3/80

MID TERM EXAM- 2017-18
PHYSICS
CLASS XII

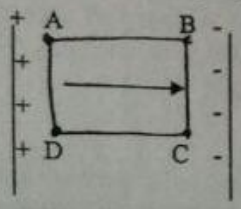
Time Allowed: 3 Hrs Maximum Marks: 70

General Instructions:

(i) All questions are compulsory.
(ii) Question numbers 1 to 5 are very short answer type questions, carrying one mark each.
(iii) Question numbers 6 to 10 are short answer type questions, carrying two marks each.
(iv) Question numbers 11 to 22 are also short answer type questions, carrying three marks each.
(v) Question numbers 23 is value based question, carrying four marks .
(vii) Question numbers 24 to 26 are long answer type questions, carrying five marks each.
(viii) Use of calculators is not permitted. However, you may use log tables, if necessary.

1 Mark Questions

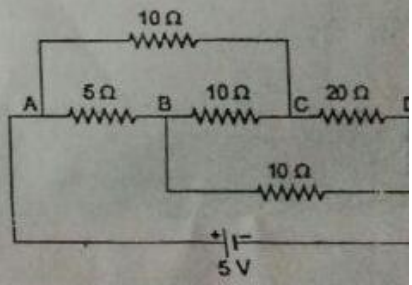
1. . A uniform electric field E exists between two charged plates as shown in the figure. What would the work done in moving a charge 'q' along the closed rectangular path ABCDA ?



2. State the condition under which terminal potential difference is equal to the EMF of the cell.
3. The power factor of an a.c. circuit is 0.5. What will be the phase difference between voltage and current in this circuit.
4. What is the value of angle of dip at (i) poles (ii) equator?
5. How does the frequency of UV light changes when it goes from air to water? why?

2 Mark Questions

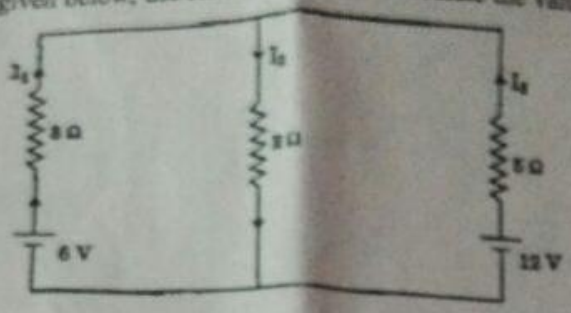
6. Define electric flux. Write its S.I. units. A spherical rubber balloon carries a charge that is uniformly distributed over its surface. As the balloon is blown up and increases in size, how does the total electric flux coming out of the surface change? Give reason
7. Calculate the value of the current drawn from a 5 V battery in the circuit as shown



8. Derive the expression for force per unit length between two long straight parallel current carryi conductors. Hence define one ampere.
9. State four properties of Electro Magnetic waves.
10. The image of a candle is formed by a convex lens on a screen. The lower half of the lens is pain black to make it completely opaque. Draw a ray diagram to show image formation. How will t image be different from the one obtained when the lens was not painted black?

3 Mark Questions

11. A dielectric slab of thickness 't' is introduced without touching between the plates of a parallel plate capacitor, separated by a distance 'd' (t < d). Derive an expression for the capacitance of the capacitor.
12. Two capacitors A and B are connected in series with a 100V supply and it is observed that potential difference across them is 40V and 60 V respectively. A capacitor of capacitance 6μF is now connected in parallel with B and as a result the potential difference across B falls to 50 V. Find the capacitance of A and B.
13. Two point electric charges of unknown magnitude and sign are placed a distance 'd' apart. The electric field intensity is zero at a point, not between the charges but on the line joining them. Write two essential conditions for this to happen.
14. In the network given below, use Kirchoff's laws to calculate the values of electric currents I_1, I_2 and I_3.



15. A meter bridge consisting of two external resistances X and Y, in series with a meter long wire shows null deflection at 33.7 cm. The resistance Y is shunted by a resistance of 12 ohm and the null point is found to shift a distance of 18.2 cm to the right. Determine the resistance of X and Y.
16. A beam of alpha particles and that of protons of the same velocity 'v', enter a uniform magnetic field at right angles to the field lines. The particles describe circular paths. What is the ratio of the radii of the two circles
17. How can you convert a galvanometer into an ammeter. Which one of the two, an ammeter or a millimeter, has a higher resistance and why?
18. (a) Define self inductance. Write its S.I. units.
    (b) Derive an expression for self inductance of a long solenoid of length 1, cross-sectional area A having N number of turns
19. A wheel with 10 metallic spokes each 0.5 m long is rotated with angular speed of 120 revolutions per minute in a plane normal to the earth's magnetic field. If the earth's magnetic field at the given place is 0.4 gauss, find the emf induced between the axle and the rim of the wheel.
20. Identify the constituent radiation of electromagnetic spectrum which
    (i) is used for studying crystal structure.
    (ii) is absorbed by the ozone layer in the atmosphere.
    (i) produces intense heating effect
    (ii) Used for communication
    (iii) Used for detecting fracture in bones
    (iv) Emitted by radioactive samples

1.

Two polaroids P1 and P2 are placed with their axes perpendicular to each other. Unpolarised light of intensity I, is incident on P1. A third Polaroid P3 is kept in between P1 and P2 such that its pass axis

makes an angle of 30° with that of P1. Determine the intensity of light transmitted through P1, P2 and P3.

22.
(i) Draw a schematic labeled ray diagram of a reflecting type telescope.
(ii) Write two important advantages justifying why reflecting type telescopes are preferred over refracting telescopes.
(iii) The objective of a telescope is of larger focal length and of larger aperture (compared to the eyepiece). Why? Give reasons.

4 Mark Question

23. Subhash wanted to see the work of a transformer.He connected the primary coil of the transformer to an a.c. supply. At that time an aluminium ring in his hand falls into the core of the transformer. Without noticing that , he switched on the power supply. The aluminium ring flew up into the air. He panicked. His father who was an electrical engineer, explained the reason.
State the values associated with the above behavior of Subhash and his father.
Why did the aluminum ring fly? State the principle and explain.

5 Mark Questions

24. State the principle of potentiometer. How can you find the internal resistance of a cell using a Potentiometer explain with the help of a circuit diagram? Also explain why we cannot use a voltmeter to measure the EMF of a cell?

25. Explain the principle and working of a cyclotron with the help of a labeled diagram.
A cyclotron's oscillator frequency is 10 MHz. What should be the operating magnetic field for accelerating protons? If the radius of its 'dees' is 60 cm, what is the kinetic energy of the proton beam produced by the accelerator ? Express your answer in units of MeV.
($e = 1.6\times10^{-19}$ C, $m_p = 1.67\times10^{-27}$ kg, 1 MeV = 1.602×10^{-13} J)

26. (a) Draw a ray diagram showing the passage of light through a glass prism. Hence, obtain a relation between the angles of deviation, angle of incidence and angle of emergence and the angle of prism.
(b) Explain how the above relationship can be used to find the refractive index of the material of the prism.