الامتحان التنافسي للمتقدمين للدراسات العليا (الدكتوراه) المحاولة الثانية لقسم الفيزياء-كلية العلوم/ جامعة بغداد للعام الدراسي ٢٠١٥-٢٠١٦

الاختصاص:فيزياء المواد

اولاً:الورقة العامة ٢٠%

1-Multiple Choice Questions:

Q.1) 120 Pa is equal to

(a) 1.2×10^4 atm,   (b) 1.2×10^{-4} atm,   (c) 1.2×10^3 atm,   (d) 1.2×10^{-3} atm.

Q.2) While you are sitting on your chair, the earth is exerting you a gravitational force and you are exerting the earth --------force.

(a) Same   (b) greater   (c) smaller   (d) no

Q.3) Hamilton's principle is an example of a:

a) Hamiltonian   b) Lagrange multiplier   c) stationary point   (d) vibrational principle.

Q.4) The bulk superconductor is

(a) Perfect paramagnetic   (b) Perfect piezomagnetic   (c) Perfect diamagnetic.

Q.5) Hall coefficient determines:

(a) the concentration of charge carriers. (b) the concentration and type of charge carriers. (c) the magnetic field.

Q.6) The conventional unit cube of the diamond structure contains :

(a) 4 atoms.   (b) 8 molecules   (c) 8 atoms

Q.7) For cross products,
(a) the commutative and associative laws are valid
(b) the commutative and associative laws are not valid
(c) the commutative law is not valid while the associative law is valid
(d) the commutative law is valid while the associative law is not valid.

Q.8) The necessary and sufficient condition that the field $\vec{F}$ be a conservative is that

(a) $\operatorname{div} \vec{F} = 0$,   (b) $\operatorname{grad} \vec{F} = 0$,   (c) $\operatorname{curl} \vec{F} = 0$,   (d) $\operatorname{div} \operatorname{grad} \vec{F} = 0$.

Q.9) The following equation: $\oint_C M\, dx + N\, dy = \iint_R \left(\dfrac{\partial N}{\partial x} - \dfrac{\partial M}{\partial y} \right) dx\, dy$ is the definition of

(a) Green's theorem in the plane   (b) Stoke's theorem   (c) divergence theorem of Gauss

University of Baghdad
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Date: 2 / 9 / 2015

Qualifying Examination
for Ph.D Students
Year:2015-2016
Time: 3 Hours

Q.10) The expectations value of a function $f(x)$ when the wave function depends only on x is given by
$<f(x)> =$

(a) $\int_{-\infty}^{\infty} \psi^*(x) f(x) \psi(x) dx$

(b) $\int_{-\infty}^{\infty} f(x) \psi(x) dx$

(c) $\int_{-\infty}^{\infty} f(x) \psi^*(x) dx$

(d) $\int_{-\infty}^{\infty} \sqrt{f(x)} \psi(x) dx$

Q.11) The coupling of two angular moment, j_1 and j_2 gives the following umber of substates:

(a) $j_1 + j_2$　　(b) Values from j_1 to j_2 , in integer steps.

(c) Values from $\left| j_1 - j_2 \right|$ to $\left| j_1 + j_2 \right|$, in integer steps.

Q.12) A particle has a total energy that is less than that of a potential barrier. When the particle penetrates the barrier, its wave function is

(a) A positive constant.

(b) Oscillatory.

(c) Exponentially increasing.

(d) Exponentially decreasing

2- Short Note Questions

Q.1) What is the meaning of simple harmonic motion?

Q.2) What is the magnitude of the resultant sum of the following three displacement vectors?
$\overrightarrow{D_1}$=(20,5)m, $\overrightarrow{D_2}$=(-12,-28)m, $\overrightarrow{D_3}$=(-3,7)m

Q.3) 1-Discuss briefly 3 ways to measure the binding energy of the excitons.

Q.4) By plotting the temperature dependence of the heat capacity ,show how to differentiate between metals and dielectric materials in general.

Q.5) Convert $2\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6} \right)$ into the rectangular form.

Q.6) Find $\vec{A} \times \vec{B}$, where $\vec{A} = 2\vec{i} - 3\vec{j} - \vec{k}$ and $\vec{B} = \vec{i} + 4\vec{j} - 2\vec{k}$.

Q.7) The wave function of a particle at given time is given by $\psi(x) = \frac{e^{ikx}}{\sqrt{x^2 + a^2}}$, where k and a are constants. Is $\psi(x)$ normalized? If not, find the normalization constant.

Q.8) Hydrogen atom in the state $\psi(\vec{r},t) = \sqrt{\frac{3}{4}} \psi_{100}(\vec{r}) e^{-iE_1 t/\hbar} + \sqrt{\frac{1}{4}} \psi_{211}(\vec{r}) e^{-iE_2/\hbar}$

What is the probability of measurements which give $E=E_1$?

الاختصاص: فيزياء المواد

1 Multiple Choice Question:

Q.1)When to atoms approach each other, the energy will (decrease , increase , become zero) and the forces of (attraction , repulsion) will increase at a distance (R) , the potential energy reach as (minimum, maximum)

Q.2)The distance between the adjacent nuclei corresponding to the (maximum , minimum) potential energy is called bond length.

Q.3)A space lattice can be considered as an infinite array of (points, particles , atoms) in space.

Q.4)Lattice coordinates describe a position of a (point, vector ,plan)on or within a unit cell.

Q.5)The crystalline state of polymers (differs ,similar)form typical crystalline solids.

Q.6)Nuclei begin to form when the (liquid , melt) is cooled below its (freezing , melting)point

Q.7)The modulus of rigidity depend on two parameters (shear tensile, stress, shear strain, strain).

Q.8)Fracture is a separation of (body , bonds , lattice)by forces into two or more parts.

Q.9)The hardness of a materials can be measured by (tensile, Rockwell, creep) test.

Q.10)Twinning usually requires a (higher , lower) shear stress than slip.

Q.11)In homogeneous nucleation ,nucleus is controlled by (free energy, surface energy, free energy and surface energy)

Q.12)Diffusion in liquid phase is (faster , slower) than solid phase.

2 Short Note Questions

Q.1)Stats types of polymers.

Q.2) What is the benefits of lever Rule for Alloys.

Q.3) Plot the diagram for binary system (solubility in liquid and insolubility in solid stats)

Q.4)Explain and defined Addition polymerization .

Q.5)Stats and defined types for composites

Q.6) Explain the typical stress –strain curve

Q.7)Define the refractory materials

Q.8)What is the open mold and close mold processes.