University of Baghdad
College of Science
Department of Physics
Date: 22 /6/ 2017

Qualifying Examination
for Ph.D Students
Year : 2017 -2018
Time : 3 Hours

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

للعام الدراسي 2017- 2018

الاختصاص : فيزياءالمواد (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
  $F(r)= (-K/r^2)$, 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

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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) $|x| = \begin{cases} x, & if \ x < 0 \\ -x, & if \ x \geq 0 \end{cases}$

(b) $|x| = \begin{cases} x, & if \ x \geq 0 \\ -x, & if \ x < 0 \end{cases}$

(c) $|x| = x$ for $-\infty < x < \infty$

(d) $|x| = -x$ for $-\infty < x < \infty$.

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

(a) $e^{x_1 + x_2}$,

(b) e^{x_1 / x_2},

(c) $e^{x_1 - x_2}$,

(d) $e^{x_1 x_2}$.

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 F=(2xy+z²) ǐ + x² ǰ + 2xz Ḱ 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 (**F= - KcosΘ ř)** , where **(K)** is constant and**(ř)** 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 $[L^2, L \quad] = 0$

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

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

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1-Multiple Choice Questions (MCQ)

Q.1) The solid state in the chemistry and physics has shown that the properties performance of every engineering material depends on it……………..
   (a) Internal structure
   (b) Bonds
   (c) Internal energy

Q.2) The horizontal rows of the periodic table are called (**periods, groups**).

Q.3) When two atoms approach each other, the distance between the adjacent nuclei Corresponding to the minimum potential energy is call the bond length (**Yes , no**)

Q.4) A phase transformation can be defined as a homogeneous , physically distinct part of a system .   (**Yes   , no**)

Q.5) A phase transformation usually involves a complete rearrangement of atoms ions , or molecules depend on parameter called entropy .   (**Yes   , no**)

Q.6) Solid solution in alloy systems may be two kinds , substitutional and interstitial .
   (**Yes , no**)

Q.7) For binary system , Eutectic point, which represents the lowest temperature at which the mixture will melt . (**Yes , no**)

Q.8) Diffusion means, mass transport phenomena within a solid only. (**Yes, no**)

Q.9) Crystals can be grown from a vapor only. (**Yes , no**)

Q.10) Homogeneous Nucleation depend on surface energy only (**Yes , no**)

Q.11) Stress- strain curve gives information about type of structures (**Yes , no**)

Q.12) Hardness is good test to give information about fracture (**yes   , no**)

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2-Short Note Questions (MCQ)

Q.1) Explain   Ionic bond

Q.2) Plot the relation between specific volume an temperature to find transition temperature for crystal

Q.3) Explain cooling curve for binary solid solution

Q.4) Plot phase diagram for components mutually soluble in liquid and insoluble in solid state.

Q.5) Plot the relation between specific volumes an temperature to find transition temperature for amorphous

Q.6) Explain cooling curve for binary pure compound

Q.7) Explain single crystals

Q.8) Stats and explain types of polymer