-25}\mathrm{J}$ (C) $3.99\times10^{-25}\mathrm{J}$ (D) $5.56\times10^{-25}\mathrm{J}$

(E) $7.12\times10^{-26}\ J$

(D) 22.A 5A current flows in a circular loop of radius 2cm. The axis of the loop is at 30$^\circ$ to a uniform field 0.06T. What is the magnitude of the torque on the loop?

(A) $1.22\times10^{-3}\mathrm{N\cdot m}$ (B) $1.88\times10^{-3}\mathrm{N\cdot m}$ (C) $1.22\times10^{-4}\mathrm{N\cdot m}$ (D) $1.88\times10^{-4}\mathrm{N\cdot m}$

(E) $3.76\times10^{-4}\mathrm{N\cdot m}$

(C) 23.A 15pF parallel-plate capacitor is connected to a 50V battery. The area of each plate is 80cm$^2$. What is the energy density in the fiele? ($\in_0=8.85\times10^{-12}\mathrm{C^2/N\cdot m^2}$)

(A) $2.62\times10^{-4}\mathrm{J/m^3}$ (B) $3.38\times10^{-4}\mathrm{J/m^3}$ (C) $5.00\times10^{-4}\mathrm{J/m^3}$ (D) $6.76\times10^{-4}\mathrm{J/m^3}$

(E) $7.97\times10^{-4}\mathrm{J/m^3}$

(E) 24.What minimum frequency of light is needed to eject electrons from a metal whose work function is $4.3\times10^{-19}\mathrm{J}$? ($h=6.63\times10^{-34}\mathrm{Js}$)

(A) $1.9\times10^{14}\mathrm{Hz}$ (B) $3.8\times10^{14}\mathrm{Hz}$ (C) $4.6\times10^{14}\mathrm{Hz}$ (D) $5.2\times10^{14}\mathrm{Hz}$

(E) $6.5\times10^{14}\mathrm{Hz}$

(C) 25.Through how many volts of potential difference must an electron be accelerated to achieve a wavelength of 0.28nm? ($h=6.63\times10^{-34}\mathrm{Js}; m_e=9.11\times10^{-31}\mathrm{kg}$)

(A)12V (B)16V (C)19V (D)31V (E)34V