Bharatiya Vidya Bhavan's
Vallabhram Mehta Public School
(Vidyashram) Vadodara

54 YEARS

Let noble thoughts come to us from every side-Rigveda, 1-89-i

Date:26/9/2016	**SAMPLE-9**	**Subject:PHYSICS**
Class: XII	**Name of the student:**	**Max. Marks:70**

General Instructions:

- All questions are compulsory.
- Questions 1 to 5 are one mark questions.
- Questions 6 to 10 are two marks questions.
- Questions 11 to 22 are three marks questions.
- Question 23 is value based question carrying four marks.
- Question 24 to 26 are five marks questions.
- There is no overall choice in the question paper. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choices in such questions.
-Use of calculator is not permitted. However you may use log tables if necessary.
-You may use the following values of physical constants wherever necessary:

$c = 3x10^{-8}m/s$
$h = 6.63x10^{-34}Js$
$e = 1.6x10^{-19}C$
$\mu_0 = 4\pi x10^{-7}$ Tm/A
$1/4\pi\varepsilon_0 = 9x10^9$ Nm^2/C^2
$m_e = 9.1x10\text{-}^{31}kg$
$m_p = 1.675x10^{-27}kg$
$m_n = 1.673x10^{-27}kg$

1.Define the SI unit of electric potential.

2.Plot a graph showing the variation of resistance of a conducting wire as a function of its radius, keeping the length of the wire and its temperature constant.

3.Considering all connections being done correctly, still a potentiometer does not give the balance point, why?

4.A steady current is flowing in a cyclindrical conductor. Does an electric field exist within the conductor?

5.Write an equation in vector form for magnetic Lorentz force acting on a current carrying conductor in a magnetic field. What will be the direction of this force?

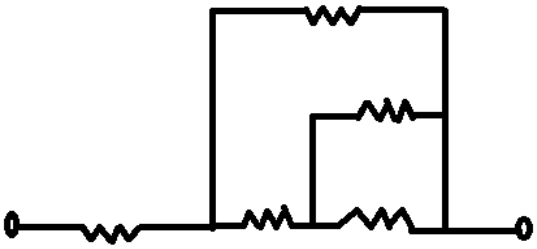
6.A long charged cylinder of linear charge density λ is surrounded by a hollow co-axial conducting cylinder. What is the electric field between the two cylinders?

7.Can we increase or decrease the range of the given ammeter? Justify

OR

Can we increase or decrease the range of the given voltmeter? Justify

8.Calculate the equivalent resistance in the circuit given below, Consider all resistances be of 10Ω.



9.Two point charges of 10μC and 15μC are kept 18cm apart in air. Calculate the work done in moving the first charge by 3cm towards the second charge.

10. A capacitor has some dielectric between the plates and the capacitor is connected to a d.c. source. The battery is now disconnected and the dielectric is removed. State whether the capacitance, energy stored, electric field, charge stored will increase, decrease or remain constant.

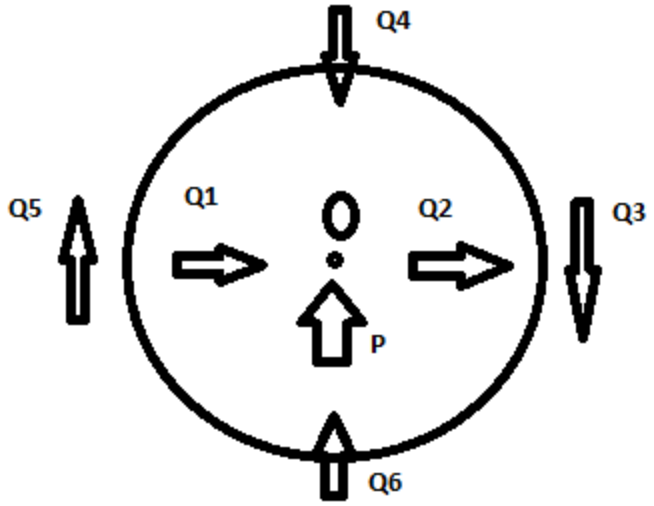
11. Explain the mechanism of current flow in a conductor, hence define drift velocity and relaxation time. Also derive the relation between current and drift velocity.

12. Identify electromagnetic waves with wavelength
i)used to treat muscular strain ii)used by FM radio station iii)used to detect fracture in bones iv)absorbed by ozone layer of the atmosphere v)used in revealing secret writings on ancient walls . Also arrange them in decreasing order of their wavelength.

13.A short bar magnet placed in a horizontal plane has its axis aligned along the magnetic north south direction. Null points are found on the axis of the magnet at 14cm from the centre of the magnet. Earth's magnetic field at the place is 0.36G and angle of dip is zero. What is the total magnetic field on the normal bisector of the magnet at the same distance as the null points?

OR

Figure shows a small magnetized needle P placed at point O. The arrow shows direction of magnetic moment. The other arrows show different positions of another identical magnetized needle Q



i)In which configuration is the system not in equilibrium?
ii) In which configuration is the system in a)stable and b)unstable equilibrium
iii)Which configuration corresponds to a)lowest and b) highest potential energy

14.A cyclotron's oscillator frequency is 10 MHz What should be the operating magnetic field for accelerating protons? If the radius of its disc is 0.60 m, what is the kinetic energy of the proton beam produced by the accelerator? (e=1.6 x10^{-19} C, m =1.67 x 10^{-27} kg). Express your answer in units of MeV.(1 MeV =1.602 x 10^{-13}J)

15. The length of a potentiometer wire is 1200cm and it carries a current of 80mA. For a cell of emf 4V and internal resistance 20 ohm, null point is found at 1000cm. If a voltmeter is connected across the cell, balancing length is decreased by 20cm. Find i)resistance of whole wire ii)reading of the voltmeter iii)resistance of the voltmeter.

16. What is a radial field of a galvanometer and how it achieved in terms of construction? Define the terms i)Figure of merit ii) voltage sensitivity

17. Self inductance plays the role of electrical inertia-Explain the statement with mathematical expressions.

18. Prove that magnetic field exists only for the region within the toroid and is zero for regions outside the toroid.

19. Prove that current leads voltage by $\boldsymbol{\pi}/2$ for a.c applied to a capacitor. Draw corresponding graphs depicting average power loss as zero.

20. Compare soft and hard ferro magnets giving six points of difference.

21. Explain mutual induction. Also define SI unit of inductance and factors affecting mutual inductance for a pair of coils.

22. A magnetic field in a plane electromagnetic wave is given by
$B_y = 3 \times 10^{-7} \sin(0.314 \times 10^{3} z + 3.14 \times 10^{11} t)$ tesla.
i)What is the wavelength and frequency of the wave ii)Write the equation for electric field

23. Ronak connected a cell of emf 2V with a bulb. He found that the bulb did not glow. He went to his grandfather. He suggested that the resistance of the bulb seems to be high. He gave him three more cells and told him to connect them in series and see if the bulb glows or not. Ronak followed his grandfather's advice and found that the bulb started glowing.
(i) What values did Ronak depict in the above situation?
(ii) What is meant by emf of the cell and why was ronak advised to connect the cells in series?
(iii) A cell of emf 2V and internal resistance 0.2Ω shows a reading of 1.8V in the voltmeter. What is current flowing in the circuit?

24. State Gauss theorem. Use it to calculate the electric field of an infinitely long charged planar sheet. For two sheets having same magnitude of surface charge density but opposite polarity of charge, calculate the electric field between and outside the sheets.

OR

Derive an expression for torque and potential energy of an electric dipole kept in an external electric field. When is the dipole said to be in stable and unstable equilibrium and how much is the torque acting on the dipole in these situations.

25. What is the energy stored in a capacitor? Derive an expression for energy density of an electric field. A 4μF capacitor is connected to a 8μF capacitor. The combination is charged at 300V, Calculate the i)total charge on the combination and ii)total energy stored in the combination.

OR

Define polarization of a dielectric. Explain with diagrams as to why the polarization of dielectric reduces the electric field inside the dielectric. Hence define dielectric constant. A parallel plate capacitor with air between the plates has a capacitance of 8μF. Space between the plates is reduced by half and is filled with a medium of dielectric constant 5, then calculate the new capacitance.

26. Explain principle, construction and working of a transformer. Mention any four different type of losses in a transformer along with the ways to overcome these losses.

OR

An a.c supply $V=V_m \sin\omega t$ is connected to a series combination of L, C and R. With help of necessary phasor diagrams, calculate the impedance of the circuit and discuss the phase relation between voltage and current.