TEST SERIES 2019-20 **TEST NO. 2**

CH. 2 AND 3 **CONDUCTED ON 5TH JANUARY 2020**

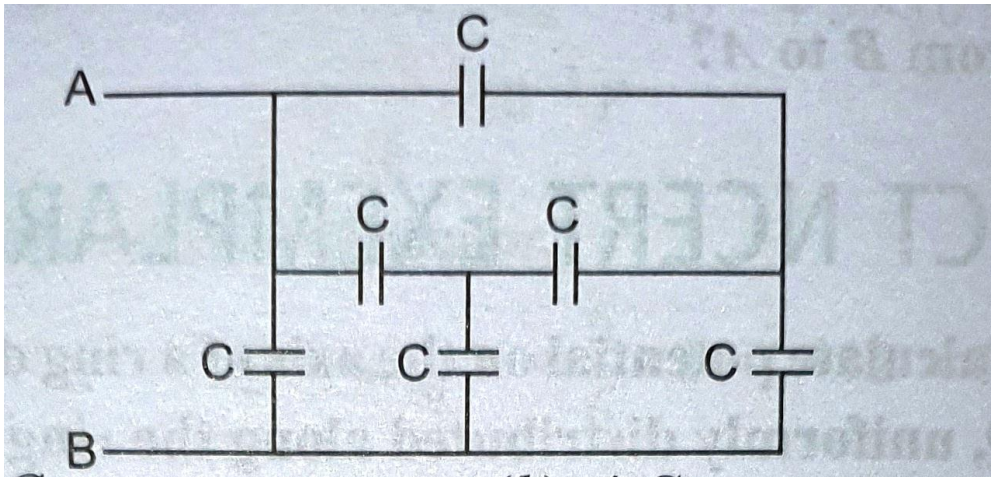
Maximum Marks: 55 **Time Allowed: 2 hours**

- **Section A is of 1 mark questions. Question 1 to 10 are multiple choice questions.**
- **Section B consist of 10 questions of 2 marks each.**
- **Section C consists of 5 questions of 3 marks each**

SECTION A

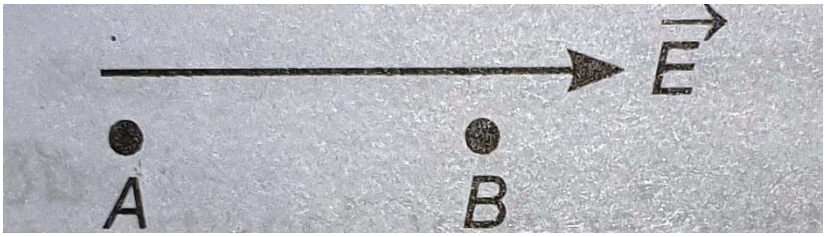
1. **A positively charged particle is released from rest in an uniform electric field. The electric potential energy of the charge**
   (a) **Remains constant because field is uniform**
   (b) **Increases because the charge moves along the electric field**
   (c) **Decreases because the charge moves along the electric field**
   (d) **Decreases because the charge moves opposite to the electric field**
2. **Two small spheres each carrying a charge q are placed r distance apart. If one of the spheres is taken around the other in a circular path of radius r, the work done will be equal to**
   (a) **Force between them x r**
   (b) **Force between them x 2πr**
   (c) **Force between them/2πr**
   (d) **Zero**
3. **The electric potential V at a point O(x,y,z) in space is given by $V = 4x^2$ volt. The electric field at the point (1,0,2) in volt per metre is**
   (a) **8 along negative x axis**
   (b) **8 along positive x axis**
   (c) **16 along negative x axis**
   (d) **16 along positive x axis**
4. **In a region of constant potential**
   (a) **The electric field is uniform**
   (b) **The electric field is zero**
   (c) **There can be charge inside the region**
   (d) **The electric field shall necessarily change if a charge is placed outside the region.**

5. **The radii of two metallic spheres A and B are r_1 and r_2 respectively ($r_1 > r_2$). They are connected by a thin conducting wire and the system is given a certain charge. The charge will be greater**
   - **(a) On the surface of the sphere B.**
   - **(b) On the surface of the sphere A.**
   - **(c) Equal on both.**
   - **(d) Zero on both.**
6. **A parallel plate capacitor is connected with the terminals of a battery. The distance between the plates is 6 mm. if a glass plate (dielectric constant K = 9) of 4.5 mm is introduced between them, then the capacity will become**
   - **(a) 2 times**
   - **(b) The same**
   - **(c) 3 times**
   - **(d) 4 times**
7. **Two metal plates form a parallel plate capacitor. The distance between the plates is d. A metal sheet of thickness d/2 and of the same area is introduced between the plates. What is the ratio of the capacitance in the two cases?**
   - **(a) 2:1**
   - **(b) 3:1**
   - **(c) 1:2**
   - **(d) 5:1**
8. **Find the equivalent capacitance of the system across the terminals A and B.**

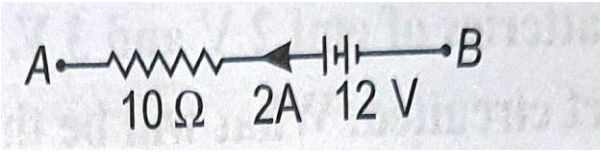


   - **(a) 2 C**
   - **(b) 4 C**
   - **(c) 3 C**
   - **(d) 5 C**

9. **Two charges 5 nC and – 3 nC are located 16 cm apart. Electric potential will be zero at**
   (a) **Only 10 cm from 5 nC**
   (b) **Only 40 cm from 5 nC**
   (c) **Both 10 cm and 40 cm from 5 nC**
   (d) **Only 6 cm from -3 nC**
10. **The potential difference across a potentiometer wire 18 m long is 2.5 V. The emf of the cell which is balanced by 100 cm long wire is**
   (a) **0.2125 V**
   (b) **0.3125 V**
   (c) **0.5123 V**
   (d) **0.1215 V**
11. **An electron moves from point A to point B in a uniform electric field as shown. Does the electric field do positive work on this electron?**



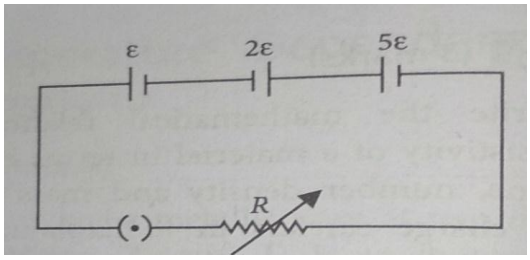
12. **Does the capacitance C of a capacitor increase, decrease or remains same:**
   (a) **When the charge q on it is tripled.**
   (b) **When the potential difference V across it is doubled.**
13. **In the figure, what is the potential difference between A and B**



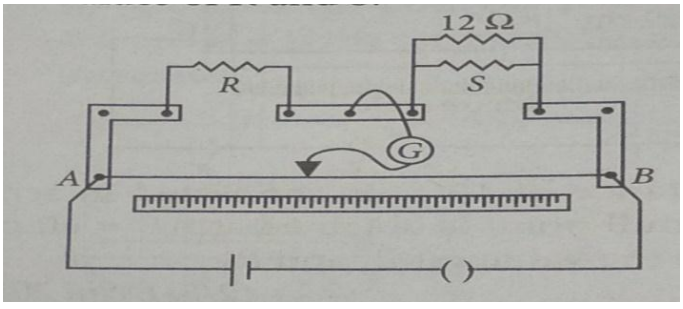
14. **Drift velocity of electrons in a conductor ……. With increase in temperature.**
15. **Why copper is not used for making potentiometer wires?**
16. **Give an example of a material for which temperature coefficient of a material is negative.**
17. **Electrical permittivity has unit Farad per meter. True or false?**
18. **Water has a much greater dielectric constant because water molecules has a large permanent dipole moment. True or false?**
19. **Equipotential surfaces corresponding to a constant electric field in the z-direction are planes parallel to x-y plane. True or false?**
20. **Mobility of electrons is independent of applied potential difference. True or false?**

SECTION B

21. Net capacitance of three identical capacitors connected in series is 1μF. What will be their net capacitance if connected in parallel? Find the ratio of energy stored in these two configurations, if they are both connected to the same source.
22. Depict equipotential surfaces due to an isolated point charge. Why do the equipotential surfaces get closer as the distance between the equipotential surface and the source charge decreases?
23. A capacitor of unknown capacitance is connected across a battery of V volts. The charge Stored in it is 360 μC. when potential across the capacitor is reduced by 120 V, the charge Stored in it becomes 120 μC. Calculate the potential V and the unknown capacitance C.
24. Calculate the amount of work done to dissociate a system of three charges 1 μC, 1 μC and -4 μC placed on the vertices of an equilateral triangle of side 10 cm.
25. An electrical technician requires a capacitance of 2 μF in a circuit across a potential difference of 1 kV. A large number of 1 μF capacitors are available to him each of which can withstand a potential difference of not more than 400 V. Suggest a possible arrangement that requires the minimum number of capacitors.
26. A 4 μF capacitor is charged by a 200 V supply. It is then disconnected from the supply, and is connected to another uncharged 2 μF capacitor. How much electrostatic energy of the first capacitor is lost in the form of heat and electromagnetic radiation?
27. Three cells of emf Ɛ, 2Ɛ and 5Ɛ having internal resistance r, 2r and 3r respectively are connected across a variable resistance R as shown in the figure. Find the expression for the current. Plot a graph for variation of current with R.



28. In a meter bridge, the null point is found at a distance of 40 cm from A. If a resistance of 12 ohm is connected in parallel with S, the null point occurs at 50.0 cm from A. Determine the values of R and S.

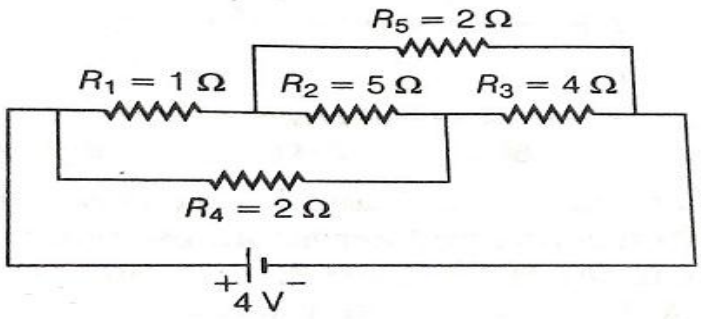


29.

(a) You are required to select a carbon resister of resistance 47 KΩ± 10% from a large collection. What should be the sequence of color bands used to code it?

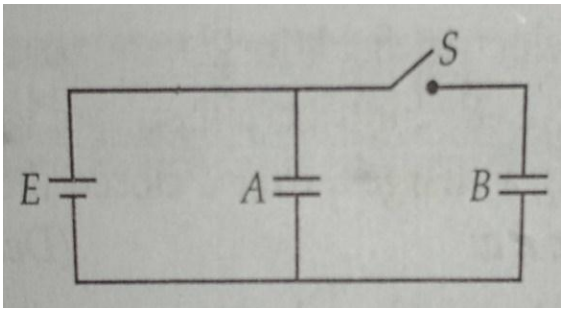
(b) Write the characteristic of manganin which make it suitable for making standard resistance.

30. Calculate the current drawn from the battery in the given network.



SECTION C

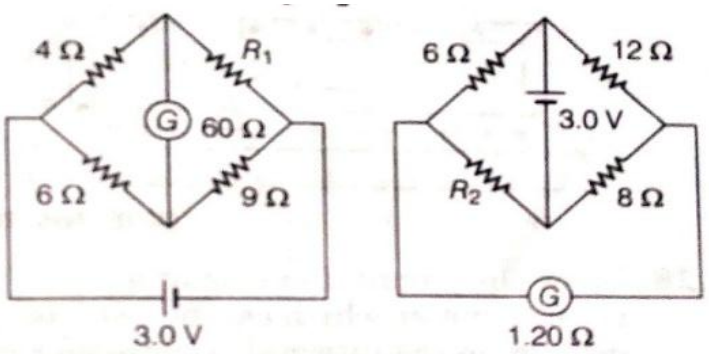
31. With the help of circuit diagram, explain how a potentiometer can be used to compare emf of two primary cells?
32. Obtain the expression for the energy stored per unit volume in a charged parallel plate capacitor.
33. A fully charged parallel plate capacitor is connected across an uncharged identical capacitor. Show that the energy stored in the combination is less than that stored in the single capacitor.
34. Two identical parallel plate capacitors A and B are connected to a battery of E volt with the switch S closed. The switch is now opened and the free space between the plates of the capacitors is filled with a dielectric of dielectric constant K. Find the ratio of the total electrostatic energy stored in both capacitors before and after the introduction of the dielectric.



35.

(a) Using Kirchhoff's law, obtain the balance condition in terms of the resistances of arms of Wheatstone bridge.

(b) Figure shows two circuits each having a galvanometer and a battery of 3V. When the galvanometer in each arrangement does not show any deflection, obtain the ratio R_1/R_2.



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