**INDIAN SCHOOL SOHAR**
**UNIT TEST- 2019 (PHYSICS – THEORY)**

**CLASS: XII** **MAXIMUM MARKS: 50**
**DATE: 12/05/2019** **DURATION: 2Hrs**

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**General Instructions :**

**1.All questions are compulsory.**
**2.There are 27 questions in all.**
**3.Questions 1 to 15 carry one mark each.**
**4.Questions 16 to 20 carry two marks each.**
**5.Questions 21 to 25 carry three marks each.**
**6. Questions 26 and 27 carry two marks each.**
**7. There is no overall choice. However, internal choice has been provided in one question of one mark, one question of two and three marks and two questions of five marks each. You have to attempt only one of the given choices in such questions**
**8.Use of calculator is not permitted.**

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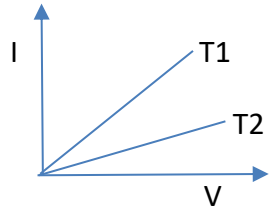
**Multiple choice questions: ( 1 mark each)**

1.Current voltage graphs for a given metallic wire at two different temperatures T1 and T2 are shown in the figure. Which of the temperatures T1 and T2 is greater ?




(a) T1 > T2 (b) T1 = T2

(c) T1< T2 (d) T1 = 2 T2

2.Two parallel large thin metal sheets have equal surface charge densities ($\sigma$ = 26.4 × $10^{-12}$C/$m^2$) of opposite signs. The electric field between these sheets is :

(a) 3 × $10^{-10}$N/C (b) 1.5 × $10^{-10}$N/C

(c) 1.5 N/C (d) 3 N/C

3. A charge of +q is at a distance of L/2 above a square of side L. The flux linked with this square surface is :

(a) $\frac{q}{4\epsilon o}$ (b) $\frac{2q}{3\epsilon o}$

(c) $\frac{q}{6\epsilon o}$ (d) $\frac{6q}{\epsilon o}$

4. Three resistances P,Q,R each of 2 Ω and an unknown resistance S form the four arms of a Wheatstone's bridge circuit. When a resistance of 6 Ω is connected in parallel to S, the bridge gets balanced. What is the value of S ?

(a) 3 Ω (b) 1 Ω

(c) 2 Ω (d) 6 Ω

5. A charged particle moving in a magnetic field has increased in its velocity, then its radius of the circle

(a) decreases (b) increases

(c) remains the same (d) becomes half

**Objective type questions : (1 mark each)**

6. Force between two point electric charges kept at a distance d apart in air is F.If these charges are kept at the same distance in water , how does the force between the charges change?

7. What is the S.I. unit of electric flux?

8. Plot a variation of electric field intensity E due to a charged sphere of radius R with a distance r from its centre.

9. Define resistivity of a material.

10. What is the magnitude of force experienced by a stationary charge exposed to a uniform magnetic field ?

**Very short answer type questions: ( 1 mark each )**

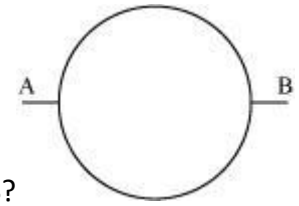
11. Two insulated charged copper spheres A and B of identical size have a charge Qa and Qb respectively. A third sphere C of the same size but uncharged is brought in contact with A first and then in contact with the second sphere B and finally removed from both. What are the new charges on A and B.

12.Why do the equipotential surfaces due to uniform electric field not intersect each other?

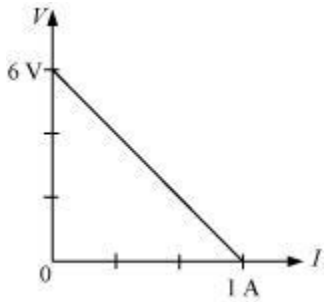
13.When a dipole is placed in a uniform electric field, there is no linear motion of the dipole. Why? **OR**

13.Describe the resonance condition required in a cyclotron.

14. A wire of resistance 8R is bent in the form of a circle. What is the effective resistance between the ends of a diameter AB?




15. 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?



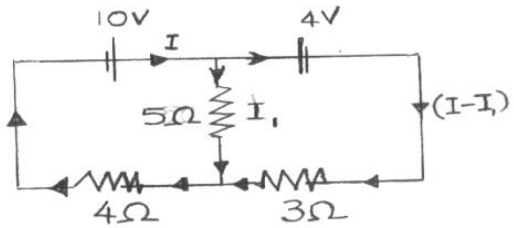

**Short answer type questions: (2 marks each)**

16.Derive an expression to show that resistance of a conductor is given by R= $\frac{ml}{ne^2A\tau}$ ; where τ is relaxation time.

**OR**

16. Use Gauss's law to derive the expression for the electric field due to uniformly charged infinite thin plane sheet.

17.Find current passing through 5Ω resistor.




18 . Obtain an expression of current I and potential difference V for 'n'-Identical cells of emf $\varepsilon$ and internal resistance r each connected in parallel.

19. A particle of charge 'q' and mass 'm' is moving with a velocity **v**. It is subjected to uniform magnetic field **B** directed perpendicular to its velocity. Show that it describes a circular path. Write the expression for its radius.

20.A point charge q is placed at O as shown in the figure O P Q
Is Vp – Vq positive or negative when (i) $q > 0$ (ii) $q < 0$ ? Justify your answer.

**Short answer type question: ( 3 marks each)**

21.(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.

22.Derive an expression for potential at a point due to an electric dipole.

**OR**

22. 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.

23.(a) An infinitely long positively charged straight wire has a certain linear charge density. An electron is revolving around the wire with a constant velocity in a circular plane perpendicular to the wire. Deduce the expression for its kinetic energy.

(b) Plot a graph of the kinetic energy as a function of linear charge density.

24. Draw a schematic sketch of the cyclotron. State its working principle. Show that the cyclotron frequency is independent of the velocity of the charged particles.

25. (a) A point charge +Q is kept in vicinity of uncharged conducting plate. Sketch electric field lines between charge and plate.

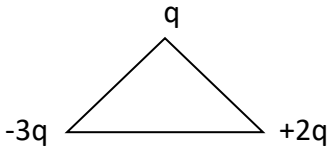
(b) Two infinitely large parallel sheet have surface charge density $+\sigma$ . Write the magnitude and direction of the net fields in the region between the plates and outside the plates.

**Long answer type questions : ( 5 marks each )**

26.(a) Define the term potential energy difference.

(b) Derive an expression for potential energy for a system of three charges in the presence of external field.

(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 = $1.6 \times 10^{-10}$ C.

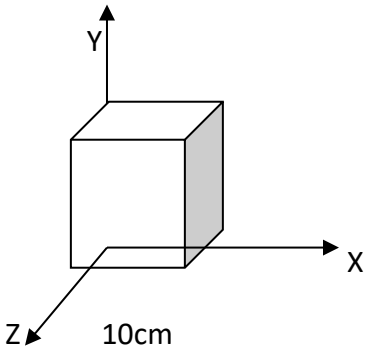



**OR**

26.(a)Using Gauss's law obtain the expression for the electric field due to a uniformly charged sphere of radius R at point inside the sphere.

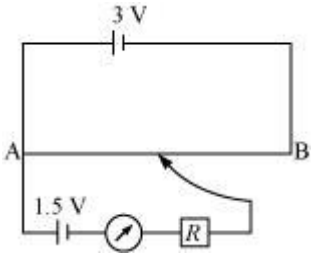
(b) Electric field in the given figure is directed along +X direction and is given by $E_x = 5Ax+2B$, A=10N/C-m and B = 5N/C, calculate

(i)the electric flux through the cube.
(ii)Net charge enclosed within the cube.




27. (a) State kirchoff's laws of electric circuit and use these laws to derive the Wheatstone principle.

(b)A potentiometer wire of length 1 m is connected to a driver cell of emf 3 V as shown in the figure. When a cell of 1.5 V emf is used in the secondary circuit, the balance point is found to be 60 cm. On replacing this cell and using a cell of unknown emf, the balance point shifts to 80 cm.




(i) Calculate unknown emf of the cell.
(ii) Explain with reason, whether the circuit works, if the driver cell is replaced with a cell of emf 1 V.
(iii) Does the high resistance *R*, used in the secondary circuit affect the balance point? Justify

**OR**

27.(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.