

銘傳大學 96 學年度轉學生招生考試

生物醫學工程學系、電子工程學系

7 月 25 日 第四節

物理學試題

(第 / 頁共 / 頁)

(限用答案本作答)

可使用計算機

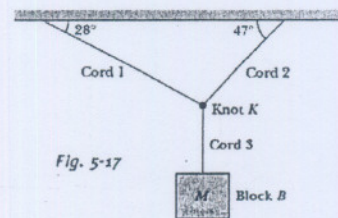
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1. A wave traveling along a string is described by $y(x, t) = 0.00327 \sin(72.1x - 2.72t)$, in which the numerical constants are in SI units (0.00327 m, 72.1 rad/m, and 2.72 rad/s).
What is the wavelength of this wave?
- (a) 0.87 cm (b) 0.435 cm (c) 8.7 cm (d) 4.35 cm

2. A block whose mass m is 680 g is fastened to a spring whose spring constant k is 65 N/m. The block is pulled a distance $x = 11$ cm from its equilibrium position at $x = 0$ on a frictionless surface and released from rest at $t = 0$.
What is the angular frequency of the resulting motion?
- (a) 4.5 rad/s (b) 0.435 rad/s (c) 0.98 rad/s (d) 9.78 rad/s

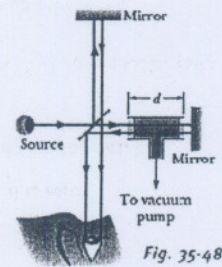
3. For the following three vectors, what is $3\vec{C} \cdot (2\vec{A} \times \vec{B})$?
 $\vec{A} = 2.00\hat{i} + 3.00\hat{j} - 4.00\hat{k}$ $\vec{B} = -3.00\hat{i} + 4.00\hat{j} + 2.00\hat{k}$ $\vec{C} = 7.00\hat{i} - 8.00\hat{j}$
- (a) 540 (b) 480 (c) 450 (d) 840

4. In Fig. 5-17, a block B of mass $M = 15.0$ kg hangs by a cord from a knot K of mass m_K , which hangs from a ceiling by means of two other cords. The cords have negligible mass, and the magnitude of the gravitational force on the knot is negligible compared to the gravitational force on the block. What is the tension in the Cord 3?
- (a) 104 N (b) 147 N (c) 134 N (d) 168 N

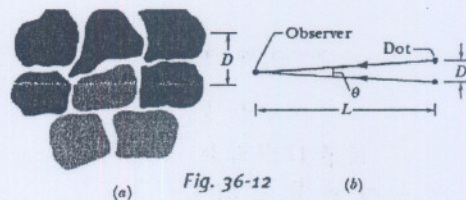


5. A lens is made of glass having an index of refraction of 1.5. One side of the lens is flat, and the other is convex with a radius of curvature of 20 cm. Find the focal length of the lens.
- (a) 4 cm (b) 8 cm (c) 40 cm (d) 20 cm.

6. In Fig. 35-48, an airtight chamber of length $d = 5.0$ cm is placed in one arm of a Michelson interferometer. (The glass window on each end of the chamber has negligible thickness.) Light of wavelength $\lambda = 500$ nm is used. Evacuating the air from the chamber causes a shift of 60 bright fringes. From these data and to six significant figures, find the index of refraction of air at atmospheric pressure.
- (a) 1.004 (b) 1.003 (c) 1.0004 (d) 1.0003



7. Figure 36-12a is a representation of the colored dots on a pointillistic painting. Assume that the average center-to-center separation of the dots is $D = 2.0$ mm. Also assume that the diameter of the pupil of your eye is $d = 1.5$ mm and that the least angular separation between dots you can resolve is set only by Rayleigh's criterion. What is the least viewing distance from which you cannot distinguish any dots on the painting?



- (a) 6.1 m (b) 12.2 m (c) 3.05 m (d) 10.2 m
8. In electromagnetic wave, what is the amplitude ratio of the electric field and magnetic field? (C: light speed)
- (a) 2C (b) C (c) 10 C (d) 1/2 C.
9. A slit of width a is illuminated by white light. For what value of a will the first minimum for red light of wavelength $\lambda = 650$ nm appear at $\theta = 15^\circ$?
- (a) 25110 nm (b) 502 nm (c) 2511 nm (d) 5022 nm
10. How were variable displays made bright and counterfeit proof on the money? It is caused by
- (a) interference (b) refraction (c) reflection (d) diffraction.
11. The capacitance of a parallel-plate capacitor with plate area A and plate separation d is given by:
- (a) $\epsilon_0 d/A$, (b) $\epsilon_0 A/d$, (c) dA/ϵ_0 , (d) $\epsilon_0 dA$,

本試題兩面印刷

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12. Consider Gauss's law: $\oint_S \vec{E} \cdot d\vec{a} = q / \epsilon_0$, ϵ_0 is the permittivity constant, $d\vec{a}$ is the area element

and S is the integral surface. Which of the following is true?

- (a) \vec{E} must be the electric field due to the enclosed charge,
 (b) If $q = 0$, then $\vec{E} = 0$ everywhere on the Gaussian surface
 (c) If the three particles inside have charges of $+q$, $+q$, and $-2q$, then the integral is zero
 (d) If a charge is placed outside the surface, then it cannot affect \vec{E} at any point on the surface.

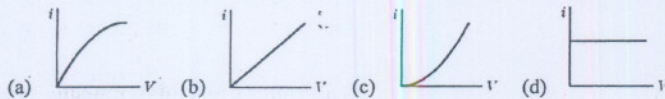
13. Consider a conservation field of \vec{E} . Which of the following is not true?

- (a) $\nabla \cdot \vec{E} = 0$, (b) $\nabla \times \vec{E} = 0$, (c) $\oint_r \vec{E} \cdot d\vec{l} = 0$, $d\vec{l}$ is the line element. (d) $\vec{E} = \nabla \phi$, ϕ is a scalar field.

14. Capacitors C_1 and C_2 are connected in series. The equivalent capacitance is given by:

- (a) $C_1 C_2 / (C_1 + C_2)$, (b) $(C_1 + C_2) / C_1 C_2$, (c) $1 / (C_1 + C_2)$, (d) $C_1 + C_2$

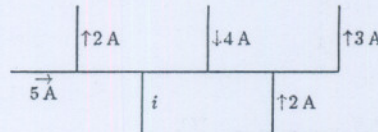
15. Which of the following graphs best represents the I - V relationship for a device that obeys Ohm's law?



16. A portion of a circuit is shown, with the values of the currents given for some branches.

What is the direction and value of the current i ?

- (a) \uparrow , 4A (b) \downarrow , 4A (c) \uparrow , 6A (d) \downarrow , 6A



17. Consider Ampere's circuital law: μ_0 is the permeability constant. Which of the following is true?

- (a) $\oint_r \vec{B} \cdot d\vec{l} = \mu_0 I$, (b) $\int_r \vec{B} \cdot d\vec{l} = \mu_0 I$, (c) $\oint_s \vec{B} \cdot d\vec{a} = \mu_0 I$, (d) $\int_s \vec{B} \cdot d\vec{a} = \mu_0 I$

Note: $d\vec{l}$ is the line element, Γ is the integral path, I is the current, and \vec{B} is the magnetic field.

18. Consider Faraday's law of electromagnetic induction: Which of the following is not true?

- (a) $\oint_r \vec{E} \cdot d\vec{l} = -\frac{d\Phi_B}{dt}$, (b) $\epsilon = -\frac{d\Phi_B}{dt}$, (c) $\epsilon = -\frac{d}{dt} \int_s \vec{B} \cdot d\vec{a}$, (d) $\vec{E} = -\frac{d}{dt} \oint_s \vec{B} \cdot d\vec{a}$

Note: \vec{E} is the induced electric field, Φ_B is the magnetic flux, ϵ is the induced electromotive force

19. Consider the differences between electric and magnetic forces on a moving charged-particle.

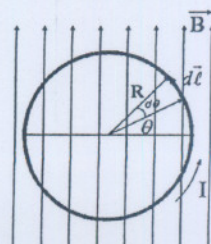
Which of the following is not true?

- (a) The electric force is always parallel or anti-parallel to the direction of the electric field,
 (b) The magnetic force is perpendicular to the magnetic field,
 (c) The magnetic field can alter the direction of the velocity vector and change the speed of the particle,
 (d) The magnetic force associated with a steady magnetic field does not work when the charged particle is displaced.

20. A wire bent into the shape of a circle of radius R forms a closed circuit and carries a current I ($I \neq 0$). The circuit lies in the xy plane, and a uniform magnetic field ($B \neq 0$) is present along the positive y axis as shown in the figure.

Which of the following is true?

- (a) The net magnetic force must be zero,
 (b) The net magnetic force is $I(\pi R^2)B$,
 (c) The net magnetic force is $I(2\pi R)B$
 (d) The net magnetic force can not be calculated because the conditions are not clear.



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