MONTHLY TEST, JUNE – 2024
STANDARD -XII　　Reg. No. [　][　][　][　][　][　]
Time : 1.30 Hrs.　　　　**PHYSICS**
SECTION - I　　　　　　　**Marks : 50**

Answer all the questions :　　　　　　　　　　　　**10 X 1 = 10**
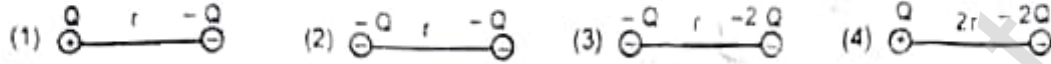**Choose the best answer :**

1. If σ is conductivity of a conductor of length l and A is the area of cross section A, then the quantity $\left(\frac{l}{\sigma A}\right)$ is called

   a) conductance　　b) resistivity　　c) drift velocity　　d) resistance

2. Rank the electrostatic potential energies for the given system of charges in correct relation is

   (1) Q ─r─ -Q　　(2) -Q ─r─ -Q　　(3) -Q ─r─ -2Q　　(4) Q ─2r─ -2Q

   a) 1 = 4 < 2 < 3　　b) 2 = 4 < 3 < 1　　c) 2 = 3 < 1 < 4　　d) 3 < 1 < 2 < 4

3. When a rubber rod is rubbed with animal fur, the rubber rod is
   a) negatively charged because of transfer of electrons from the fur
   b) positively charged because of transfer of electrons from the rubber rod
   c) negatively charged because of transfer of protons from the fur
   d) positively charged because of transfer of protons from the rubber rod

4. The total current in the circuit when the internal resistance of each cell is 0.5 Ω is
   a) 2.0 A　　　　b) 4.16 A
   c) 0.49 A　　　d) 0.98 A
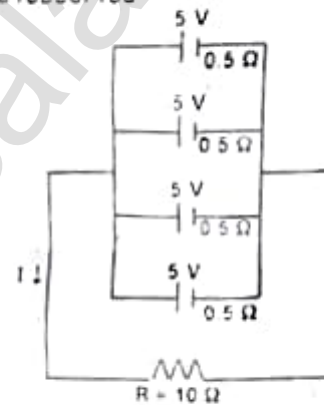
5. The colour code for a resistor of resistance 3.5 kΩ with 5% tolerance is
   a) Orange, Green, Orange and Gold
   b) Green, Orange, Red and Gold
   c) Orange, Green, Red and Gold
   d) Orange, Green, Red and Silver

6. The relation between the radius of a spherical surface (r) and its surface charge density (σ) is

   a) σ α r　　b) σ α $\frac{1}{r}$　　c) σ α r²　　d) σ α $\frac{1}{r^2}$

7. The graph plotted between the electric field (E) and radial distance (r) for a charged spherical shell of radius R is
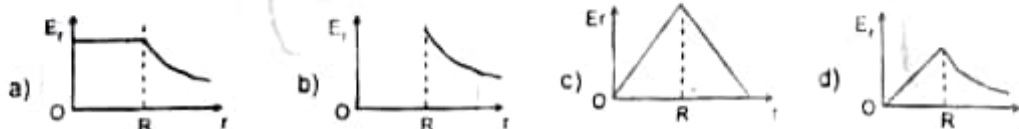
8. A wire connected to a power supply of 230 V has power dissipation P_1. Suppose the wire is cut into two equal parts and connected parallel to the same power supply. In this case power dissipation is P_2. The ratio $\frac{P_2}{P_1}$ is
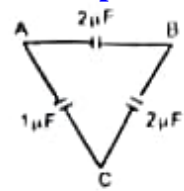
   a) 1　　　　b) 2　　　　c) 3　　　　d) 4

9. In the following, which are reversible?
   a) Seeback and Peltier effects only　　b) Seeback and Thomson effects only
   c) Peltier and Thomson effects only　　d) Seeback, Peltier and Thomson, all the three effects

10 Three capacitors are connected in triangle as shown in the figure The equivalent capacitance between the points A and C is

a) $2\mu F$　　　b) $1\mu F$　　　c) $3\mu F$　　　d) $\frac{1}{4} \mu F$

SECTION - II

Answer any five questions: Question no.17 is compulsory.　　　　　5 X 2 = 10

11. The electric field lines never intersect. Justify.

12. Distinguish between drift velocity and mobility.

13. The resistance of a nichrome wire at $20^{0}C$ is 10Ω. If its temperature coefficient of resistivity is $0.004/^{0}C$, find the resistance of the wire at boiling point of water.

14. Define 'electrostatic potential energy'.

15. Give the effects of dielectrics in capacitors when they are disconnected from batteries.

16. What do you know about the resistivity of materials?

17. Calculate the electric flux through the rectangle of sides 5 cm and 10 cm kept in the region of a uniform electric field $100 \, NC^{-1}$. The angle is 60^{0}. If 0 becomes zero, what is the electric flux?

SECTION - III

Answer any five questions. Question no. 24 is compulsory.　　　　　5 X 3 = 15

18. State the applications of capacitors.

19. Derive the expression for power $P = VI$.

20. Write a short note on super conductors.

21. A parallel plate capacitor filled with mica having $\xi_r = 5$ is connected to a 10 V battery. The area of each parallel plate is 6 cm^2 and separation distance is 6 mm. Find the capacitance and stored energy.

22. Explain the cells in series.

23. Find the electric field due to two infinite parallel charged sheets.

24. A battery has an emf of 12 V and connected to a resistor of 3Ω. The current in the circuit is 3.93 A. Calculate terminal voltage and the internal resistance of the battery.
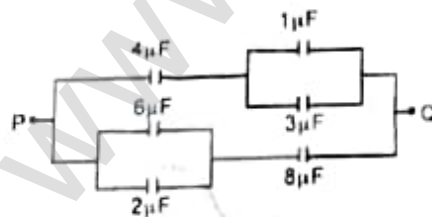
SECTION - IV

Answer all the questions in detail:　　　　　3 X 5 = 15

25. a)　　Obtain the expression for electric field due to a charged infinite plane sheet.

(OR)

b) i)　Derive the expression for resultant capacitance when capacitors are connected in parallel.

　　ii)　Find the equivalent capacitance between P and Q for the configuration given below.

26. a)　Explain the determination of unknown resistance using metre bridge.

(OR)

b) i)　Explain the relation between current and drift velocity.

　　ii)　A copper wire of $10^{-6} \, m^2$ area of cross section, carries a current of 2 A. If the number of free electrons per cubic metre in the wire is 8×10^{28}. Calculate the drift velocity.

27. a)　What is thermo electric effect? State and explain Seeback effect. State its applications.

(OR)

b)　Derive an expression for electrostatic potential energy of a dipole in a uniform electric field.

—— $\cdot \, \Omega \cdot$ ——