

G. R. E. 物理試題大全

(1970年~1973年)

編著者

黃 啓 明



文源書局有限公司印行

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編者序

本書根據1970年度至1973年度美國 graduate record examination 考古題精心編纂而成。解答案由十位老師同學鑽研而導。資料最全，答案正確。

本書是供國內外大專院校物理、電機、機械、核工、電子工程等科系備考 GRE 之參考。使用本書保證獲取高分，以利留美獎學金之申請。亦可當作求職考試之參考。

本書出版，學文源書局藉此，予厚感戴。在此致謝，亦是大學院校畢業生、研究生之一大福音。

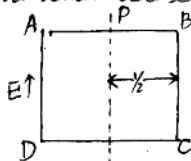
黃啓明 謹識於 新竹
62年7月5日

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$$\frac{r}{\phi} - \frac{1}{q}$$

In suitable units the electric field E at one instant of time is zero to the right of plane P and uniform with magnitude 3 to the left of plane of P . $ABCD$ is a square with side length 1.



1. What is the electromotive force for the curve $ABCD$?

- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

Ans: (D)

2. There is also a magnetic field present. B is present to the right of the plane P . B is perpendicular to the paper and its magnitude is 6 to the left of P . What is the magnetic flux through the square $ABCD$?

- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

Ans: (D)

3. Which of the following statements must be true in the situation described in the previous 2 questions?

- (A) The magnetic flux through the square can't be constant at the moment being considered.
(B) The electromotive force is always proportional to the magnetic flux through the square.

- (c) The situation is unrealistic because electric and magnetic field always vary sinusoidally with position.
 (d) The situation is unrealistic because electric and magnetic field are always parallel.

Ans: (A)

4. Which of the following statements about relativistic mechanics is not true?

- (A) The classical expression of kinetic energy is applicable in relativistic mechanics.
 (B) The relativistic mechanics reduced to Newton's mechanics for velocity much less than c .
 (C) The relativistic equations of motion have a closed formal similarity to Newton's equation if the relativistic equation are written in terms of the proper time.
 (D) Relativistic mechanics is useful in the design of particle accelerators.
 (E) Energy is conserved in relativistic mechanics.

Ans: (A)

5. A wire with one segment bent into a semicircle is rotated in a uniform magnetic field. The average power dissipated in the resistor is P_0 . If both angular and resistance double, the average power dissipated will be
 (A) $P_0/4$ (B) P_0 (C) $P_0/2$ (D) $2P_0$ (E) $3P_0$

Ans: (D)



6. Electron scattered from a thin film incident on a scintillation screen, what is necessary to obtain a ring scintillation on the screen?



- (A) Density of the film is uniform
- (B) Thickness of the film is uniform
- (C) The electrons are monoenergetic
- (D) The incident electrons are polarized

Ans: (C)

7. Al is atomic mass ≈ 27 , density $\approx 2.7 \text{ g/cm}^3$, attenuation length $\approx 10 \text{ cm}$, 則其 cross section $\approx$

- (A) 10^{-12} cm^2
- (B) 10^{-16} cm^2
- (C) 10^{-8} cm^2
- (D) 10^{-24} cm^2
- (E) 以上皆非

Ans: (D)

8 One particle is Confine in $-V$ potential in ϕ , Prob
in $x = \frac{L}{6}$ is probability of finding the particle
per unit length.

(A) e^{-L}

(B) $\frac{1}{L}$

(C) $\frac{1}{2L}$

(D) $\frac{1}{4L}$

Ans: (C)

9 Given Al $\vec{p}$ Mass, density & intensity. 從 $1 \rightarrow \frac{1}{2}$
求 total cross section:

Ans: total Cross section $\sigma = \frac{1}{x}$

10 由 $p + p \Rightarrow \pi^+ + d$ 式可得什麼 information?

(A) π^+ is spin equal to zero.

(B) π^+ spin is 1. Ans: (A)

11 If the intensity of A and A' be $I \Rightarrow$ the
illumination at P is

(A) $\frac{I}{3g}$ (B) $\frac{I^2}{9g^2}$ (C) $\frac{I}{3g^2}$ (D) $\frac{I}{9g^2}$

Ans: (D)

$$12. \text{ S.T.P. 中 gas } p, v, T \text{ 及 } n \longrightarrow \lambda = \frac{1}{\sqrt{2}} \frac{1}{n \pi d^2}$$

中 mean free path.

13. In variance with respect to space-displacement conservation of:

- (A) energy
- (B) angular
- (C) linear momentum
- (D) parity
- (E) None of the above

Ans: (C)

$$14. x' = ax + bt, y' = y, z' = z, t' = ex + ft$$

中 transformation

- (A) Galilean (x-t) transformation.
- (B) Lorentz
- (C) linear
- (D) identity
- (E) relation with nonzero angle.

Ans: (E)

$$15. \text{ 中 } E' = \gamma(p \cdot E) = ?$$

- (A) $\frac{E - v p_x}{\sqrt{1 - v^2/c^2}}$
- (B) $\frac{E + v p_x}{\sqrt{1 - v^2/c^2}}$
- (C) $\frac{E}{\sqrt{1 - v^2/c^2}}$

Ans: (A)

16 $A\ddot{x} + B\dot{x} + Cx = F(t)$

R-L-C circuit with sinusoidal source 則

- (A) $A=0$ (B) $B=0$ (C) $C=0$ (D) $F(t)=0$ (E) None of the above

Ans: (E)

- 17 一球在 fluid 中沉其 density 與之相同, 則 equation of motion 為:

Ans: $m\ddot{x} + K\dot{x} + mg = 0$

- 18 $F(t) = F_0 \cos \omega t$ 長時間後

- (A) Oscillate with frequency ω
 (B) Oscillate with frequency ω_0
 (C) 先增大然後減小

Ans: (A)

- 19 音叉在地球上振動頻率為 400 聲, 其在月球上之頻率

- (A) 增加
 (B) 不變
 (C) 減少

Ans: (B)

- 20 在月球做有關光譜之實驗, 根據廣義相對論

- (A) Shift to red
 (B) Shift to blue
 (C) the same as on earth

Ans: (A)

21 对于一个固定波而言, which of the following is not correct:

(A) $v = \sqrt{\frac{T}{\mu}}$

(B) 不同的 frequency 有同速度

(C) $\phi = f(x + \sqrt{\frac{T}{\mu}} t) + g(x - \sqrt{\frac{T}{\mu}} t)$

(D) two pulse 相对输入於互相間過去後改变 string 外形

(E) transmitted

Ans: (D).

22 $K\ddot{x} + L\dot{x} + Mx = 0$

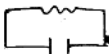
(A) $K=0$ only

(B) $L=0$ only

(C) $M=0$ only

(D) $(K, L, M) \neq 0$

(E) 全部利用

23 一个 circuit  无 charge 时

Ans: (A) $L \frac{d^2q}{dt^2} + R \frac{dq}{dt} + \frac{q}{C} = \mathcal{E}$

24 Solid 在同密度液体中可通重力

Ans: (C) $m\ddot{x} + kx = 0$

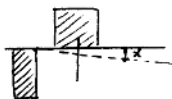
25 R-L-C couple 外加 $\mathcal{E} \sin t$

Ans: (D)

26. A body x rest on a plate, oscillate with 980 Hz in order that x does not leave the plate, the amplitude of the oscillate must be less than:

(A) $\cancel{\frac{1}{g}}$ (B) $\cancel{\frac{1}{4\pi} \cdot 980}$ (C) $\cancel{\frac{1}{8\pi} \cdot 980}$ (D) $\cancel{\frac{1}{4\pi^2} \cdot 980}$

Ans: (D)



27. If A and A' are coherent, and at p the phase difference is $\frac{\pi}{3}$, then the intensity at p is

(A) $I_1^2 + I_2^2 - I_1 I_2$

(B) $I_1^2 + I_2^2$

(C) $I_1^2 + I_2^2 + I_1 I_2$

(D) $I_1^2 - I_2^2$

Ans: (C)

28. If not coherent $\rightarrow$ average over a period the intensity at p is:

(A) $I_1^2 + I_2^2 - I_1 I_2$

(B) $I_1^2 + I_2^2$

(C) $I_1^2 + I_2^2 + I_1 I_2$

(D) $I_1^2 - I_2^2$

Ans: (B)

29. If the intensity of A and A' are I, the illumination at P is

- (A) $\frac{1}{3}I$ (B) $\frac{I^2}{9g^2}$ (C) $\frac{I}{3g^2}$ (D) $\frac{I}{9g^2}$

Ans: (D).

30. If there is a medium between source and B such that the intensity at B is reduced to 60% of the origin, which percentage will be to A

- (A) 80%
(B) 45%
(C) 16%
(D) 0.003%

Ans: (C).

31. Rigid dumbbell. principle moment of inertia is:

- (A) all equal zero
(B) all three not equal and nonvanishing
(C) two of them equal and greater than the 3rd
(D) two of them equal and smaller than the 3rd

Ans: (C)

32. Bohr theory, 其中可量化的有:

- (A) $\frac{1}{2}I\omega^2 = (n+\frac{1}{2})\hbar\omega$
(B) angular momentum = $n\hbar$

Ans: (B)

33. If an ideal diode is connected in series with R , the average power dissipated in the resistance is
 (A) $P/4$ (B) $P/2$ (C) P_0 (D) $2P_0$ (E) $4P_0$

Ans: (B)

34. In an electrostatic field, which of the following statements is true of the surface of equipotential?

- (A) They are tangent to the electrostatic field.
 (B) They are closer together in region of weak electrostatic field than in region of strong electrostatic field.
 (C) Some times surfaces of different potential cross each other.
 (D) They don't exist.
 (E) None of the above statement is true.

Ans: (E)

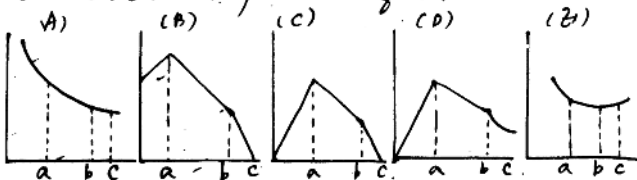
35. A plane electromagnetic wave is incident normally on a perfect reflecting flat surface. Which of the following is true?

- (A) The electromagnetic field of the reflected wave is equal and opposite to that of incident of wave at all point in space.
 (B) The magnetic field of the reflected wave is in plane, with that of the incident wave at the surface of the reflector.

- (c) The reflected wave is circularly polarized.
 (d) The reflected wave is polarized, at 90° with respect to direction of polarization of the incident wave.
 (E) None of the above statement is true.

Ans: (B)

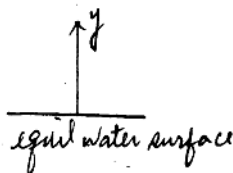
36. Two infinitely long coaxial conductors carry equal and opposite currents. In each of the conductors the current density is constant and uniform. The inner is a solid cylinder of radius a the outer is a cylindrical shell with radius b, c , which of the following graph mostly represents the magnetic field of the conductor as a function of r ?



Ans: (C)

Concern a wave on the surface of a pool of water the height h of the water relative to its equilibrium level is given by function of y and time t by

$$h = a \sin(by + ct) \text{ where } a = 5 \text{ cm } b = 3 \text{ cm}^{-1} \text{ } c = 2 \text{ sec}^{-1}$$



37. The wave length of the wave is

- (A) $\frac{1}{3}$ cm (B) $2\frac{2}{3}$ cm (C) 3 cm (D) 5 cm (E) 6π cm

Ans: (B).

38. The speed of wave is

- (A) $\frac{2}{3}$ cm/sec (B) $\frac{3}{2}$ cm/sec (C) $\frac{5}{2}$ cm/sec (D) 5 cm/sec (E) 6 cm/sec

Ans: (A)

39. This wave could be turned into a pure standing wave adding another wave.

- (A) With the same amplitude and frequency and opposite direction of propagation.
 (B) With $\frac{1}{2}$ amplitude and same frequency and same direction.
 (C) With same amplitude, wave length and direction.
 (D) With twice speed, same amplitude and same frequency.

Ans: (A)