1. All questions are compulsory.
2. Q. 1 to 5 are Very short Answer type questions (1 Mark each.)
3. Q. 6 to 12 are short Answer type questions. (2 Marks each.)
4. Q. 13 to 24 are short answer questions (3 Marks each.)
5. Q. 25 to 27 are Long Answer type questions, (5 marks each.)
6. Please write down the serial number of the question before attempting it.
7. You may use the following values of physical constants where ever necessary:

Permittivity in free space (ε_0) = 8.85×10^{-12} F/meter

Permeability in free space (μ_0) = $4\pi \times 10^{-7}$ T m A^{-1}

Mass of Proton (m_p) = 1.67×10^{-27} kg

Mass of electron (m_e) = 9.1×10^{-31} kg.

Charge on electron or proton (e) = 1.6×10^{-19} C

Velocity of Light (C) = 3×10^{8} m/sec

Avogadro's Number (N) = 6.023×10^{23}

Plank's Constant (h) = 6.626×10^{-34} J. Sec

8. Use of calculators is not permitted. However, you may ask log table for Mathematical tables.

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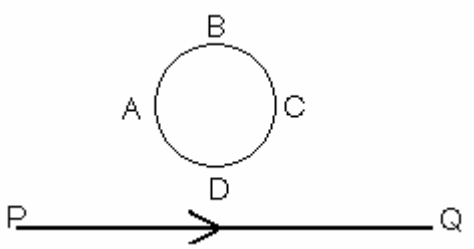
1. Why are microwaves used in Radar?
2. What is current? Mention its SI unit.
3. Does the colour of radiation depend on its frequency or on wavelength.
4. What physical quantity is the same for X-rays of wavelength 1^A, green light of wavelength $5500A^0$ & radiation of wavelength 21cm?
5. A certain region has cylindrical symmetry of electric field. Name the charge distribution producing such a field.
6. What is the magnitude of the induced current in the circular loop-A B C D of radius r, if the straight wire PQ carries a steady current of magnitude I ampere ?



7. Initially the number of nuclei of a radioactive substance are 100. At t=1s these numbers become 80. Find the number of nuclei undecayed at t=2s.
8. How does the forbidden energy gap of an intrinsic semiconductor vary with the increase in temperature?
9. A radioactive sample has 20 times of safe activity limit. After how many half lives will the radioactive sample be safe?
10. When photons of energy hν falls on an aluminium plate (of work function E_o),photoelectrons of maximum kinetic energy K are ejected. If the frequency of radiation is doubled, find the maximum kinetic energy of the ejected photoelectrons.
11. When photons of energy hν falls on an aluminium plate (of work function E_o),photoelectrons of maximum kinetic energy K are ejected. If the frequency of radiation is doubled, find the maximum kinetic energy of the ejected photoelectrons.
12. Soap bubble shows beautiful colours in sun light. Why?

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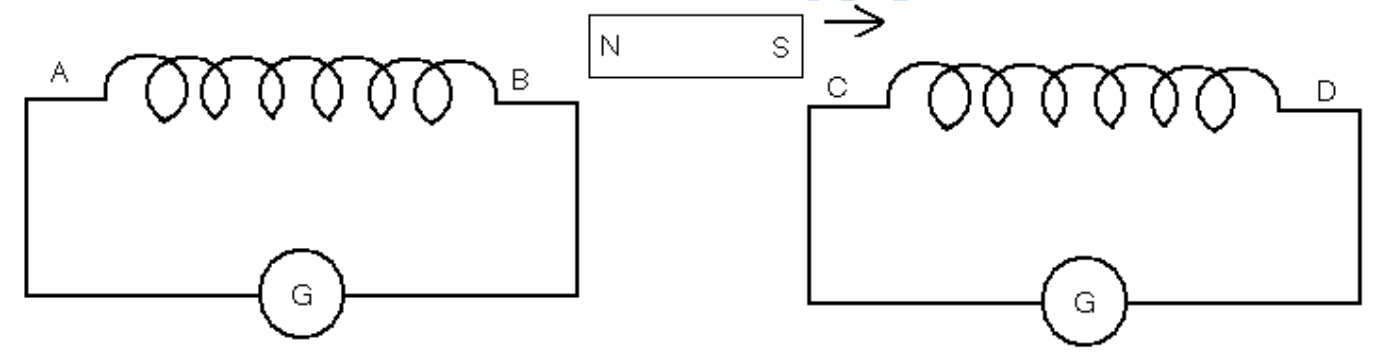
13. A partially plane polarised beam of light is passed through a polaroid. Show graphically the variation of the transmitted light intensity with angle of rotation of the Polaroid.

14. Coloured spectrum is observed, whenwe see through a muslin cloth. Why?

15. A magnet is moved in the direction indicated by an arrow between two coil A B and C D as shown in the figure. Suggest the direction of current in each coil.



17 How does the self inductance of a coil change, when Number of turns in the coil is decreased. An iron rod is introduced into it. Justify your answer in each case.

18 If two identical galvanometers, one is to be converted into ammeter and other into millimeter, which will require a shunt of large Resistance.

19 Using proper figure, explain why a voltmeter is connected in parallel but ammeter in series.

20 A solenoid 0.4 M long has a layout of windings of 500 turns each. A 5cm long wire of mass 2Kg lies inside the solenoid near its centre and normal to axis. The wire is connected to an external battery which supplies a 4A current in the wire. Calculate the value of current to support the weight of wire.

21 Two point electric charges A and B of unknown magnitude and sign are placed d distance apart. The electric field is zero at a point, not b/w the

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charges but on the line joining them and closer to A. Write 2 essential conditions for this to happen

22 An alternating voltage E= 200 sin 300t is applied across a series combination of R= 10 Ω and an inductor of 800 mH. Calculate the

i) impedance of the circuit

ii) peak value of current in the circuit

iii) power factor of the circuit.

23 A silver wire has a resistance of 2.0 ohms at 20^{o}C and a resistance of 2.5 ohms at 100^{o}C. Determine the temp coefficient of resistance.

24 A concave lens made of a material of refractive index n_1,is kept in a medium of refractive index n_2. A parallel beam of light is incident on the lens. Complete the path of rays of light emerging from the concave lens if i) $n_1>n_2$ ii) $n_1=n_2$ iii) $n_1<n_2$.

25 The activity of a radioactive sample decreases to one third of its original value in 9 years. What will be its activity after further 9 years?

26 The electrical conductivity of a semiconductor increases when electromagnetic radiation of wavelength shorter than 2480 nm is incident on it. Find the band gap of the semiconductor .

Given h= 6.63 x 10^{-34} js .

C= 3 x 10^{8} m/s.

27. What is equivalent resistance of the circuit .

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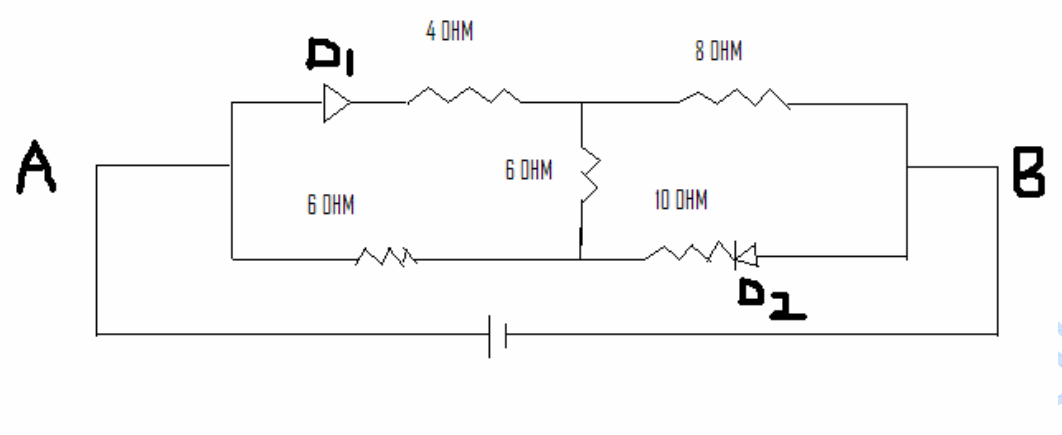


28. It is necessary to use satellites for long distance T.V. transmission. Justify? With the help of necessary diagram make it clear that "taller the antenna, greater the coverage of the Television broadcast". At a particular place at a distance of 10km from a transmission station a person can receive signals but not able to receive signals at 100km, suggest a method how he can receive signal at 11 km (2+2+1)

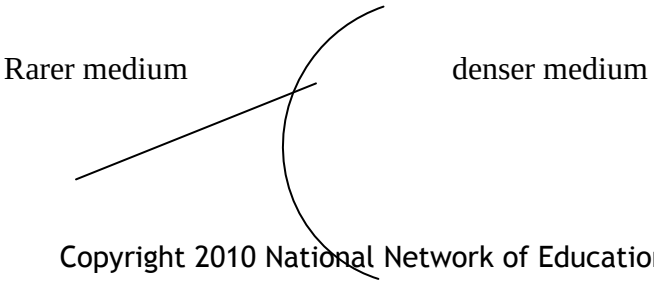
29. Give principle of working of a van de Graaff generator. With the help of a labelled diagram describe its construction and working. How is the leakage of charge minimized from the generator?

Or

Derive the expression for the energy stored in a parallel plate capacitor of capacitance C with air as medium between its plates having charges Q and –Q. Show that this energy can be expressed in terms of electric field ½ $\varepsilon_0 E^2 Ad$ where A is the area of each plate and d is the separation between the plates. How will the energy stored in a fully charged capacitor change when the separation between the plates is doubled and a dielectic medium of dielectric constant 4 is introduced between the plates?

30 spherical surface of radius of curvature R, separates a rarer and

a. denser medium as shown in figure



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b. O P C

c. Compute the path of incidence ray showing the formation of image. Hence derive the relation connecting object distance ‘u’ image distance ‘v’ radius of curvature R and refractive indices n_1 and n_2.

d. b) Draw the ray diagram of astronomical telescope

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