

# ANDHRA EDUCATION SOCIETY SCHOOLS

NEW DELHI  
MID TERM EXAMINATION (2017-18)  
CLASS - XII  
SUBJECT - PHYSICS

Time : 3:00 Hrs.

Max Marks : 70

### General Instructions:-

- All questions are compulsory.
- Q.no. 1 to 5 (Section-A) carry one mark each, question no. 6 to 10 (Section-B) carry two marks each, questions 11 to 22 (Section-C) carry three marks each, Q.No. 23 (Section-D) carrying four marks and questions 24 to 26 (Section-E) carry five marks each.

### SECTION-A

- How much work is done in moving a 500 $\mu$ C charge between two points separated by 2 cm on an equipotential surface? 0
- Sketch graph to show how charge Q given to a capacitor of capacitance C varies with the potential difference.
- A proton and a deuteron have the same velocity. What is the ratio of their de Broglie wave length? 0
- What is the ratio of nuclear densities of the two nuclei having mass numbers in the ratio 1:4. 0
- What is the purpose of modulating a signal in transmission. 0
- Write the following in descending order of wave length. Gamma rays, Hertzian waves, yellow light, UV rays, blue light and X-Rays.
- The refractive index of a material is  $\sqrt{3}$ . What is the angle of refraction if the unpolarised light incident on it at the polarizing angle of the medium. 0
- How did de Broglie hypothesis lead to Bohr's quantum condition of atomic orbits. 0
- Sketch a graph between frequency of incident radiations and stopping potential for a given photo sensitive material. What information can be obtained from the slope of the graph and intercept on the potential axis. 0
- Define the "Activity" of a radio active substance. State its SI unit. Give a plot of activity of a radio active species versus time. 0

(OR)

PTO

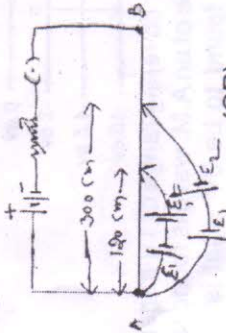
(i) positively charged (ii) negatively charged.

(OR)

- Find expression for the force and torque on an electric dipole kept in a uniform dielectric field.
- Identify two pairs of perpendicular vectors in above expression.
- Show diagrammatically the orientation of the dipole in the field for which the torque is
  - maximum
  - Half the maximum value and
  - zero.

25. (a) State the principle of potentiometer. Define potential gradient. Obtain an expression for potential gradient in terms of resistivity of the potentiometer wire.

- Figure shows a long potentiometer wire AB having a constant potential gradient. The null points for the primary cells of emfs  $\epsilon_1$  and  $\epsilon_2$  connected in the manner shown are obtained at a distance of  $L_1 = 120$  CM and  $L_2 = 300$  cm from the end A. Determine
  - $\epsilon_1, \epsilon_2$  and
  - position for the null point for the cell  $\epsilon_1$  only.



(OR)

- Use kirchoff's rules to obtain conditions for the balance condition in a wheat stone bridge.
  - Describe briefly giving the necessary circuit diagram how a potentiometer used to measure the internal resistance of a primary cell.
- Derive the condition for constructive and destructive interference for a double slit experiment.
  - Write any four differences between Interference and diffraction.
  - How interference fringes effect when
    - the separation between the two slits is decreased?
    - the monochromatic light replaced by a white light.
    - the screen is moved away from the slit.
    - the width of the source slit is increased.
- (OR)
- Draw a labelled ray diagram of a refracting telescope. Define its magnifying power and write the expression for it.
  - Write the necessary conditions for total internal reflection. Write the relation between the refractive index and critical angle for a given pair of optical media.

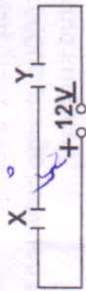
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Derive the expression  $=Noe \cdot Xt$  for a radio active substance.

11. Define electric field strength and find an expression for the electric field strength at a distant point situated along the equatorial line of an electric dipole.

12. Derive an expression for the energy stored in a capacitor charged to a potential difference  $V$ . Hence derive an expression for the energy density of a capacitor.

13. X and Y are two parallel plate capacitors having the same areas of plates and same separation between the plates. X has air between the plates and Y contains a dielectric medium  $\epsilon_0 = 4$ .  
 (a) calculate the capacitance of each capacitor if equivalent capacitance of the combination is  $4 \mu f$ .  
 (b) calculate the potential difference between the plates of X and Y.  
 (c) what is the ratio of electrostatic energy stored in X and Y?



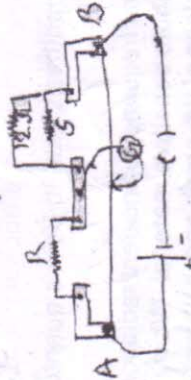
14. Define drift velocity. Derive an expression for drift velocity in terms of relaxation time of electrons.

15. Two cells of emf 1.5 v and 2 v and internal resistances  $1\Omega$  and  $2\Omega$  respectively are connected in parallel to pass a current in the same direction through an external resistance of  $5\Omega$ .

(a) Draw the circuit diagram.  
 (b) Using Kirchoff's laws, calculate the current through each branch of the circuit and potential difference across  $5\Omega$ .

(OR)

In a meter bridge, the null point is found at a distance of 40 cm from A. If a resistance of  $12\Omega$  is connected in parallel with S, the null point occurs at 50 cm from A. Determine the values of R and S.



16. The oscillating magnetic field in a plane electromagnetic wave is given by  $B_y = (8 \times 10^{-6}) \sin[2 \times 10^{11}t + 300\pi x]$  T. (i) calculate the wavelength of the electromagnetic wave. (ii) write down the expression for the oscillating electric field.

$B_0 \sin(\omega t + kx)$

17. Derive lens maker formula.

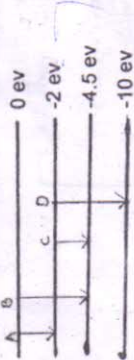
18. Explain the working of reflecting type telescope. Write any four advantages of reflecting type telescope over the refracting type telescope.

19. Derive prism formula.

20. Explain the laws of photo electric emission on the basis of Einstein's photo electric equation.

21. (a) The energy levels of a hypothetical hydrogen-like atom are shown in figure. Find out the transition, from the ones shown in figure, which will result in the emission of a photon of wavelength 275 nm.

(b) which of these transitions corresponds to the emission of radiation of (i) maximum and (ii) minimum wavelength?



22. (a) Derive an expression for covering range of TV transmission tower.  
 (b) The maximum amplitude of an A.M. wave is found to be 15 V while its minimum amplitude is found to be 3V. what is the modulation index?

23. During a thunderstorm the "live" wire of the transmission line fell down on the ground. A group of boys passing through noticed it and some of them wanted to place the wire by the side. As they were approaching the wire and trying to lift it, Hari noticed it and immediately pushed them away to prevent from touching wire. Two of them got hurt in the process. Hari took them to a doctor to get medical aid. Based on the above paragraph, answer the following:

(a) write two values which Hari displayed during the incident.  
 (b) why is it that a bird can sit on a suspended 'live' wire without any harm where as touching it on the ground can give a fatal shock?  
 (c) The electric power from a power plant is set up to a very high voltage before transmitting it to distant consumers. Explain why?

24. (a) State and prove Gauss's law in electrostatics.

(b) Using Gauss's law, prove that the electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it.

(c) How is the field directed if the sheet is