الامتحان التنافسي للمتقدمين للدراسات العليا (الدكتوراه) لقسم الفيزياء-كلية العلوم
جامعة بغداد للعام الدراسي ٢٠١٦-٢٠١٧

الاختصاص: فيزياء الاغشية الرقيقة

اولاً:الورقة العامة ٢٠%

1- Multiple Choice Questions:

Q.1) A baseball has a mass of 0.145kg. The resultant force required to given this baseball an acceleration of 400m/sec^2 is: **a)** 85N,   **b)** 58 N,   **c)** 77 N,   **d)** 60 N.

Q.2) An electric motor exerts a force of 400N on a cable and pulls it a distance of 30m in 1 min. the power supplied by the motor is : **a)** 200 watt,   **b)** 150 watt,   **c)** 300 watt,   **d)** 234 watt.

Q.3) The Hamilton's function for one-dimension harmonic oscillator is:

a) $H = \frac{p^2}{2m} + \frac{k}{2}x^2$,   **b)** $H = \frac{m}{2}v^2 + \frac{k}{2}x^2$,   **c)** $H = \frac{p^2}{2m} - \frac{k}{2}x^2$,   **d)** $H = \frac{m}{2}v^2 - \frac{k}{2}x^2$.

Q.4) There are---------------- of lattice in 3-dimension
     a)5   **b)**14   **c)**7   **d)**3

Q.5) Crystals of inert gas atoms are bound by
     a)Hydrogen interaction   **b)**Van der Waals interaction   **c)**Ionic bond **d)**Covalent bond

Q.6) Metals are bound by the reduction in the ---------------- of the valence electrons in the metals as compared with the free atom.
     a)P.E.   **b)**K.E.   **c)**Both K.E. and P.E.   **d)**Repulsive energy

Q.7) Function written as y = -4x + 16 is general form of
     a)slope 16, y-intercept(0,-4)   **b)**slope 4, y-intercept(0,-16)
     c)slope 0, y-intercept(-4,16)   **d)**slope -4, y-intercept(0,16)

Q.8) Value of determinant is computed by adding multiples of one column to
     a) another column   **b)**another matrix   **c)**another dimension   **d)**another row

Q.9) Two equations that can be drawn as same line on graph then these equations are considered as

     a) constant equations   **b)**solved equations   **c)**equivalent equations   **d)**non-equivalent equations

Q.10) Q1/ the single particle intrinsic spin (S) has one of the following values:
     a) ℏ   **b)** ℏ/2   **c)** nℏ   **d)** ℏ^2

Q.11) Which of the following relations are correct for the harmonic oscillator system
a) $L^2 | lm >= h^2 l(l + 1) | lm >$ **b)** $[L^2, L^{\rightarrow}] = 0$
c) $H = \frac{p_x^2}{2m} + \frac{1}{2}m\omega^2 x^2$ **d)** $F_l^l(\theta, \phi) = P(\theta)Q(\phi)$

Q.12) Hydrogen like atom represented according to one of the following set of quantum numbers

     a)(n_x, n_y, n_z) **b)** (n, l, m_l) **c)** (S, S_z, T, T_z) **d)** non of the forgoing options

University of Baghdad
College of Science
Department of Physics
Date: 18 / 7 / 2016

Qualifying Examination
for Ph.D Students
Year:2016-2017
Time: 3 Hours

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2- Short Note Questions:

Q.1) A pendulum bob with a weight of 20N hangs from a cord. A horizontal force sufficient to bring the cord to an angle of 25^0 with the vertical is applied to the bob. Find the tension in the cord?

Q.2) A ball is thrown horizontally with a velocity of 50ft/sec from a tower 100ft high. Find the time of flight?

Q.3) Write about Laue conditions

Q.4) Write about crystals of inert gases

Q.5) Find the divergence and curl of $\vec{A} = (2xz)\hat{i} + (x^2 y)\hat{j} + (x - y^2 z)\hat{k}$

at point **(2,-1,1)**

Q.6) Find the modules and the principle argument of complex number

$$Z = \frac{(1+i)^2}{1-i}.$$

Q.7) Rewrite this equation to produce Ψ_1 Ψ_2 and Ψ_3 in term of Ψ_0

Q.8) the orbital angular momentum quantum number (ℓ=3, 2, 1) find all possible values of total spin (j)

ثانياً :الورقة الخاصة ٨٠%

Multiple Choice Questions:

Q.1) In diode the relation between current and voltage is:
    (a) Linear   (b) Square   (c) Exponential   (d) Not these

Q.2) The pattern of XRD in amorphous semiconductor in form:
(a) Spots   (b) Sharp holes   (c) Wide holes   (d) Peaks

Q.3) Elements with 1, 2, or 3 valence electrons usually make excellent:
    (a) conductors   (b) semiconductors   (c)insulators   (d) neutral

Q.4) Schokly – Raad equation given the relation between mobility and:
    (a) Energy gap (b) Activation energy   (c) Conductivity   (d) Relaxation time

Q.5) Tauc relation gives the:
    (a)Conductivity (b) Mobility   (c) Energy gap   (d) Dielectric constant

Q.6) If conductance increases as temperature increases, this is known as a:
    (a) positive coefficient   (b)negative current flow
    (c)negative coefficient   (d) positive resistance

Q.7) Lattice mismatches which mean:
    (a)Difference conductivity   (b)Similar conductivity
    (c)Dissimilar crystal structure   (d) Similar crystal structure

Q.8) Energy gap for IR detector semiconductor is:
    (a) Wide gap   (b)Narrow gap   (c)No energy gap   (d)Semimetal

Q.9) If the drift velocity of holes under a field gradient of 100 V/m is 5 m/p, the mobility is
    (a) 0.05   (b) 0.5   (c) 50   (d) 500

Q.10) Semiconductor laser diode includes the:
(a) Indirect transition (b) Direct transition (c)No transition   (d) Forbidden transition

Q.11) What would be a typical magnitude for the reverse current in a general- purpose Silicon diode?
    (a)A few picoampers   (b)A few nanoampers
    (c)A few microampers   (d)A few milliampers

Q.12) In a-Si the dangling bond can be saturated by:
    (a) Nitrogen   (b) Hydrogen   (c)Oxygen   (d)Argon

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2- Short Note Questions

Q1: Who can produce a-Si:H by glow discharge.

Q.2: Draw an ideal I-V characteristic solar cell.

Q3: Thermoelectric power is the one of methods to determine the type of carriers for semiconductor explain this method.

Q4: Draw indirect transition with phonon emits and absorb.

Q5: What type of thermal detectors?

Q6: Write the equation of detectivity and resposivity in detectors.

Q7: Compare between CFO and Mott-Davies model for amorphous semiconductors.

Q8: Draw the dependence of mobility on temperature.