高雄醫學大學九十二學年度學士後醫學系招生考試試題

科目:普通物理學　　考試時間：80 分鐘　　共 三 頁

說明:一.選擇題用 2B 鉛筆在「答案卡」上作答，修正時應以橡皮擦拭，切勿使用修正液（帶），未遵照正確作答方法而致無法判讀者，考生自行負責。
二.試卷必須繳回，不得攜出試場。

[單選題]每題 4 分，共計 100 分。答錯一題倒扣 1 分，倒扣至零分為止，未作答者，不給分亦不扣分。

1. The current amplitude in an inductor in a radio receiver is to be 250 μÅ when the voltage amplitude is 3.60 V at a frequency of 1.60 MHz. What is the inductance?
(A) 13.4 mH　(B) 2.78 mH　(C) 10.8 mH
(D) 1.43 mH　(E) 4.01 mH

2. A conducting wire has a 1.0 mm diameter , a 2.0 m length, and a 50 mΩ resistance. What is the resistivity of the material ?
(A) $1.96\times10^{-8}\Omega\cdot m$　(B) $9.8\times10^{-7}\Omega\cdot m$　(C) $1.0\times10^{-7}\Omega\cdot m$
(D) $3.5\times10^{-5}\Omega\cdot m$　(E) $6.8\times10^{-8}\Omega\cdot m$

3. A uniform rod of mass m and length L is freely pivoted at one end. What is the period of its oscillation? ($I_{system}=1/3\ mL^2$)
(A) $2\pi(L/g)^{1/2}$　(B) $2\pi(2L/3g)^{1/2}$　(C) $2\pi(L/3g)^{3/2}$
(D) $2\pi(L/3g)^{1/2}$　(E) $2\pi(3L/g)^{1/2}$

4. A hollow sphere of inner radius 8.0 cm and outer radius 9.0 cm floats half submerged in a liquid of specific gravity 0.80. Find the density of the material of which the sphere is made.
(A) 2.1×10^3 kg/m^3　(B) 1.3×10^3 kg/m^3　(C) 1.5×10^3 kg/m^3
(D) 1.7×10^3 kg/m^3　(E) 1.9×10^3 kg/m^3

5. What will be the speed of a solid sphere of mass M and radius Ro when it reaches the bottom of an incline if it starts from rest at a vertical height H and rolls without slipping? See Fig.5. Ignore losses due to dissipative forces.
(A) $\sqrt{gH}$　(B) $\sqrt{\frac{4}{3}gH}$
(C) $\sqrt{\frac{10}{7}gH}$　(D) $\sqrt{2gH}$
(E) $\sqrt{2gH\sin\theta}$

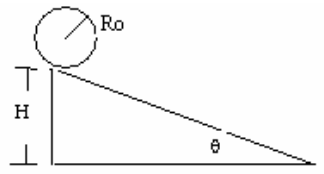

Fig 5

6. Each of four particles move along an x axis. Their coordinates (in meters) as fuctions of time (in seconds) are given by
Particle 1: $x(t)= 2.5 - 3.0t^3$
Particle 2: $x(t)= 2.5 + 3.0t^3$
Particle 3: $x(t)= 2.5 + 3.0t^2$
Particle 4: $x(t)= 2.5 - 1.5t - 3.0t^2$
Which of these particles have (has) constant acceleration?
(A) Only 1 and 2　(B) Only 2 and 3　(C) Only 1 and 3
(D) Only 3 and 4　(E) Only 4

7. The potential energy of a body of mass m is given by $U(x)= -ax/(b^2-x^2)$, where *a* and *b* are constants. The corresponding force is：
(A) $\frac{-a(b^2+x^2)}{(b^2-x^2)}$　(B) $\frac{-a(b^2+x^2)}{(b^2-x^2)^2}$　(C) $\frac{a(b^2+x^2)}{(b^2-x^2)^2}$
(D) $\int\frac{-ax}{(b^2-x^2)}\,dx$　(E) $\int\frac{ax}{(b^2-x^2)}\,dx$

8. An infinite cylinder of radius R has a hole of radius a along its central axis. The rest of the cylinder has a uniform charge density $\rho\ C/m^3$. Determine the electric field in the region . $a < r < R$

(A) $\frac{\rho}{2\varepsilon_0}(r - \frac{a^2}{r})$ (B) $\frac{\rho}{2\varepsilon_0}(\frac{R^2 - a^2}{r})$ (C) $\frac{\rho}{2\varepsilon_0}\ \frac{a^2}{r}$

(D) $\frac{\rho}{2\varepsilon_0}(\frac{a^2}{r - a})$ (E) $\frac{\rho}{2\varepsilon_0}(\frac{R^2}{r - a})$

9. A small satellite is in elliptical orbit around Earth as shown in Fig.9. If L denotes the magnitude of its angular momentum and K denotes kinetic energy, then

(A) $L_2 > L_1$ and $K_2 > K_1$ (B) $L_2 > L_1$ and $K_2 = K_1$

(C) $L_2 = L_1$ and $K_2 = K_1$ (D) $L_2 < L_1$ and $K_2 = K_1$

(E) $L_2 = L_1$ and $K_2 > K_1$

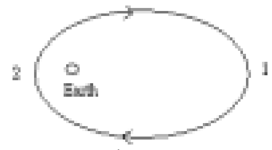

Fig. 9

10. A man launches a boat at a bridge and rows upstream a distance of 1 km where he drops a bottle in the water. He then continues to row upstream for an additional 10 min. At that point he turns around and rows downstream, arriving at the bridge at the same time as the bottle. What is the speed of the water in the river? Assume that the man rows at the same speed relative to the water at all times.

(A) 0.83 m/sec (B) 0.79 m/sec (C) 1.20 m/sec

(D) 1.50 m/sec (E) 0.90 m/sec

11. A transverse wave on a string is given by y＝(2.0 cm)×sin π[(200/s)t－(0.8/cm)x]. What is the maximum particle speed?

(A) 200π cm/sec (B) 370π cm/sec (C) 400π cm/sec

(D) 350π cm/sec (E) 450π cm/sec

12. White light reflected at perpendicular incidence from a soap film has, in the visible spectrum, an interference maximum at 6000 Å and a minimum at 4500 Å, with no minimum in between. If n = 1.33 for the film, what is the film thickness, assumed uniform?

(A) 1450 Å (B) 2670 Å (C) 3534 Å

(D) 3380 Å (E) 5120 Å

13. One mole of an ideal gas expands slowly and isothermally at temperature T until its volume is doubled. The change of entropy of this gas for this process is:

(A) Rln2 (B) ln2/T (C) 0

(D) RTln2 (E) 2R

14. An electron moves through a uniform magnetic field given by $\vec{B} = B_x\hat{i} + 3B_x\hat{j}$. At a particular instant, the electron has the velocity $\vec{v} = (2.0\hat{i} + 4.0\hat{j})\,m/s$ and the magnetic force acting on it is $(6.4\times10^{-19}\ \mathrm{N})\hat{k}$. Find B_x

(A) –2.0T (B) –0.29T (C) 0.29T

(D) 0.5T (E) 2.0T

15. Imagine an aluminum cup of 0.10 liter capacity filled with glycerin at 22 ℃. How much glycerin will spill out of the cup if the temperature of the cup and glycerin is raised to 28 ℃? (The coefficient of volume expansion of glycerin is $5.1\times10^{-4}/^0C$, the coefficient of linear expansion of aluminum is $2.3\times10^{-5}/^0C$)

(A) 292.2 mm^3 (B) 264.6 mm^3 (C) 26.6 mm^3

(D) 345.1 mm^3 (E) 487.4 mm^3

16. A spy satellite in orbit at an altitude of 200 Km has a mirror of diameter 50 cm. Assuming that it is limited only by diffraction, what is the closest distance between two bodies on the earth's surface for them to be resolved ? Take λ=400 nm

(A) 19.5 cm (B) 21.2 cm (C) 18.0 cm

(D) 10.3 cm (E) 2.8 cm

17. Four circuits have the form shown in Fig.17. The capacitor is initially uncharged and the switch S is open. The values of the emf E, resistance R, and capacitance C for each of the circuits are
Circuit 1: E=24V, R=4Ω, C=1μF
Circuit 2: E=18V, R=6Ω, C=9μF
Circuit 3: E=12V, R=1Ω, C=6μF
Circuit 4: E=10V, R=5Ω, C=5μF
Rank the circuits according to the current just after switch S is closed least to greatest.

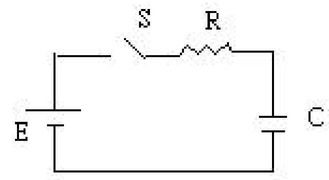

Fig. 17

(A) 1, 4, 3, 2 (B) 3, 1, 4, 2 (C) 4, 3, 2, 1
(D) 4, 2, 1, 3 (E) 3, 1, 2, 4

18. A cyclotron used to accelerate α particles ($m=6.65\times10^{-27}$ kg; $q=3.2\times10^{-19}$ Coul) has a radius of 0.50 m and a magnetic field of 1.8 T. What is the period of revolution of the α particles?
(A) 8.3×10^{-9} sec (B) 7.3×10^{-8} sec (C) 6.3×10^{-7} sec
(D) 5.3×10^{-6} sec (E) 4.3×10^{-5} sec

19. A harmonic oscillator consists of a 0.015-kg mass on a spring. Its frequency is 2.0 Hz, and the mass has a speed of 0.40 m/sec as it passes the equilibrium position. What is the value of the quantum number n for its energy state? ($h=6.626\times10^{-34}$ J・S)
(A) 8.6×10^{26} (B) 3.4×10^{19} (C) 9.1×10^{29}
(D) 5.0×10^{28} (E) 7.6×10^{31}

20. Singly ionized chlorine atoms of 35 amu and 37 amu, traveling with speed 2.0×10^{5} m/sec, enter perpendicularly a uniform magnetic field of 0.50 tesla. After bending through 180° the atoms strike a photographic film. What is the separation distance between the two spots on the film? (1.00 amu ＝ 1.67×10^{-27} kg)
(A) 2.1 cm (B) 3.7 cm (C) 1.7 cm
(D) 4.5 cm (E) 5.8 cm

21. The escape velocity at the surface of Earth is approximately 10 km/s. What is the escape velocity for a planet whose radius is 4 times and whose mass is 100 times that of Earth?
(A) 0.4 km/s (B) 2 km/s (C) 50 km/s
(D) 250 km/s (E) 4000 km/s

22. A nucleus with mass number A and atomic number Z undergoes β^{+} decay. The mass number and atomic number, respectively, of the daughter nucleus are：
(A) A–1, Z–1 (B) A–1, Z+1 (C) A+1, Z–1
(D) A, Z+1 (E) A, Z–1

23. One quarter of a circular loop of wire carries a current I as shown in Fig.23. The current I enters and leaves on straight segments of wire. The straight wires are along the radial direction from the center C of the circular portion. The length of each straight segment is h. Find the magnetic field at C.

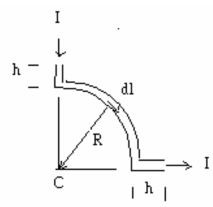

Fig. 23

(A) 0 (B) $\mu_0 I(\frac{\pi R}{2})$ (C) $\mu_o I(\frac{\pi R}{2}+2h)$
(D) $\frac{\mu_0 I}{8R}$ (E) $\frac{\mu_0 I}{8R+2h}$

24. A particle moving along the x axis is acted upon by a single force $F=F_o e^{-kx}$, where F_o and k are constants. The particle is released from rest at x=0. It will attain a maximum kinetic energy of：
(A) F_o/k (B) F_o/e^{k} (C) kF_o
(D) $\frac{1}{2}(kF_o)^2$ (E) $k\,e^{k}F_o$

25. A Carnot engine operates between a hot reservoir at 320°K and a cold reservoir at 260°K. If it absorbs 500 j of heat at the hot reservoir, how much work does it deliver?
(A) 34 j (B) 57 j (C) 94 j
(D) 73 j (E) 109 j