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# CBSE 12th Physics 2016 Solved Paper Outside Delhi

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# CBSE 12th Physics 2016 Solved Paper Outside Delhi

TIME - 3HR. | QUESTIONS - 26

THE MARKS ARE MENTIONED ON EACH QUESTION

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## SECTION-A

**Q.1. A charge 'q' is moved from a point A above a dipole of dipole moment 'p' to point B below the dipole equatorial plane without acceleration. Find work done in the process. 1 mark**

**Ans.** Work done will be zero, as potential at A and B is same.

**Q.2. In what way is the behaviour of a diamagnetic material different from that of a paramagnetic, when kept in an external magnetic field. 1 mark**

**Ans.** Diamagnetic acquire feeble magnetisation in the direction opposite to magnetising field, while paramagnetic acquire in the direction of magnetising field.

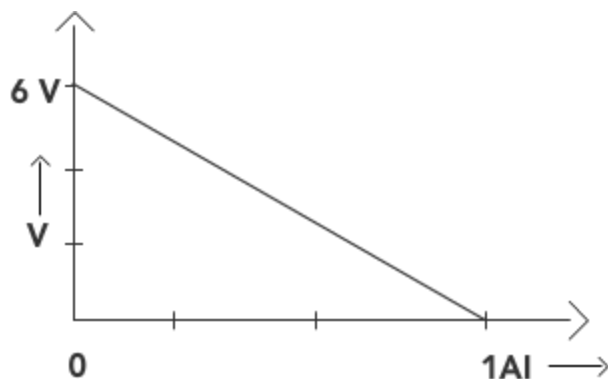
**Q.3. Name the essential components of a communication system. 1 mark**

**Ans.** Transmitter, channel and receiver.

**Q.4. Why does sun appear red at sunrise and sunset? 1 mark**

**Ans.** Sun rays travel a larger thickness of atmosphere, the lower wavelengths in the blue region completely scatter away (and disappears) and the higher wavelength (red) is least scattered and reach to our eyes.

**Q.5. The plot of the variation of potential difference across a combination of three identical cells in series, versus current is shown below. What is the emf and internal resistance of each cell? 1 mark**



**Ans.** From the graph, when,  $I = 0$ ,  $V = 6$  Volts.

So, emf of each cell =  $\frac{6}{3} = 2$  v

$$r = \frac{E}{I} = \frac{6}{1} = 6\Omega$$

So, internal resistance of each cell =  $2\Omega$

## SECTION-B

**Q.6. Define modulation index. Why is it kept low ? what is the role of a bandpass filter?**

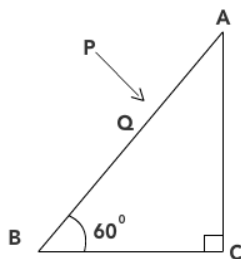
*2 marks*

**Ans.** Modulation index is the ratio of amplitude of modulating signal to amplitude of

carrier waves.  $\mu = \frac{A_m}{A_c}$ .

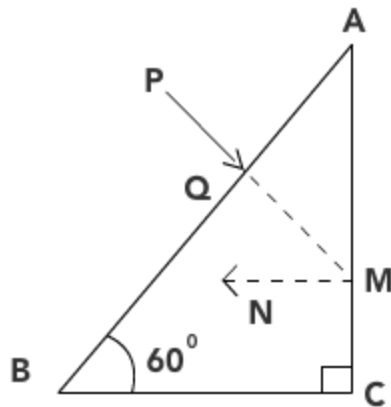
It is kept low to decrease distortion or noise. A band pass filter rejects low and High frequencies and allows a band of frequencies to pass.

**Q.7. A ray PQ incident normally on the refracting face BA is refracted in the prism BAC made of material of refractive index 1.5. Complete the path ray through the prism. From which face will the ray emerge ? justify your answer. *2 marks***



**Ans.** From the figure  $\angle A = 30^\circ$

$\angle QMN = 30^\circ = \text{angle of incidence.}$



Now  $\mu = \frac{1}{\sin c} \Rightarrow \frac{1}{\mu} = \frac{1}{1.15} = \frac{2}{3}$

Also,  $\sin i = \sin 30^\circ = \frac{1}{2}$

So,  $C > i$

$\Rightarrow i < C$

So, total internal reflection will not take place and ray PQ will emerge from AC.

**Q.8. Calculate the de-Broglie wavelength of the electron orbiting in the  $n = 2$  state of hydrogen atom ? 2 marks**

**Ans.** Energy in orbit for which  $n = 2$

$$E = \frac{-13.6}{2^2} \text{ eV} = -3.4 \text{ eV}$$

Now,  $3.4 \times 1.6 \times 10^{-19} = \frac{hc}{\lambda}$

$$\Rightarrow \lambda = \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{3.4 \times 1.6 \times 10^{-19}} = 3.639 \times 10^{-7} = 3639 \text{ \AA}$$

**Q.9. Define ionization energy. How would the ionization energy change when electron in hydrogen atom is replaced by a particle of mass 200 times that of the electron but having the same charge? 2 marks**

**Ans.** It is defined as the energy required to knock an electron completely out of the atom. It will remain same as it depends on charge and not on mass.

**OR**

**Calculate the shortest wavelength of the spectral emitted in balmer series [given Rydberg constant,  $R = 10^7 m^{-1}$  ]**

**Ans.** For shortest wavelength of Balmer series

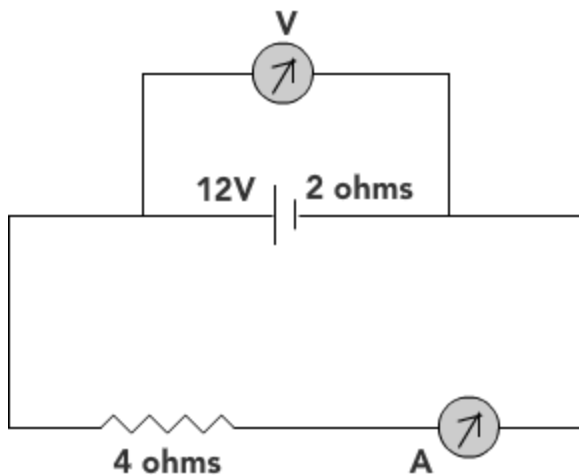
$$ni \rightarrow \infty$$

$$\frac{1}{\lambda_{\min}} = R \left[ \frac{1}{2^2} - \frac{1}{\infty} \right] = \frac{R}{4}$$

$$\Rightarrow \lambda_{\min} = \frac{4}{R} = 3646 \text{ \AA}$$

**Q.10.** A battery of emf 12V and internal resistance  $2 \Omega$  is connected to a  $4 \Omega$  resistor as shown in the figure.

- (a) Show that a voltmeter when placed across the cell and across the resistor, in turn, gives the same reading.
- (b) To record the current in the circuit, why is voltmeter placed in parallel and ammeter in series in the circuit? *2 marks*



**Ans.** Total resistance =  $2 + 4 = 6 \Omega$

(a)

$$I = \frac{E}{R} = \frac{12}{6} = 2A$$

$$V = E - Ir = 12 - 2 \times 2 = 8 \text{ Volt}$$

Voltmeter reading = 8V

Am meter reading = 2A

Now when voltmeter is placed parallel to  $4\Omega$  resistance, potential drop across  $4\Omega$  resistance is  $4 \times 2 = 8V$ . So, voltmeter will show 8V.

(b) Voltmeter is placed parallel and ammeter in series in the circuit, because ammeter is a very low resistance device and voltmeter has very high resistance.

## SECTION-C

**Q.11. Define an equipotential surface. Draw equipotential surfaces :**

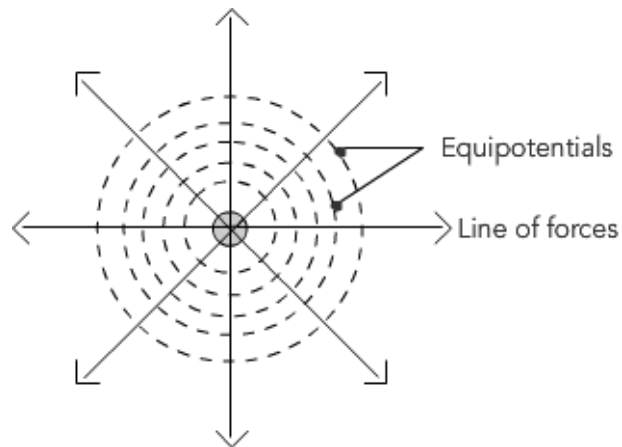
(i) in the case of a single point charge and

(ii) in a constant electric field in Z-direction. Why the equipotential surfaces about a single charge are not equidistant?

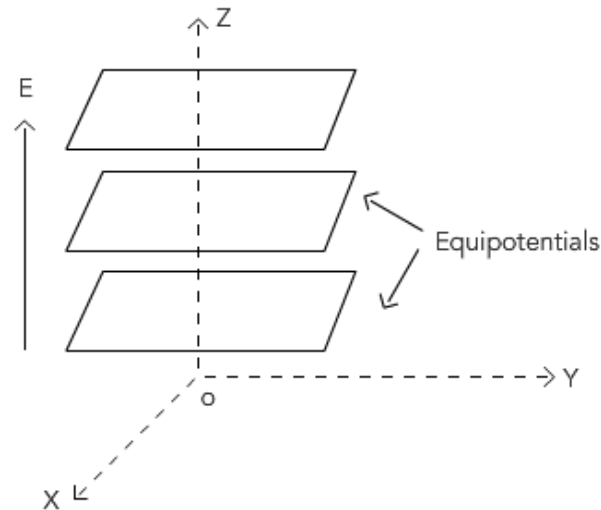
(iii) can electric field exist tangential to an equipotential surface? give reason.

*3 marks*

**Ans. (i)**



(ii) A surface where potential at every point is same called equipotential surface.



Because electric field keeps on decreasing as we move away from charge. So, potential also decreases.

- (iii) Let, electric field is tangent to equipotential surface, then work has to be done in moving a charge over surface, but work done in moving charge over an equipotential surface is zero, so it contradicts our assumption.

**Q.12. (a) State law of Malus.**

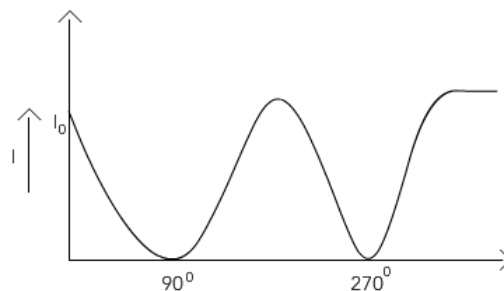
**(b) Draw a graph showing the variation of intensity ( $I$ ) of polarised light transmitted by an analyser with angle ( $\theta$ ) between polariser and analyser.**

**(c) What is the value of refractive index of a medium of polarising angle  $60^\circ$ ? 3 marks**

**Ans** (i) When a beam of completely plane polarized light is passed through analyser, the intensity  $I$  of the transmitted light varies directly as the square of cosine of the  $\theta$  between the transmission direction of polariser and analyser. *i.e.*

$$I = I_0 \cos^2 \theta$$

(ii)



(iii)  $\mu = \tan ip = \tan 60^\circ = \sqrt{3}$

**Q.13. Sketch the graph showing variation of stopping potential with frequency of incident radiations for two photosensitive materials A and B having threshold frequencies  $\nu_A > \nu_B$ .**

**(i) In which cases is the stopping potential more and why ?**

**(ii) Does the graph depend on the nature of the material used ? Explain. 3 marks**

**Ans.** (i) For  $\nu_A$  stopping potential is more because more frequency of photon means more energy of electron, and hence, more potential is required to stop it.

(ii) Slope of the graph  $\tan \theta = \frac{h}{e}$  universal constant.

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