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

للعام الدراسي 2017- 2018

الاختصاص : فيزياء الليزر والكهروبصريات (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

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

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

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

الاختصاص : فيزياء الليزر والكهروبصريات (الورقة العامة)

2-Short Note Questions (MCQ)

Q.1) If F=(2xy+z²) ĭ + x² ĵ + 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 $[L^2, L_{\_\_}] = 0$

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

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

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

الاختصاص : فيزياء الليزر والكهروبصريات (الورقة الخاصة)

1-Multiple Choice Questions (MCQ)

Q1/ CO_2 laser is a type of:
  a) Solid state laser
  b) liquid state laser
  c) gas state laser

Q2/ Ruby laser operate with:
  a) two system
  b) three system
  c) four system

Q3/ The laser stability condition of confocal mirrors are:

  a) (0,0)

  b) (1,1)

  c) (-1, -1)

Q4/ The divergence of semiconductor laser is:

  a) Less than to other types of laser.

  b) Greater than to other types of laser

  c) Equal to other types of laser.

Q5/ The preferential operator of laser system with:

  a) Two level system

  b) Three level system

  c) Four level system**.**

Q6/The measurement of the laser wavelength by using:

  a) Refractometer

  b)   Electrmeter

  c) Monochrometer

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

Q.7) In dye laser the photo- physical process are:
   a) Radiative process
   b)   Non radiative
   c) Radiative and non radiative process.

Q.8) The main propagation phenomena in conventional fiber are:
   a)   Total internal reflection
   b)   Bragg reflection
   c)   Others.

Q. 9) Laser Mode-locking technique gives a short pulse in the range of:
    1) Nano-second
   2) Pico -second
   3) Femto-second.

Q.10) The types of attenuation of the laser light propagation in atmosphere are:
   a) Absorption
   b) scattered
   c) both of them

Q.11) Laser operation with C.W when transition time is:
   a) $T_1 = T_{21}$
   b) $T_1 < T_{21}$
   c) $T_1 > T_{21}$

Q.12) laser effect on the human eye tissues are:
   a) Thermal effect
   b) Photochemical effect
   c) Both of them

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

الاختصاص : فيزياء الليزر والكهروبصريات (الورقة الخاصة)

2-Short Note Questions (MCQ)

Q.1) Q- switching technique is allowed to…………………………………

Q.2) Laser contains are ………………………………………………..

Q.3) The definition of maser is …………………………………………

Q.4) Fiber optics consist of…………………………………………………

Q.5) The types of photonic crystal fiber are…………………………………

Q.6) Spectroscopy meaning…………………………………………………..

Q.7) Raman spectrum classified into two types which are …..……………

Q.8) The X- ray diffraction measurement useful for ………………………