



الامتحان التنافسي للمتقدمين للدراسات العليا (الدكتوراه) لقسم الفيزياء / كلية العلوم/جامعة بغداد

للعام الدراسي 2017 -2018

الاختصاص : فيزياء الاغشية الرقيقة (الورقة العامة)

1-Multiple Choice Questions (MCQ)

Q.1) If a generalized coordinate has the dimensions of velocity, generalized Velocity has the dimensions of

- (a) Displacement
- (b) Velocity
- (c) Acceleration
- (d) Force

Q.2) Choose the correct statements:

- (a) The angular momentum is conserved for system possessing rotational symmetry.
- (b) If the Lagrangian of a system is invariant under translation along a direction, the corresponding linear momentum is conserved.
- (c) If the lagrangian of a system is invariant under translation a long a direction, we cannot say anything about the corresponding linear momentum.
- (d) For a conservation system, the Hamiltonian is equal to the sum of kinetic and potential energies.

Q.3) A particle is moving on elliptical path under inverse square law force of the form $\mathbf{F}(\mathbf{r})= (-\mathbf{K}/r^2)$, the eccentricity of the orbit is

- (a) A function of total energy.
- (b) Independent of total energy.
- (c) A function of angular momentum.
- (d) Independent of angular momentum.

Q.4) The binding energy of alkali metal is ----- than of alkali halide crystal

- a- equal
- b- Higher
- c- More higher
- d- Less

Q.5) The space lattice in diamond structure is -----

- a- Bcc
- b- Hexagonal
- c- Cubic
- d- Fcc



Q.6) Bragg law satisfied only for wavelength -----

- a- $\lambda \geq 2d$
- b- $\lambda = 2d$
- c- $2\lambda \geq 2d$
- d- $\lambda \leq 2d$

Q.7) The absolute value of the real number x is defined by:

- (a) $|x| = \begin{cases} x, & \text{if } x < 0 \\ -x, & \text{if } x \geq 0 \end{cases}$
- (b) $|x| = \begin{cases} x, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0 \end{cases}$
- (c) $|x| = x$ for $-\infty < x < \infty$
- (d) $|x| = -x$ for $-\infty < x < \infty$.

Q.8) The result of $(e^{x_1})^{x_2}$ is given by:

- (a) $e^{x_1+x_2}$,
- (b) e^{x_1/x_2} ,
- (c) $e^{x_1-x_2}$,
- (d) $e^{x_1x_2}$.

Q.9) The Domain (D_0) and Range (R_g) of the function $y = \sqrt{x+4}$ are given by:

- (a) $D_0 : x \geq -4, R_g : y \geq 0$
- (b) $D_0 : -\infty < x < \infty, R_g : y = 0$
- (c) $D_0 : x = 0, R_g : y = -4$.
- (d) $D_0 : x \geq -4, R_g : y = 0$.

Q.10) The expectation value of the kinetic energy of the one dimensional harmonic oscillator in the ground state is

- A: $0 \hbar\omega$ B: $1 \hbar\omega$ C: $1/2 \hbar\omega$

Q.11) In Angular momentum By Ladder Operators, $[L_x, L_y] =$

- A: $i\hbar L_z$ B: 0 C: 1

Q.12) In one dimensional harmonic oscillator, $a\psi_1 =$

- A: ψ_0 B: ψ_1 C: ψ_2



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2-Short Note Questions (MCQ)

Q.1) If $\mathbf{F}=(2xy+z^2)\mathbf{i} + x^2\mathbf{j} + 2xz\mathbf{k}$ newton ,then show that it is conservation. Calculate the amount of work done by this force in moving a particle from $(0,1,2)$ to $(5,2,7)$ m .

Q.2) A particle of mass (m) move on plane in the field of force given by polar Coordinate ($\mathbf{F}= -\mathbf{K}r\cos\Theta\mathbf{\hat{r}}$), where (\mathbf{K}) is constant and($\mathbf{\hat{r}}$) is the radial unit vector

(a) Will the angular momentum of the particle about the origin be conserved? Justify your statement.

(b) Obtain the differential equation of the orbit of the particle.

Q.3) Explain the structure factor of Fcc lattice

Q.4) What is Brilloiun zone

Q.5) Evaluate $\int \frac{\cos x dx}{\sin x}$.

Q6.) Find $\frac{dy}{dx}$ for $y = \cosh^2 5x - \sinh^2 5x$.

Q.7) In Angular momentum By Ladder Operators Prove that $[L^2, L_x] = 0$

Q.8) Represent L^2 it in a matrix form if you given that

$$\langle \ell' m' | L^2 | \ell m \rangle = \hbar^2 \ell(\ell + 1) \delta_{\ell' \ell} \delta_{m' m}$$



الاختصاص : فيزياء الاغشية الرقيقة (الورقة الخاصة)

1-Multiple Choice Questions (MCQ)

Q.1) Tauc relation gives the:

- (a) Dielectric constant
- (b) Mobility
- (c) Energy gap
- (d) Conductivity

Q.2) What can a semiconductor sense?

- (a) Pressure
- (b) Magnetism
- (c) temperature
- (d) all of them

Q.3) Surface morphology of thin films examination by:

- (a) AFM
- (b) XRF
- (c) FT-IR
- (d) EDS

Q.4) The width of depletion layer in p-n junction inversely depends on:

- (a) Activation energy
- (b) Carrier mobility
- (c) Carrier concentration
- (d) Optical transition

Q.5) In diode the relation between current and voltage is:

- (a) Linear
- (b) Square
- (c) Exponential
- (d) Not these

Q.6) Minority carriers are many times activated by:

- (a) Dopants
- (b) Pressure
- (c) Heat
- (d) Forward bias



Q.7) Heterojunction diode includes:

- (a) Similar crystal structure
- (b) Similar carrier concentration
- (c) Similar energy gap
- (d) Dissimilar material

Q.8) What would be a typical magnitude for the reverse current in a general- purpose Silicon diode?

- (a) A few nanoamperes
- (b) A few picoamperes
- (c) A few milliamperes
- (d) A few microamperes

Q.9) Hall mobility in amorphous semiconductor depends on:

- (a) Optical transition
- (b) Activation energy
- (c) Carrier concentration
- (d) Energy gap

Q.10) Generation – recombination is mainly depending on:

- (a) Trap center
- (b) Conductivity
- (c) Energy gap
- (d) Crystal structure

Q.11) Chalcogenide glasses contain the element from:

- (a) Sixth column
- (b) Fourth column
- (c) Fifth column
- (d) Third column

Q.12) Energy gap for IR detector semiconductor is:

- (a) No energy gap
- (b) Narrow gap
- (c) Wide gap
- (d) Semimetal



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2-Short Note Questions (MCQ)

- Q.1) Compare between CFO and Mott-Davies model for amorphous semiconductors.
- Q.2) Write about band energy model for amorphous semiconductors.
- Q.3) Write about chalcogenide semiconductors.
- Q.4) Compare between LED and Laser diode.
- Q.5) Compare between schottky diode and p-n Junction.
- Q.6) What mean degenerate semiconductors?
- Q.7) Explained the principle operation of deposition by a.c sputtering.
- Q.8) Draw the dependence of mobility on temperature.