No. of printed pages: 4

INDIAN SCHOOL SOHAR
UNIT TEST- 2014
PHYSICS – THEORY

CLASS: XII **MARKS : 50**

DATE: 20/05/2014 **TIME: 2HRS**

General Instructions:

1. All questions are compulsory.

2. There are 18 questions in all .Questions 1 to 3 carry one mark each, questions 4 to 7 carry two marks each, questions 8 to 15 carry three marks each and questions 16 to 18 carry five marks each.

3. There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all two questions of five marks each. You have to attempt only one of the given choices in such questions

4. Use of calculator is not permitted.

5. You may use the following physical constants wherever necessary

C= 3X 10^8 m/s **h= 6.626 X10^{-34} Js** **e =1.6X 10^{-19} c**

$\frac{1}{4\pi\varepsilon o}$ =9 X 10^9 Nm^2/c^2 **N_A= 6.023 X10^{23}/mol**

Mass of proton=1.676 X 10^{-27} kg **Mass of neutron=1.675 X 10^{-27} kg**

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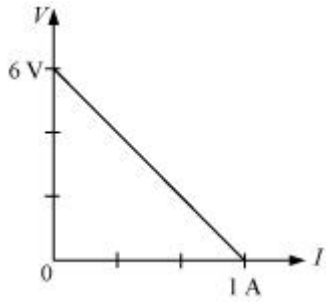
1. Two plane sheets of charge densities +σ and + σ are kept in air as shown in Fig. What are the electric field intensities at points A and B? (1)

+σ .A

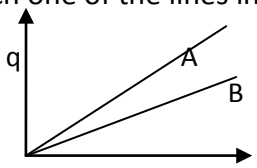
+σ .B

2. When a dipole is placed in a uniform electric field, there is no linear motion. Why? (1)

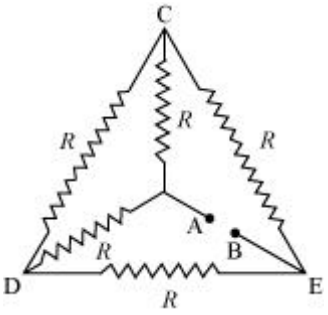
3. The plot of the variation of potential difference across a combination of three identical cells in series versus current is as shown below. What is the emf of each cell? (1)



4. The given figure shows the variation of charge 'q' versus potential difference 'V' for two capacitors C_1 and C_2.Two capacitors have same plate separation, but plate area of C_2 is double than that of C_1. Which one of the lines in graph corresponds to C_1 and C_2? Why? (2)



5. (i) Calculate the equivalent resistance of the given electrical network between points *A* and *B*.
(ii) Also calculate the current through *CD* and *ACB*, if a 10 V d.c source is connected between *A* and *B*, and the value of *R* is assumed as 2 Ω. (2)

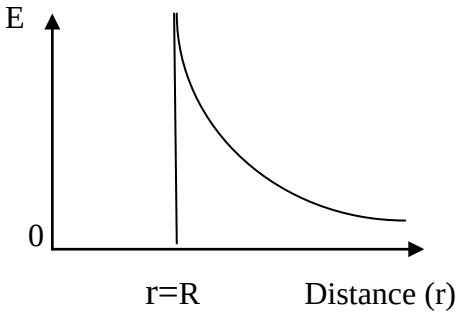


6. Derive an expression for the potential energy of an electric dipole in an uniform electric field **E**. (2)

OR

6. Derive an expression potential due to a point charge. (2)

7.



Graph shows the variation of electric field with distance of a uniformly charged conductor. Identify the charged conductor. Find the electric field due to this charged conductor at a distance r >R. (2)

8. Show that resistance of a conductor is given by $R=\frac{ml}{ne^2A\tau}$; where τ is relaxation time. Using this relation,explain why the resistivity of the metal increases with rise of temperature(3)

9. (a) Depict the equipotential surfaces for a system of two identical positive point charges placed a distance 'd' apart.(b Deduce the expression for the potential energy of a system of three point charges q_1 , q_2,q_3 brought from infinity to the points r_1 , r_2 ,r_3 respectively in the presence of external electric field $\vec{E}$. (3)

10. Define the term electric dipole moment. Derive the expression for electric field intensity due to a dipole at a point a distance 'r' from centre along axial line. (3)

11.Two parallel plate capacitors X and Y , have the same area of plates and same separation between them, X has air between the plates while Y contains a dielectric medium of K=4.

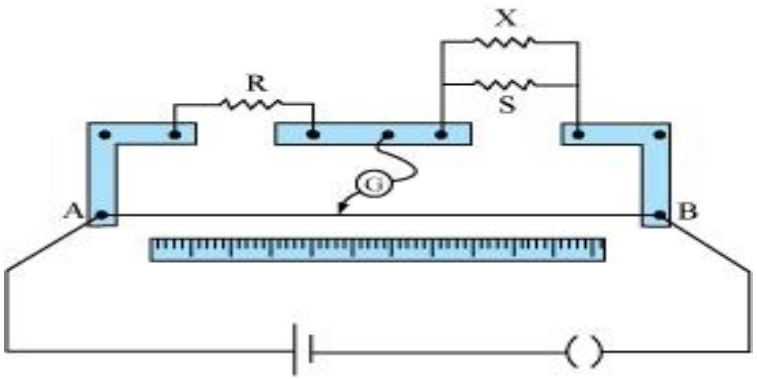
(i) calculate capacitance of each capacitor if equivalent capacitance of the combination is 4μF.

(ii) Calculate the potential difference between the plates X and Y.

(ii)What is the ratio of electrostatic energy stored in X and Y? (3)

12.(a) State the principle of working of a meter-bridge.

(b)X is connected in parallel with S, the null point occurs at l_2 cm. Obtain a formula for X in terms of l_1, l_2 and S. (3)



13.(a) How is the electric field due to charged capacitor affected when a dielectric slab is inserted between the plates fully occupying the intervening region?
(b)A slab of material of dielectric constant K has the same area as the plates of a parallel plate capacitor but has thickness ½ d, where d is the separation between the plates. Find the expression for the capacitance when the slab is inserted between the plates. (3)

14.Derive an expression for potential at a point due to an electric dipole. (3)

OR

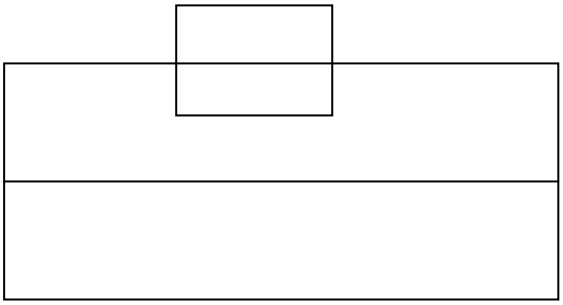
14. Derive an expression for electric field due a electric dipole at a point in equatorial plane. What is the direction of dipole compared to the electric field. (3)

15.State Gauss theorem in electrostatics. Apply this theorem to obtain the electric field on the surface of charged conductor. (3)

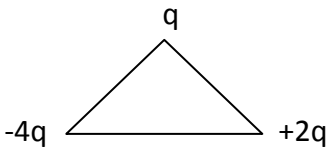
16. (a) Plot a graph comparing the variation of potential V and electric field E due to a point charge Q as a function of distance R from the point charge.
(b)Find the ratio of potential differences that must be applied across the parallel and series combination of two capacitors C1 and C2 with their capacitances in the ratio 1:3 so that the energy stored in the two cases , becomes the same.
(c)Derive an expression for energy stored in a capacitor. (5)

OR

16. (a)Explain the principle and working of a Van de graff generator.
(b)Calculate the steady current through the 2Ω resistor in the circuit shown. (5)

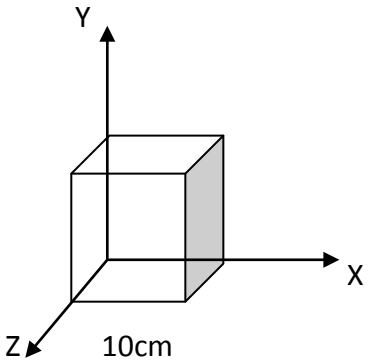


17.(a) Define electric flux. Write its S.I.units.
(b) Using Gauss's law, prove that the electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it.
(c) Calculate the work done to dissociate the system of three charges placed on the vertices of a triangle of length 10cm as shown. Given q = 1.6×10^{-10} C. (5)

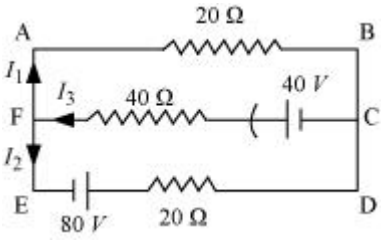


OR

17.(a)Derive an expression for n cells connected in series.
(b) Electric field in the given figure is directed along +X direction and is given by $E_x = 5Ax+2B$, A=10N/C/m and B = 5N/C, calculate
(i) the electric flux through the cube.
(ii) Net charge enclosed within the cube.



18. (a) State kirchoff's laws of electric circuit and use these laws to derive the Wheatstone principle.
(b) Using these rules determine the value of the current I_1 in the electric circuit given below.



(5)

OR

18.(a) Explain the principle of a potentiometer. How will you compare the e.m.f of two primary cells using a potentiometer? Explain with proper circuit diagram.
(b) A cell of emf E and internal resistance r is connected across a variable resistor R. Plot a graph showing the variation of the terminal potential V with resistance R.
(c) Predict from the graph, the condition under which V becomes equal to E. (5)