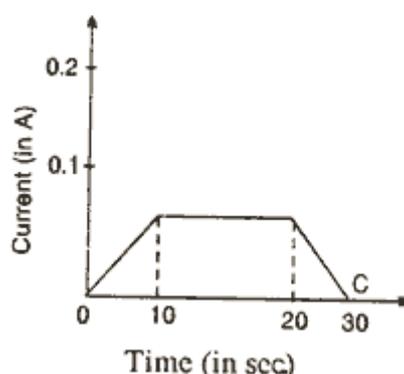
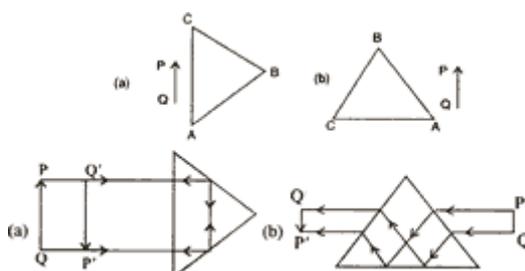


PHYSICS – 2003

- Q. 1.** Define electrical conductivity of a conductor and give its S.I. unit.
- Q. 2.** What happens to the power dissipation if the value of electric current passing through a conductor of constant resistance is doubled?
- Q. 3.** How does the (i) pole strength and (ii) magnetic moment of each part of a bar magnet change if it is cut into two equal pieces transverse to its length?
- Q. 4.** Write S.I. unit of magnetic flux. Is it a scalar or a vector quantity?
- Q. 5.** Name the factor which decides the quality of reproduced document sent by Fax.
- Q. 6.** Mention any two properties of electric lines of force. Sketch them for an isolated positive point charge.
- Q. 7.** In a copper voltameter, a varying electric current, as shown in graph, is passed. The mass of copper deposited at the end of 30 seconds is m grams. Using the graph, find the value of e.c.e. of copper in gC^{-1} .



- Q. 8.** An a.c. voltage $E = E_0 \sin \omega t$ is applied across an inductor L . Obtain an expression for current I .
- Q. 9.** An object is placed in front of a right angled prism ABC in two positions (a) and (b) as shown. The prism is made of crown glass with critical angle of 41° . Trace the path of two rays from P and Q , (i) in (a), normal to the hypotenuse and (ii) in (b), parallel to the hypotenuse.



- Q. 10.** Name the reaction which takes place when a slow neutron beam strikes ${}_{92}^{235}\text{U}$ nuclei. Write the nuclear reaction involved.

Or

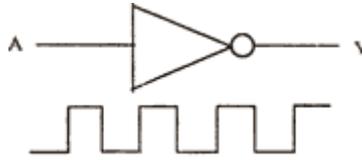
The work function of lithium is 2.3 eV. What does it mean? What is the relation between the work function 'W' and threshold wavelength λ_0 of a metal?

- Q. 11.** In the series of radioactive disintegration of ${}_{88}^{226}\text{Ra}$ first an alpha-particle and then a

beta-particle is emitted. What is the atomic number and mass number of the new nucleus formed by these successive disintegrations?

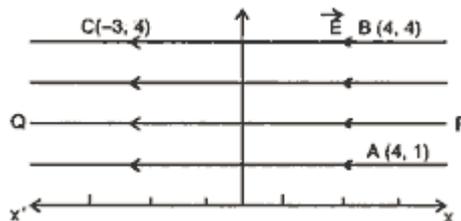
Q. 12. In the figure below, circuit symbol of a logic gate and input wave form is shown.

- Name the logic gate,
- write its truth table and
- give the output wave form.



Q. 13. What is an equipotential surface?

A uniform electric field of 300 NC^{-1} is directed along PQ. A, B and C are three points in the field having x and y coordinates (in metres) as shown in the figure. Calculate potential difference between the points (i) A and B and (ii) B and C.



Q. 14. Draw a labelled diagram of Van de Graff generator. State its principle of working.

Q. 15. What is meant by 'drift velocity of free electrons'? Derive Ohm's law on the basis of the theory of electron drift.

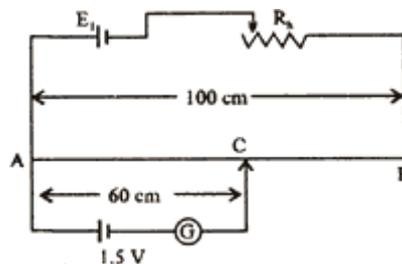
Or

What is Wheatstone bridge? Deduce the condition for which Wheatstone bridge is balanced.

Q. 16. What is meant by the sensitivity of a potentiometer?

A battery E_1 of 4 V and a variable resistance R_h are connected in series with the wire AB of the potentiometer. The length of the wire of the potentiometer is 1 metre. When a cell E_2 of e.m.f. 1.5 volt is connected between points A and C, no current flows through E_2 . Length of AC = 60 cm.

- Find the potential difference between the ends A and B of the potentiometer,
- Would the method work, if the battery E_2 is replaced by a cell of e.m.f. of 1 V?



Q. 17. Two straight, parallel, current carrying conductors are kept at a distance 'r' from each other, in air. The direction of current in both the conductors is the same. Find the magnitude and direction of the force between them. Hence define one ampere.

Q. 18. Distinguish between diamagnetic and ferromagnetic materials in respect of their (i) intensity of magnetisation, (ii) behaviour in a non-uniform magnetic field and (iii) susceptibility.

Q. 19. State Huygens' principle. For reflection of a plane wave front at a plane reflecting surface,

construct the corresponding reflected wave front. Using this diagram, prove that angle of incidence is equal to angle of reflection.

Q. 20. What is meant by interference of light?

In a double slit experiment with monochromatic light, fringes are obtained on a screen placed at some distance from the slits. If the screen is moved by 5×10^{-2} m towards the slits, the change in fringe width is 3×10^{-5} m. If the distance between slits is 10^{-3} , calculate the wavelength of light used.

Q. 21. Why are de-Broglie waves associated with a moving football not visible? The wavelength,



of a photon and the de-Broglie wavelength of an electron have the same value. Show

$$\frac{2 \lambda m c}{h}$$

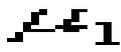
that the energy of the photon is times the kinetic energy of the electron, where m, c and h have their usual meanings.

Q. 22. Define Antenna. Write a short note on Antenna. Name two types of antenna.

Q. 23. What is meant by the term 'modulation'? Explain with the help of a block diagram, how the process of modulation is carried out in radio broadcasts.

Q. 24. Write three special characteristics of the light source used in optical communication. Name any one optical detector. Explain the meaning of the term 'sensitivity' and 'responsivity' of a detector.

Q. 25. Derive the relation between distance of object, distance of image and radius of curvature of a convex spherical surface, when refraction takes place from a rarer medium of refractive index



to a denser medium of refractive index and the image produced is real.



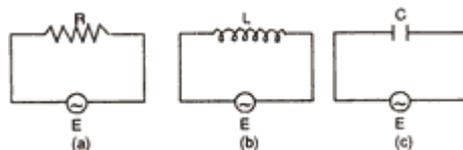
State assumptions and convention of signs used.

Or

Draw a ray diagram to show the formation of image of an object placed between the optical centre and focus of the convex lens. Write the characteristics of image formed. Using this diagram, derive the relation between object distance, image distance and focal length of the convex lens. Write the assumptions and convention of signs used.

Q. 26. What is a choke coil? Why is it preferred to resistance in a.c. circuits?

In figures (a), (b) and (c) are shown three a.c. circuits with equal currents. If the frequency of e.m.f. be increased, then what will be the effect on the currents flowing in them? Explain with reason.



Q. 27. Draw a circuit diagram of a common emitter amplifier using n-p-n transistor. Show input and output voltages graphically.

The current gain for common emitter amplifier is 59. If the emitter current is 6.0 mA, find (i) base current and (ii) collector current.