Bihar Board Class 12 Physics Question Paper 2017

Questions and answer-2017

Inter Science (+2)

Physics 2017

Time: 3 Hours 15 minutes **Total Marks:70**

Instruction for the candidates:

(1) Candidates are required to give their answer in their own words as for as practicable.
(2) Figure in the right hand margin full marks.
(3) 15 Minutes of extra time has been allowed for the candidates to read the questions carefully.
(4) This question paper is divided into two sections- **Section-A and Section-B**
(5) In **Section-A,** there are 28 **objectives types question** which are compulsory. Each carrying **1 mark.** Darken the circle with blue black pen against the correct option on OMR Sheet provided to you.
Do not use whitener/Liquid Blade/Nail on OMR Paper, otherwise the result will be invalid.
(6) In Section-B, there II short answer type question (each carrying 2 marks), out of which any 11 questions are to be answered. Apart from this, there are 4 long answer Type questions. (Each Carrying 5 marks), out of which **any 3** question are to be answered.
(7) Use of any electrons device is prohibited.

In the following Question Nos.1to 28 there is only one correct answer against each question: For

each question, mark the correct option on the answer sheet: $[28 \times 1 = 28]$

1. **The electrical intensity inside a charged hollow sphere is**
   (A) $E_0\sigma$ **(B)** σ / E_0 **(C)** *zero* **(D)** $E_0 / 2$

   Answer: Option (C)

2. **Three capacitors each of capacitors each of capacity C are connected in series. The resultant capacity will be-**
   (A) $3C$ **(B)** $3/C$ **(C)** $C/3$ **(D)** $1/3C$

   Answer: Option (C)

3. **Two cells of emf ε_1 and ε_2, internal resistance r_1 and r_2, connected in parallel. The equivalent emf of the combination is-**

(A) $\frac{\varepsilon_1 r_1 + \varepsilon_1 r_1}{r_1 + r_2}$ **(B)** $\frac{\varepsilon_1 r_2 + \varepsilon_2 r_1}{r_1 + r_2}$ **(C)** $\sqrt{\varepsilon_1 \times \varepsilon_2}$ **(D)** $\frac{\varepsilon_1 + \varepsilon_2}{2}$

Answer: Option (B)

4. **Permeability μ of a ferromagnetic substance-**

(a) $\mu >> 1$ **(B)** $\mu = 1$ **(C)** $\mu < 1$ **(D)** $\mu = 0$

Answer: Option (A)

5. **S.I unit of pole strength is-**

(A) N **(B)** N/A-m **(C)** A-m **(D)** T

Answer: Option (C)

6. **Which element is used in electric heater?**

(A) C **(B)** Platinum **(C)** Tungsten **(D)** Nichrome

(B)

Answer: Option (D)

7. **Absorbed electrical energy is-**

(A) Proportional to the potential difference

(B) Inversely proportional to the potential difference

(C) Proportional to the square of the potential difference

(D) None of these

Answer: Option (C)

8. **Wheat stone's bridge is used in measuring –**

(A) High resistance **(B)** Low resistance

(C) Both high and low resistance **(D)** Potential difference

Answer: Option (C)

9. **If the equation of an electric current is $I = 0.6\sin 100\pi t$, the frequency of electric current is-**

(A) 50π **(B)** 50 **(D)** Ampere **(D)** Mho

Answer: Option (B)

10. **The unit of reactance is-**

(A) Ohm **(B)** Fared **(C)** Ampere **(D)** Mho

Answer: Option (A)

11. The relation between peak current I_0 and root mean square current I rms is-

(A) $I_0 = \sqrt{2} I_{rms}$ **(B)** $I_0 = I_{rms}$ **(C)** $I_0 = 2I_{rms}$ **(D)** $I_0 = \frac{I_{rms}}{\sqrt{2}}$

Answer: Option (A)

12. A short sighted person uses for clear vision-

(A) Convex Lens **(B)** Concave Lens

(C) Cylindrical Lens **(D)** Bi-focal Lens

Answer: Option (B)

13. The critical angle of light passing from glass to air is minimum for-

(A) Red colour **(B)** Green colour **(C)** Yellow colour **(D)** Violet colour

Answer: Option (D)

14. The angle of minimum deviation for thin prism of refractive index μ is

(A) $(1-\mu)A$ **(B)** $(\mu-1)A$ **(C)** $(\mu+1)A$ **(D)** $(\mu+1)A^2$

Answer: Option (B)

15. Transverse nature of light is shown by-

(A) Interference **(B)** Reflection **(C)** Polarisation **(D)** Dispersion

Answer: Option (C)

16. The focal length of a lens $\mu = 1.5$ in air is 20 cm. Its focal length is medium of refractive index 1.5 is-

(A) 20cm **(B)** 40cm **(C) 10cm** **(D)** ∞

Answer: Option (A)

17. The direction of transmission of electromagnetic wave is-

(A) Parallel to $\vec{E}$ **(B)** Parallel to $\vec{B}$

(C) Parallel to $\vec{B} \times \vec{E}$ **(D)** Parallel to $\vec{E} \times \vec{B}$

Answer: Option (D)

18. The unit of ratio of magnetic field B and electrical field E(B/E) is-

(A) ms^{-1} **(B)** sm^{-1}

(C) ms **(D)** ms^{-2}

Answer: Option (B)

19. The energy of emitted photo electron depends up on-

(A) Intensity of light **(B)** Wave length of light

(C) Work-function of metal **(D)** None of these

Answer: Option (C)

20. Which one of following in charge less?

(A) Alpha particle **(B)** Beta particle

(C) Photon particle **(D)** Proton

Answer: Option (D)

21. Which series of hydrogen spectrum does not lie in infrared region?

(A) Humphreys series **(B) P**fund series

(c) Bracket series **(D)** Lyman series

Answer: Option (b) and (C)

22. The energy of electron in first Bohr orbit of hydrogen atom is-13.6eV.

(A) -3.4 eV **(B)** -6.8 eV **(C)** -2.7 eV **(D) +**3.4 eV

Answer: Option (A)

23. Time during which the amount of radioactive substance becomes half of its initial amount is called.

(A) Average life **(B)** Half-life **(C)** Decay constant **(D)** Time period

Answer: Option (B)

24. $\beta - Rays$ **are deflected in-**

(A) Gravitational field **(B)** Only in magnetic field

(C) Decay constant **(D)** Time period

Answer: Option (B)

25. For n-type Germanium, impurity doped in Germanium is-

(A) Trivalent **(B)** Tetravalent **(C)** Pentavalent **(D)** None of these

Answer: Option (C)

26. Diode is used as-

(A) An amplifier **(B)** An 0scillator **(C)** A modulator **(D)** A rectifier

Answer: Option (D)

27. Boolean expression for NAND gate is-

(A) $\overline{A \cdot B} = \gamma$ **(B)** $\overline{A + B} = \gamma$ **(C)** $\overline{A \cdot B} = \gamma$ **(D)** $A + B = \gamma$

Answer: Option (A)

28. The height of a TV transmission tower at any place on the surface of the earth is 245m. The maximum distance up to which transmission of tower will reach is-

(A) 245m **(B)** 245km **(C)** 56km **(D)** 112km

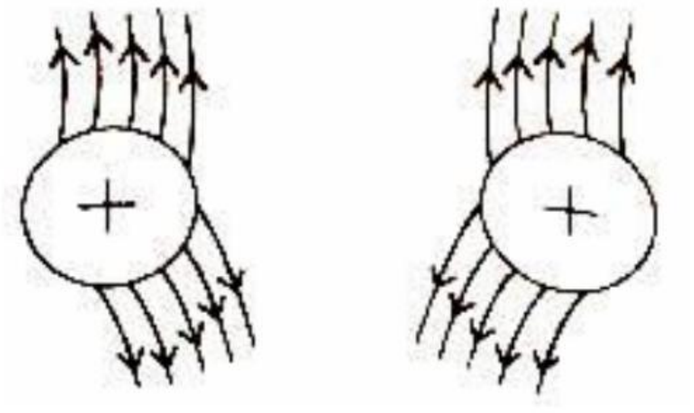
Answer: Option (C)

Section-II: (Non- objective Type)

Question Nos. 1 to 11 are of short answer type each question carries 2 marks.
$[11 \times 2 = 22]$

Short Answer Type Questions

1. **Draw lines of force of electric field due to a system of two equal point charges.**
   Answer: Electric lines of force due to a system of two point charge.



2. Write expression for magnetic fields $\vec{B}$ on axis and equator of a short bar magnet.

Answer: Magnetic field due to short Bar Magnet on the Axis.

$$B = \frac{\mu_0}{4\pi} \cdot \frac{2M}{r^3} \text{ Tesla}$$

On the equatorial line $B = \frac{\mu_0}{4\pi} \cdot \frac{M}{r^3}$ Tesla

Anti-parallel of Magnetic Moment

3. Potential due to a system of charge is V=3+2x in S.I system. What will be value of electric field at X=2m?

Answer: Given $V = 3 + 2x$

Given field $E = \frac{-dy}{dx} = \frac{-d}{dx}(3 + 2x)$

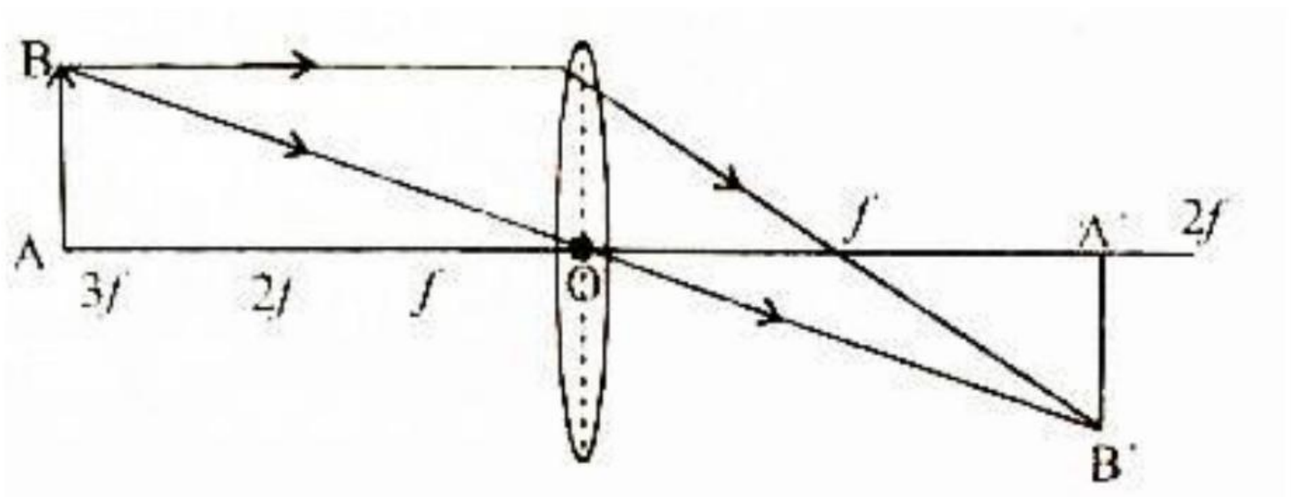
$$E = -2volt / m$$

4. Explain that Kirchhoff's second law is law of conservation of energy.

Answer: Kirchhoff second law obey the principle of conservation of energy because the net charge in the energy of a charge after the charge completes a closed path will be zero.

5. A point object is placed above principle axis at a distance three times focal length of a convex lens. Draw ray diagram showing position of image.

Answer:



In this position image is formed between f and 2f which is real, inverted and smaller then object.

6. Write Brewster law of polarization of light.

Answer:

Brewster law: The tangent of the polarizing angle is equal to R.I of Refracting Medium at which partial reflection takes place.

Snell law:

$$\frac{\sin ip}{\sin rp} = \frac{\sin ip}{\sin(90 - ip)}$$

$$= \frac{\sin ip}{\cos ip} = \tan ip$$

$p = polarizing$ angle

7. Show that a tangent galvanometer measures that current with maximum accuracy which produced 45^0 deflection.

Answer: The current measured by tangent galvanometer $I = k \tan\theta$

$$dI = k \sec^2\theta \cdot d\theta$$

And the proportional error $\frac{dI}{I} = \frac{k \sec^2 \theta d\theta}{k \tan\theta} = \frac{2d\theta}{\sin 2\theta}$

Thus, the proportional error will be minimum when $\sin 2\theta$ will be maximum $\left(\theta = 45^0\right)$.

Hence, white measuring current with tangent galvanometer it should be remembered that the deflection θ should be near about 45^0.

8. A bulb rated 100w. 220 V is connected across 240 Volt. Calculate electrical power loss.

Answer: $R = \frac{V^2}{P}$ $\quad$ R= $\frac{220 \times 220}{100}$ $\quad$ R=484Ω

Now, $P = \frac{V^2}{R} = \frac{240 \times 240}{100}$ $\quad$ P=110.8watt

9. A light of wavelength $6000A^0$ is incident on a metal of work function 2 eV. Will electrons be emitted? If yes, find maximum energy of emitted electron.

Answer: Given $\omega = 2eV$ $\quad$ λ=$6000\theta^0$

Now, Energy $\omega = E = \frac{hc}{\lambda}$

$$E = \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{6000 \times 10^{-10}} = \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{6000 \times 10^{-10} \times 1.6 \times 10^{-19}} eV$$

$$E = 2.06eV$$

Thus, the energy of incident radiation is greater than work function. So electrons are emitted from metallic surface.

Energy of emitted from metallic surface.

Energy of emitted election K.E =E-W=2.06-2 K.E = 0.06 eV

10. Write change in position of atom of an element in periodic table due to emission of α and β particle from its modulation.

Answer: The emission of an α - particle by radioactive atom result result in a daughter atom, whose atomic number is 2 unit less and mass number is 4 unit less than that of parent atom.

$$ZX^{A} \xrightarrow{\alpha-decay} Z-2^{2^{A-4}}$$

The emission of β -particle by radioactive atom results in a daughter atom whose atomic number 1 unit more but mass number is same as that of parent atom.

$$ZX^{A} \xrightarrow{\beta-decay} Z+1^{y^{A}}$$

11. Explain modulation and write types of modulation.

Answer:

Modulation: Modulation is define the process varying one or more properties of a periodic waveform called the carrier signal. It is used telecomication and electronics.

Type of modulation: which is three different types of modulation.

(i) Amplitude Modulation (AM)

(ii) Frequency Modulation (FM)

(iii) Phase Modulation (PM)

Question Nos. 12 to 15 are of long answer type. Answer must be explanatory and in your own language. All questions have alternative out of which you have to choose any one alternative.

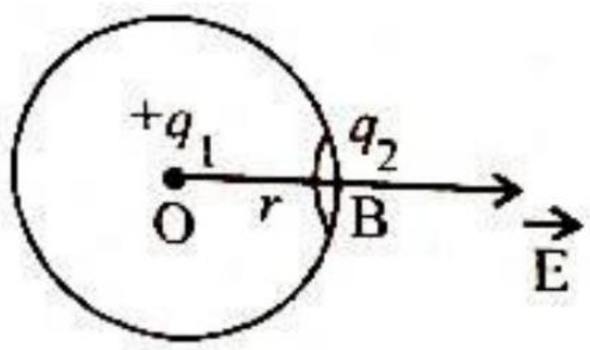
$[4 \times 5 = 20]$

12. Deduce Coulomb's law from Gauss law.

Answer: To deduce coulomb's law from Gaussis theorem: Consider that two point charge q_1 and q_2 are placed at point A and B at a distance r apart in vacuum. Let E is magnitude of electric field at the location of point charge q_2 due to charge q_1. Then force experienced by the point charge q_2 due to electric field of charge q_1.

$$F = q_2 E$$

To find E, draw a spherical surface of radius r with point as the centre. According to Gauss theorem, the total electric flux.



$$\oint \vec{E} \cdot \vec{ds} = \frac{q_1}{\varepsilon_0} \qquad \therefore \frac{q_1}{\varepsilon_0} = \oint \vec{E} \cdot \vec{ds} = \oint E \cdot ds \left(\therefore \vec{E} \parallel \vec{ds}\right)$$

$$\frac{q_1}{\varepsilon_0} = \oint \vec{E} \cdot \vec{ds} \qquad \frac{q_1}{\varepsilon_0} = E \cdot 4\pi r^2 \qquad \text{E} = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q_1}{r^2}$$

From equation (i) and (ii)

$$F = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q_1 \cdot q_2}{r^2}$$

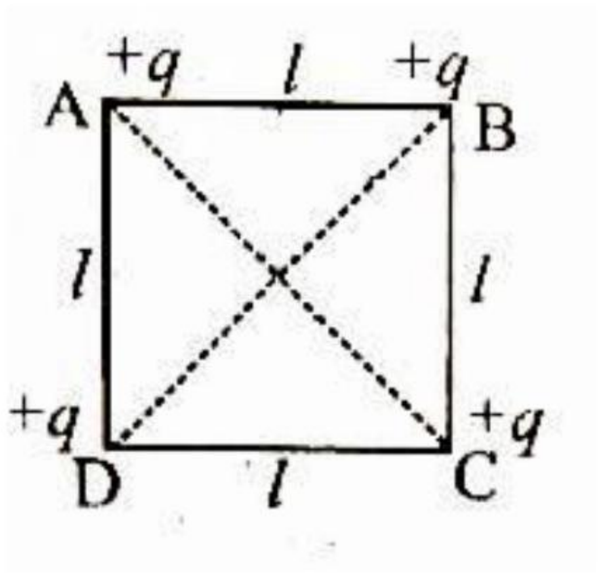
It is the mathematical from of Coulomb's law in electrostatics.

Or, Explain potential energy of a charge system. Calculate energy needed to place charge q at each corner of a square of side ℓ

Answer: Potential Energy of Charge System: The electrostatic potential energy of a system of point charges is defined as the work required to be done to bring the charge constituting the system to their respective location from infinite.

Let there is no charge initially. Now, work done to place charge +q on A=0

To keep the charge +q on B in presence of charge q on A



$$w_2 = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q_1\cdot q}{l} \qquad w_2 = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l}$$

To place charge +q on C in presence of charge of A and B work done.

$$w_3 = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q_1\cdot q}{l} + \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l\sqrt{2}} \qquad w_3 = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l}\left[1+\frac{1}{\sqrt{2}}\right]$$

Work done to place charge +q on d in presence of charge at A,B and C.

$$w_4 = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l} + \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l\sqrt{2}} + \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l}$$

$$w_4 = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l}\left(2+\frac{1}{\sqrt{2}}\right)$$

Total work done $w = w_1 + w_2 + w_3 + w_4$

$$w = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l}\left(0+1+1+\frac{1}{\sqrt{2}}+2+\frac{1}{\sqrt{2}}\right)$$

$$w = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l}\left[4+\sqrt{2}\right]$$

This work done is stored in the form of potential energy.

$$P.E = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q^2}{l}\left[4+\sqrt{2}\right]$$

13. An object is at infinity from a Plano convex lens whose plane surface is silvered. Explain formation of its image and hence find its focal length.

Answer: when the light is inviolent on the surface of plane convex lens whose plane surface is silvered then it silvered then it behaves as concave mirror.

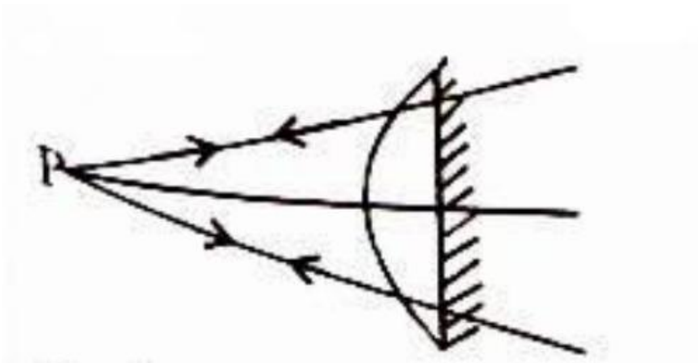
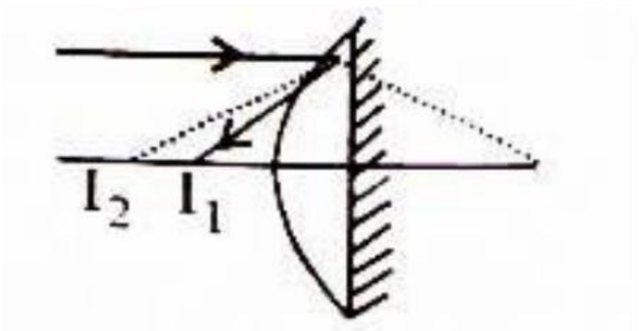


Fig. Silverd plane surface



Silverd plane surface

In this position $\frac{1}{f_1} = (\mu - 1)\left(\frac{1}{R} - \frac{1}{\infty}\right) = \frac{\mu - 1}{R}$ *and* $f_m = \frac{2}{\infty} = \infty$

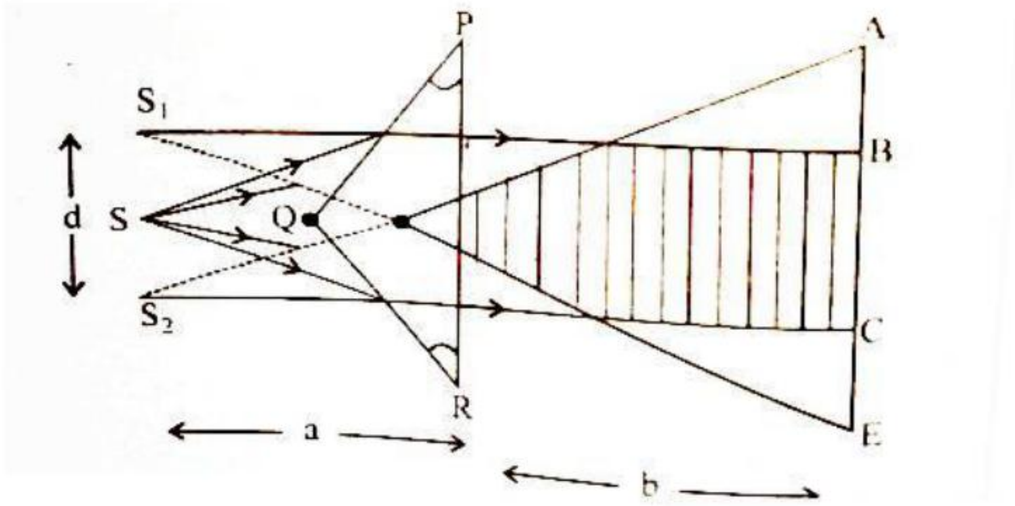
$P_L = \frac{1}{f_L} = \frac{(\mu - 1)}{R}$ and $P_M = \frac{-1}{f_M} = \frac{1}{\infty} = 0$

Power $P = P_L + P_M + P_L = 2P_L + P_M$

Focal length $F = \frac{-1}{P} = \frac{-R}{2(\mu - 1)}$

Or, What is a biprism? Explain measurement of wavelength of monochromatic light using birprism.

Answer: Biprism: The biprism is a device for obtaining two convert source for producing sustained interference. It may be supposed to made up of two prism of very small repracting angle placed base to baase.



S is the slit illuminated by a source. The light passes through a biprism PQR whose upper and lower part create virtual images S_1 & S_2 and interference fringes are obtained in the over lapping region BC.

By the young's experiment, fringe width $\beta = \frac{D\lambda}{d}$

Where, λ = wavelength of monochromatic light. If the distance of slit and distance of screen is b from biprism then $D = a + b$. By Geomeos distance between S_1 & S_2

$d = a \times 2\theta$ for biprism $\angle A$ and $\angle C$ are very small

If $\angle A = \angle C = \infty$ then Deviation produced by prism $q = (m-1)\alpha$ where is refractive index.

So, $\beta = \frac{(a+b)\lambda}{2a(\mu-1)\alpha}$ as $\lambda = \frac{2a(\mu-1)\alpha \cdot \beta}{(a+b)}$

This is the expression for wavelength of monochromatic light.

14. What is Wheatstone bridge? Explain its use in detail.

Answer: Wheatstone bridge:

1. ABDA –

   $i_1 p + i_g - i_2 R = 0$.....(1)

   2. BCDB

   $(i_1 - i_g)Q - (i_2 + i_g)S - i_g G = 0$.....(2)

   $i_1 p = i_2 R \rightarrow (3)$

   Null deflection, $i_g = 0$

$$i_1 Q - i_2 S = 0$$

$$i_1 Q = i_2 S .....(4)$$

$$\frac{i_1 P}{i_1 Q} = \frac{i_2 R}{i_2 S}$$

$$\frac{P}{Q} = \frac{R}{S}$$

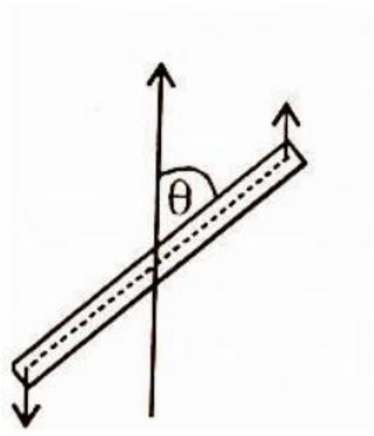
Use of Wheatstone bridge: (i) The wheatstone bridge is used for the precise measurement of low resistance.

(ii) wheatstone bridge along with operational amplifier is used to measure physical parameters such as temperature, light and strain.

(iii) Quantities such as impedance, inductance, and capacitance can be measured using variations on the wheatstone bridge.

Or, Find time period of a bar magnet oscillating freely in a uniform magnetic field $\vec{B}$.

Answer: Time period of Magnet: Consider that a magnet having the magnetic dipole moment M is freely suspended in magnetic field B. In equilibrium position. It will point in N-S direction. If the magnet is displaced through an angle θ acts on it which tends to bring it back to equilibrium position.



If I is moment of inertia of the magnet about the suspension axis and α is angular aculeration then

The valve of $\sin\theta$ is very small. So, $\sin\theta \approx \theta$ Then

$$\alpha = \frac{MB_H \theta}{I} .....(i)$$

The time period of vibration of magnet $T = 2\pi\sqrt{\frac{angular\ \text{displacement}}{angular\ \text{acceleration}}}$

$$T = 2\pi\sqrt{\frac{\theta}{\alpha}} .....(ii)$$

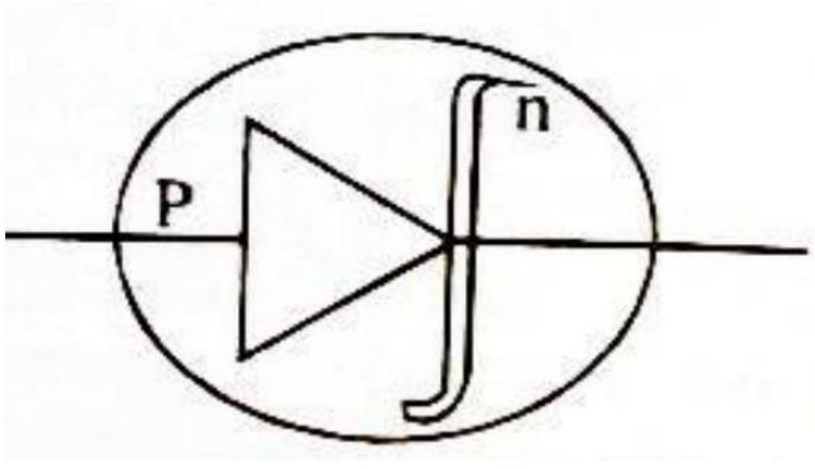
From equation (i) and (ii) $T = 2\pi\sqrt{\frac{1}{MB}}$

This is, the expression for time period in uniform magnetic field.

15. Explain- (i) Zener diode (ii) LED (light emitting diode).

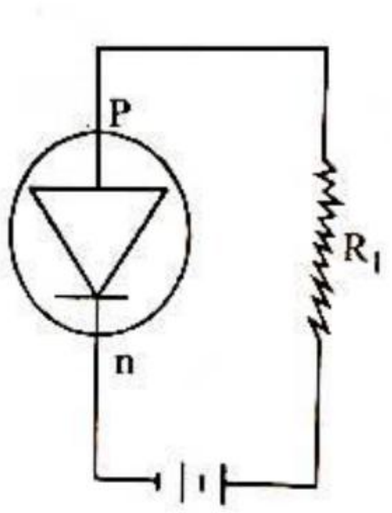
Answer: (i) Zener diode: In the usual junction diodes, when the applied reverse bias increase a particular large value, the reverse current increase suddenly on increasing the reverse bias even slightly. This particular large value of reverse bias is called break down voltage. An ordinary junction diode of low power rating will get destroyed on applying reverse bias above its break down voltage.

This specially designed junction diodes, which can operate in the reverse breakdown voltage region continuously without being damaged, are called zener diode. Symbol of zener diode is



(ii) **Light emitting diode (LED): B** when junction diode bias energy is released at the junction due to recombination of electrons and hole. In case of silicon and germanium diodes, the energy is released in infrared region.

In the junction diode made of gallium arsenide or indium phosphide, the energy is released in visible region. Such a junction diode is called light emitting diode.



Or, (i) Explain constitution of atomic nucleus

(ii) Write difference between nuclear fission and radioactivity.

Answer: (i) Atomic nucleus: The atomic nucleus are made of combination are proton and electron. Both are responsible for mass of nucleus an positive charge. The number of proton in nucleus is equal to atomic number. An atom may be regarded as a sphere of diameter 10^{-10} m but whole of the positive charge and almost the entire mass of atom is concentrated in small central core called nucleus. The nucleus is surrounded by electrons. The electron are spread over the remaining part of atom, leaving plenty of empty space in the atom.

As the atom is electrically neutral, the total positive charge an nucleus is equal to the total negative charge of electron of atom.

Nuclear fission	**Radioactivity**
(i) It is a induced phenomena. This phenomena takes place offer bombarding of neutron on heavy nucleus	**(i)** It is spontaneous phenomena.
(ii) This phenomena can be controlled.	**(ii)** It cannot be controlled.
(iii) This phenomena takes place very fastly.	**(iii)** This phenomena takes place very slowly.
(iv) A heavy nucleus splits in to two lighter nucleus after bombarding of slow moving neutron.	**(iv)** α -particle or β -particles are emitted after disintegration of radioactive substance and energy obtained in this phenomena is not very high.