# **Atomic Physics Notes Questions**

- 1. The mass of each ion of canal rays is equal to that of......
  - a) Equal to that of electron
  - b) Equal to that of proton
  - c) Equal to that of atom
  - d) Equal to that of neutron

#### <u>Ans c</u>

**Explanation :** The canal rays are positive rays which has mass nearly equal to that of an electron

- 2. Who suggested that all elements are made up of hydrogen?
  - a) Dalton
  - b) Thomson
  - c) Prout
  - d) Rutherford

#### <u>Ans c</u>

**Explanation :** Prout observed that the atomic weights that had been measured for the elements known at that time appeared to be whole multiples of the atomic weight of hydrogen

- 3. Select the correct options from below regarding Rutherford gold foil experiment
  - a) Most of the particles either passed or scattered lesser angles reveals that atom has lot of empty space
  - b) Some of the particles emitted canal rays, when striked the atom
  - c) Few alpha particles scattered backwards revealed that whole positive charge is concentrated
  - a) 1 only
  - b) 1,2,3
  - c) 1,3
  - d) 2,3

# <u>Ans c</u>

**Explanation :** Results of Rutherford gold foil experiment

- 4. Rutherford experiment failed to explain
  - a) Stability of atoms
  - b) An atom is electrically neutral
  - c) Both a and b
  - d) None of the above

#### <u>Ans : a</u>

**Explanation:** according to electromagnetic theory an accelerated electron must radiate energy, if electroncontinuously lose energy it will finally spiral down into nucleus finally atom cannot be stable

- 5. When an electron jumps from outer orbit to 2<sup>nd</sup> orbit then it is known as
  - a) Lyman series
  - b) Balmer series
  - c) Paschen series
  - d) Pfund series

# <u>Ans: b</u>

# **Explanation:**

Lyman series (outer to 1st)

Balmer(outer to 2<sup>nd</sup>)

Paschen( outer to 3<sup>rd</sup>)

Pfund(outer to 5<sup>th</sup>)

Bracket (outer to 4<sup>th</sup>)

# 6. Sodium lamps are used in laboratory because of their ..... Nature

- a) Composite
- b) Monochromatic
- c) Polychromatic
- d) Coherence

#### <u>Ans b</u>

#### **Explanation**

Sodium vapour lamps gives only monochromatic yellow light

- 7. The intensity of X ray can be controlled by
  - a) No. Of electrons striking the target
  - b) Filament current
  - c) Nature of striking material
  - d) A and B

#### <u>Ans d</u>

# Explanation

Intensity of X-rays depends upon the number of electrons striking the target i.e the rate of emission of electrons by varying the filament current

8. Soft x-rays have

- a) Wavelength below 1Å, high frequency, highenergy
- b) Wavelength above 4Å, low frequency, less energy
- c) Wavelength below 1Å,low frequency, high energy
- d) Wavelength above 1Å, high frequency, low energy

# <u>Ans b</u>

#### **Explanation**

Should have wavelength above 4Å, lesser frequency and energy

9. Speed of cathode rays is equal to

- a)  $1/10^{\text{th}}$  of speed of light
- b)  $\frac{1}{2}$  of speed of light
- c) Speed of light
- d) None of the above

# <u>Ans d</u>

# **Explanation**

It is equal to  $1/10^{\text{th}}$  of the speed of light

- 10. In holography which of the following is recorded
  - a) Phase and amplitude
  - b) Amplitude and wavelength
  - c) Phase and frequency
  - d) Phase

# Ans a

# **Explanation**

In ordinary photography only amplitude of the light wave is recorded but in hologram both phase and amplitude is recorded

- 11. The energy of the electron in the nth orbit is given by
  - a)  $13.6/n^2 eV$
  - b)  $-13.6/n^2 \text{ eV}$
  - c) -12.6/n<sup>2</sup> eV
  - d)  $12.6/n^2 eV$

# <u>Ans b</u>

# **Explanation**

By substituting the known values in following equation

We get En =  $-13.6/n^2$  eV, 1 eV =  $1.602 \times 10^{-19}$ 

- 12. In Bohr atom model, the radius of orbit is proportional to
  - a) 0 b)n c)- $n^2$  d) $n^2$

# <u>Ans d</u>

# Explanation

- $r = en^{2}h^{2}/pi$  Zme<sup>2</sup>. r is proportional to  $n^{2}$  and e is epsilon
- 13. In paschen series the spectral lines are in \_\_\_\_\_ region
  - a) Ultraviolet
  - b) Visible
  - c) Infrared
  - d) X-ray

# <u>Ans c</u>

# **Explanation**

Lyman series - UV rays

Balmer series – visible

Paschen and bracket series - Infrared

- 14. The size of an atom is of the order of
  - a) 10^-8 m
  - b) 10^-9 m
  - c) 10^-14 m
  - d) 10^-10 m

# <u>Ans d</u>

# **Explanation**

The size of an atom is of the order 10<sup>-10</sup> m

- 15. Rutherford alpha particles experiment shows that most of the atom is
  - a) Atom is hollow
  - b) Whole mass is concentrated at the centre
  - c) Nucleus is positively charged
  - d) All the above

# <u>Ans d</u>

#### **Explanation**

Rutherford alpha particles experiment showed that atom is hollow and it's mass is concentrated at the centre with the nucleus being positively charged

- 16. When the electron jumps from lower orbit to higher orbit it will
  - a) Absorb energy
  - b) Release energy
  - c) No gain of energy
  - d) None of the above

#### <u>Ans a</u>

#### **Explanation**

When an electron jumps from higher to lower emits energy in the form of photon and when it jumps from lower to higher orbit it absorbs energy

- 17. The life of an electron in the excited state is normally
  - a) 10<sup>-2</sup> seconds
  - b) 10<sup>-5</sup> seconds
  - c) 10^-8 seconds
  - d) None of the above

# <u>Ans b</u>

#### **Explanation**

Life time in excited state is  $10^{-3}$  seconds, such energy levels are called metastable states.

18. Conditions for achieving laser action

- a) Population inverse
- b) Excited state should be at metastable state
- c) Spontaneous emission
- d) Both a and b

#### <u>Ans d</u>

#### **Explanation**

There should be inverted populationi.e more atoms at excited state than in ground state, excited state should be a meta stable state . Emitted photons must stimulate further emission

19. According to Moseley's law, the frequency of the x-ray spectrum is proportional

- to
- a) Square root of atomic number
- b) Square of atomic number
- c) Square of atomic mass
- d) Square root of atomic mass

#### Ans b

# **Explanation**

Moseley's law states that the frequency of the spectral line in the characteristic x-ray spectrum is directly proportional to the square of atomic number

v proportional to Z<sup>2</sup>

- 20. Moseley law led to the discovery of
  - a) Hafnium
  - b) Technetium
  - c) Rhenium
  - d) All the above

#### <u>Ans d</u>

#### **Explanation**

Also it helped in determining the atomic number of rare earth elements and fixing their position in periodic table

- 21. The value of Rydberg constant is
  - a) 1.094 × 10^7 1/m
  - b) 1 609 × 10^7 m/s
  - c) 1.609 ×10^7 1/m
  - d) 1.094 × 10^7 m/s

#### <u>Ans a</u>

#### **Explanation**

It is a fixed value

- 22. According to classical electromagnetic theory, the circular path of an electron in Rutherford experiment is
  - a) Spiral
  - b) Circular
  - c) Parabolic
  - d) Straight line

#### <u>Ans a</u>

# **Explanation**

According to classical theory it take spiral path but Rutherford said it as circular path

- 23. The electrons revolving around the nucleus in the stationary orbits will not radiate energy was said in
  - a) Rutherford atom model
  - b) Thomson atom model
  - c) Bohr atom model
  - d) None of the above

#### <u>Ans c</u>

#### **Explanation**

# Bohr's atom model states that

The electrons can revolve around nucleus only in permissible orbits which is stationery or non radiating orbit.

- 24. Select the correct option regarding properties of cathode rays
  - a) They can travel in straight lines
  - b) They posses momentum and potential energy
  - c) They produce heat when they fall on matter
  - d) When cathode ray falls on solid substance of large atomic weight, it produce infra red rays
    - a. a only
      - b. a , b , c c. a and c
      - d. a and b

#### <u>Ans c</u>

# **Explanation**

They posses momentum and kinetic energy, they produce x-ray when they fall on solid substance of high atomic weight, they travel straight

- 25. Positive rays or canal rays are deflected by
  - a) Electric field
  - b) Magnetic field
  - c) Both a and b
  - d) They are not deflected

#### <u>Ans c</u>

# **Explanation**

Positive rays are deflected by both electric and magnetic field and their deflection is opposite to that of cathode rays

- 26. The determination of specific charge of an electron is done by
  - a) Millikan's oil drop experiment
  - b) Rutherford gold foil experiment
  - c) Thomson's method
  - d) None of the above

# <u>Ans c</u>

# **Explanation**

The specific charge (e/m) of electron is founded by Thomson method, specific charge is nothing but the charge per unit mass of the particle

27. The charge of an electron is determined by which method

- a) Rutherford experiment
- b) Thomson's method
- c) Millikan's oil drop experiment
- d) None of the above

# <u>Ans c</u>

# **Explanation**

This method is based on the motion of uncharged oil under free fall due to gravity and charged oil due to uniform electric field

- 28. At what level the energy of the electron is said to be at least
  - a) Metastable
  - b) Ground
  - c) Excited
  - d) At all levels

# <u>Ans b</u>

# Explanation

According to Bohr's theoryelectron revolve around discrete orbit without losing energy, it is said to have least energy when it is at ground state

29. The following is a accelerating potential that makes impinging electron acquire sufficient energy to knock out an electron from atom

- a) Excitation potential
- b) Ionisation potential
- c) Both a and b
- d) None of the above

# <u>Ans b</u>

# **Explanation**

It knocks out the electron from the atom and ionise the atom and so it is called as ionisation potential

30. The ionisation potential of hydrogen atom isa) 13.6 V

- b) 13.56 V
- c) 13.6 eV
- d) 12 4 eV

# <u>Ans c</u>

# <u>Explanation</u>

Ionisation of hydrogen atom required to knock out an electron from an atom is 13.6 eV 31. The minimum potential energy required to excite a free neutral atom from

- ground state to higher state is
  - a) Excitation potential
  - b) Critical potential
  - c) Ionisation potential
  - d) All of the above

# <u>Ans d</u>

# **Explanation**

Both the excitation and ionisation potential are called as critical potentials

- 32. Select the short comings of Bohr's theory
  - a) It doesn't account for the spectra of atoms more complex than hydrogen
  - b) It doesn't give information about regarding distribution of electrons in an atom
  - c) A and b
  - d) None of the above

#### <u>Ans c</u>

#### **Explanation**

See through the shortcomings of Bohr's theory

- 33. According to Sommer field atom model, the path of an electron around the nucleus is
  - a) Circular
  - b) Spiral
  - c) Ellipse
  - d) None of the above

#### <u>Ans c</u>

# **Explanation**

According to this the path of an electron around the is elliptical having nucleus as one of its foci

- 34. The energy of the electron is Maximum and minimum at ..... To the nucleus
  - a) Nearest and farthest
  - b) Farthest and nearest
  - c) It depends
  - d) None of the above

#### <u>Ans a</u>

#### **Explanation**

According to Sommerfeld atom model the energy of the atom is maximum and minimum at nearest and farthest to nucleus

- 35. X-rays were founded by
  - a) Marie curie
  - b) Wilhelm Roentgen
  - c) John Masefield
  - d) None of the above

#### <u>Ans a</u>

# **Explanation**

Wilhelm Roentgen founded X-rays when he was studying the phenomenon of discharge of electricity through gases

- 36. X-rays are produced when \_\_\_\_\_ electrons strike a metal target of suitable material
  - a) Slow moving
  - b) Fast moving
  - c) Moderate speed
  - d) None of the above

#### <u>Ans b</u>

#### **Explanation**

X-rays are produced when fast moving electrons strike a metal target of suitable material , they are invisible penetrating radiation is produced

- 37. Select the correct requirements for producing X-rays
  - a) Source of electron
  - b) Effective means of accelerating the electrons
  - c) Suitable target of low atomic number
    - A) a only
    - B) a and b
    - C) a, b, c
    - D) b and c

#### <u>Ans b</u>

#### **Explanation**

Metal should be of high atomic number

38. The pressure that suits the production of X rays in the Coolidge tube is

- a) 10^-8 mm
- b) 10^-7mm
- c) 10^-6mm

d) 10^2mm

#### <u>Ans c</u>

#### **Explanation**

The Coolidge tube should have 10<sup>-6</sup> mm of mercury pressure inside it and the metal used for cathode is tungsten

- 39. In the production of X rays the anode should have
  - a) High melting point and high thermal conductivity
  - b) Low melting point and high thermal conductivity
  - c) High melting and low thermal conductivity
  - d) Low melting point and low thermal conductivity

#### <u>Ans a</u>

# **Explanation**

The anode should have high melting point because it should not get melted by the heat produced by fast moving electrons and high thermal conductivity to carry away the heat generated.

- 40. They wavelength of X-rays depends upon the \_\_\_\_\_energy of electrons
  - a) Mechanical energy
  - b) Kinetic energy
  - c) Potential energy
  - d) None of the above

# <u>Ans b</u>

# **Explanation**

It depends upon the kinetic energy of electrons and the kinetic energy depends upon the potential difference between the filament and the target

- 41. X-rays travel in straight with the speed of
  - a) Speed of sound
  - b) Speed of light
  - c)  $1/10^{\text{th}}$  of speed of light
  - d) None of the above

#### <u>Ans b</u>

# **Explanation**

They travel in the straight line with velocity of light and they are electromagnetic waves of very short wavelength

- 42. X-rays are deflected by
  - a) Magnetic field

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- b) Electric field
- c) Gravitational
- d) None of the above

#### <u>Ans d</u>

#### **Explanation**

X-rays are not deflected by electric and magnetic Fields and this indicates they don not have charged particles

- 43. X–rays can penetrate through which of the following substances
  - a) Wood
  - b) Glass
  - c) Both a and b
  - d) None of the above

#### <u>Ans a</u>

#### **Explanation**

X-rays can penetrate through the substances which are opaque to ordinary light e.g. wood, flesh, thick paper, thin sheets of metals.

- 44. X-rays is destructive to which of the following cells
  - a) RBC
  - b) WBC
  - c) Platelets
  - d) None of the above

#### <u>Ans b</u>

#### **Explanation**

When the human body is exposed to X-rays, it causes redness of the skin, sores and serious injuries to the tissues and glands. They destroy the white corpuscles of the blood.

45. Which characteristic of X-rays is used for measuring its intensity

- a) Diffraction
- b) Ionisation
- c) Both a and b
- d) None of the above

#### <u>Ans b</u>

#### **Explanation**

the ionization produced by X-rays in a gas or vapour is generally used to detect and measure the intensity of X-rays.

46. Any plane containing an arrangement of atoms is known asa) Lattice plane

- b) Cleavage plane
- c) Both a and b
- d) None of the above

#### <u>Ans c</u>

#### **Explanation**

Any plane containing an arrangement of atoms is known as lattice plane or cleavage plane. The spacing between the atoms is of the order of 10-10 m.

- 47. X-rays cannot pass through ordinary diffraction grating because
  - a) Great wave length
  - b) Very short wavelength
  - c) It will pass through the grating
  - d) None of the above

# <u>Ans b</u>

# **Explanation**

Attempts were made to measure the wave length of X-rays by means of diffraction gratings which proved unsuccessful, as the grating failed to disperse X–rays on account of their very small wavelength

- 48. The crystal used by Von laue for the diffraction of Xrays is
  - a) Zinc sulphide
  - b) Copper sulphate
  - c) Ferric sulphide
  - d) Zinc sulphate

# Ans a

#### **Explanation**

The Xrays beam is passed through ZnS crystal for diffraction, because Xrays have very short wavelength

- 49. Using Bragg's spectrometer the wave length of Xrays can be founded by
  - a)  $2d \sin \theta = n\lambda$
  - b)  $d \sin \theta = n\lambda$
  - c)  $2d \sin \theta = 2n\lambda$
  - d) None of the above

#### Ans a

# **Explanation**

This is result of Bragg's spectrometer

2d sin  $\theta$  = n $\lambda$  where, n = 1, 2, 3 ... etc. This is known as Bragg's law

- 50. Characteristic of laser beam
  - a) Is monochromatic
  - b) Does not diverge
  - c) Extremely intense
  - d) All the above

# Ans d

# **Explanation**

These are the properties of laser beam

- 51. In a system of thermal equilibrium, the number of atoms in the ground state is than the number of atoms in the excited state
  - a) Greater
  - b) Smaller
  - c) Equal
  - d) None of the above

#### <u>Ans a</u>

# **Explanation**

In a system of thermal equilibrium, the number of atoms in the ground state is greater than the number of atoms in the excited state. This is called normal population.

52. If photons of energy hv = E2-E1 are incident on the sample, the photons can interact with the atoms in the ground state and are taken to excited state. This is

called

- a) Stimulated absorption
- b) Induced absorption
- c) Free absorption
- d) Both a and b

# <u>Ans d</u>

# **Explanation**

It is called as both stimulated and induced absorption.

- 53. The process by which the atoms in the ground state is taken to the excited state is known as
  - a) Drifting
  - b) Pumping
  - c) Pulling
  - d) None of the above

# <u>Ans b</u>

# **Explanation**

The process by which the atoms in the ground state is taken to the excited state is known as pumping. If it is taken with the help of light it is called optical pumping.

54. If the number of atoms in the excited state becomes greater than the number of atoms in the ground state . This is called as

- a) Population increase
- b) Population decrease
- c) Population inverse
- d) None of the above

#### <u>Ans c</u>

# <u>Explanation</u>

If the atoms in the ground state are pumped to the excited state by external agency it is called population inversion .

55. A Ruby rod is a crystal of

- a) Aluminium oxide
- b) Chromium oxide
- c) Sulphur oxide
- d) None of the above

#### <u>Ans a</u>

#### **Explanation**

Single crystal of ruby rod of length 10 cm and 0.8 cm in diameter. A ruby is a crystal of aluminium oxide Al2O3.

56. Which of the following is the wavelength of laser produced by Ruby laser

- a. 6983 Å
- b. 6923 Å
- c. 5943 Å
- d. 6943 Å

# <u>Ans d</u>

#### **Explanation**

When the excited ion from the metastable state E2 drops down spontaneously to the ground state E1, it emits a photon of wavelength 6943 Å.

57. In Helium Neon laser discharge tube the ratio between He and Ne is

- a) 1:2
- b) 1:6
- c) 1:4
- d) 1:10

# <u>Ans c</u>

#### **Explanation**

He – Ne laser system consists of a quartz discharge tube containing helium and neon in the ratio of 1 : 4 at a total pressure of about 1 mm of Hg.

58. The wavelength of laser produced by He-Ne is

- a) 5328 Å
- b) 4356 Å
- c) 6328 Å
- d) None of the above

#### <u>Ans c</u>

#### **Explanation**

He-Ne emits a 6328 Å photon in the visible region.

- 59. Find out the uses of laser
  - a) Used for micro surgery
  - b) Removing kidney stone and tumour
  - c) In Endoscopy
  - d) All the above

#### <u>Ans d</u>

#### **Explanation**

X rays find huge application in medical, scientific and other researches.

- 60. MASER stands for
  - a) Microwave Amplification by Stimulated Emission of Radiation
  - b) Minimum Amplification by Stimulated Emission of Radiation
  - c) Microwave Amplification by Standard Emission of Radiation
  - d) Microwave Amplification by Stimulated Emission of Radium
- 61. The practical maser material are
  - a) Chromium
  - b) Gadolinium
  - c) Ammonia gas
  - d) All the above

# <u>Ans d</u>

# **Explanation**

Practical maser materials are chromium or gadolinium ions doped as impurities in ionic crystals. Ammonia gas is also a maser material.

- 62. Which of the following is used in molecular spectroscopy
  - a) Laser
  - b) Electron
  - c) Maser
  - d) Proton

# <u>Ans c</u>

**Explanation** it finds use in molecular spectroscopy

- 63. Which of the following is used to remove unwanted material in semiconductor
  - and electronic industries
    - a) Maser
    - b) Electric current
    - c) Laser
    - d) None of the above

# <u>Ans c</u>

#### Explanation

The laser beam is used to vapourize the unwanted material during the manufacture of electronic circuit on semiconductor chips.

64. A 3 dimensional image of an object is taken by

- a) Photo graphy
- b) Holography
- c) Both a and b
- d) None

# <u>Ans b</u>

#### **Explanation**

A three dimensional image of an object can be formed by holography. In ordinary photography, the amplitude of the light wave is recorded.

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- 65. Which of following property of the laser beam makes it a very useful tool for microwave communication.
  - a) Intense laser
  - b) Narrow angular spread
  - c) Monochromatic
  - d) None of the above

#### <u>Ans b</u>

#### **Explanation**

Narrow angular spread of the laser beam makes it a very useful tool for microwave communication. Communication with earth satellites and in rocketry.

- 66. Which of the following law helps in arranging the elements in periodic table by Atomic number and not by atomic weight
  - a) Moseley's law
  - b) Avagadro's law
  - c) Newton's law
  - d) None of the above

#### <u>Ans a</u>

#### **Explanation**

Any discrepancy in the order of the elements in the periodic table can be removed by Moseley's law by arranging the elements according to the atomic numbers and not according to the atomic weights.

- 67. At atmospheric pressure, air and other gases are <u>conductors</u> of electricity.
  - a) Good conductors
  - b) Semi conductors
  - c) Bad conductors
  - d) None of the above

#### <u>Ans c</u>

# **Explanation**

At atmospheric pressure, air and other gases are poor conductors of electricity. This is because , they do not have free charged particles.

- 68. When cathode rays strike a solid substance of large atomic weight, \_\_\_\_\_ are produced.
  - a) Infra red rays
  - b) Ultraviolet rays
  - c) X-rays
  - d) Visible rays

#### <u>Ans c</u>

# <u>Explanation</u>

When cathode rays strike a solid substance of large atomic weight, X-rays are produced.

69. The velocity of canal rays is \_\_\_\_\_ than the velocity of cathode rays.

- a) Equal
- b) Larger

- c) Smaller
- d) None of the above

# Ans c

# **Explanation**

The velocity of canal rays is much smaller than the velocity of cathode rays.

- 70. Which of the following highly viscous liquid is used in Millikan's oil drop
  - experiment
    - a) Glycerine
    - b) Glycol
    - c) Oil
    - d) Grease

# <u>Ans a</u>

# **Explanation**

A spray of fine droplets of a highly viscous liquid (such as glycerine) is produced by means of an atomizer.