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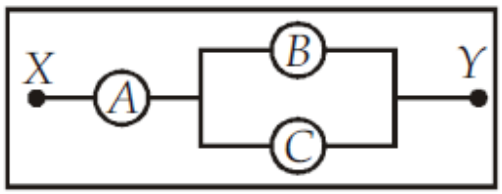
CLASS: XII (Physics)

Sheet 4 (Electricity)

1. A filament bulb (500 W, 100 V) is to be used in a 230 V main supply. When a resistance R is connected in series, it works perfectly and the bulb consumes 500 W. The value of R is

(A) 230 Ω (B) 46 Ω (C) 26 Ω (D) 13 Ω

2. A, B and C are voltmeters of resistance R, 1.5R and 3R respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A, V_B and V_C respectively, then



(A) $V_A = V_B = V_C$ (B) $V_A \neq V_B = V_C$

(C) $V_A = V_B \neq V_C$ (D) $V_A \neq V_B \neq V_C$

3. The supply voltage to a room is 120 V. The resistance of the lead wires is 6 Ω. A 60 W bulb is already switched on. What is the decrease of voltage across the bulb, when a 240 W heater is switched on in parallel to the bulb?

(A) Zero volt (B) 2.9 volt (C) 13.3 volt (D) 10.04 volt

4. A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series' first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf's is

(A) 3: 4 (B) 3: 2 (C) 5: 1 (D) 5: 4

5. A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4 m long. When the resistance, R, connected across the given cell, has values of

(i) Infinity (ii) 9.5 Ω,the 'balancing lengths', on the potentiometer wire are found to be 3 m and 2.85 m, respectively.The value of internal resistance of the cell is

(A) 0.25 Ω (B) 0.95 Ω (C) 0.5 Ω (D) 0.75 Ω

6. Two large vertical and parallel metal plates having a separation of 1 cm are connected to a DC voltage source of potential difference X. A proton is released at rest midway between the two plates. It is found to move at 45° to the vertical just after release. Then X is nearly

(A) 1×10^{-5} V (B) 1×10^{-7} V (C) 1×10^{-9} V (D) 1×10^{-10} V

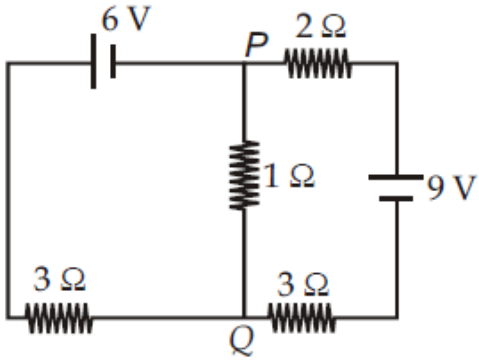
7. If a wire is stretched to make it 0.1% longer, its resistance will

(A) Increase by 0.05% (B) increase by 0.2%
(C) Decrease by 0.2% (D) decrease by 0.05%

8. In potentiometer experiment, null point is obtained at a particular point for a cell on potentiometer wire x cm long. If the length of the potentiometer wire is increased without changing the cell, the balancing length will (Driving source is not changed)

(A) Increase (B) decrease (C) not change (D) becomes zero

9. In the circuit shown, the current in the 1Ω resistor is



(A) 0 A(B) 1.3 A, from P to Q(C) 0.13 A, from Q to P(D) 0.13 A, from P to Q

10. A potentiometer wire of length 10 m is connected in series with a battery. The e.m.f. of a cell balances against 250 cm length of wire. If length of potentiometer wire is increased by 1 m, the new balancing length of wire will be

(A) 2.00 m (B) 2.25 m (C) 2.50 (D) 2.75 m

11. Two electric bulbs marked 25 W – 220 V and 100 W – 220 V are connected in series to a 440 V supply. Which of the bulbs will fuse?

(A) Both (B) 100 W (C) 25 W (D) neither

12. A resistor 'R' and 2μF capacitor in series is connected through a switch to 200 V direct supply. Across the capacitor is a neon bulb that lights up at 120 V. Calculate the value of R to make the bulb light up 5 s after the switch has been closed. (log10 2.5 = 0.4)

(A) $3.3 \times 10^7\ \Omega$ (B) $1.3 \times 10^4\ \Omega$ (C) $1.7 \times 10^5\ \Omega$ (D) $2.7 \times 10^6\ \Omega$

13. In balanced metre bridge, the resistance of bridge wire is 0.1 Ω / cm. Unknown resistance 'X' is connected in left gap and 6 Ω in right gap, null point divides the wire in the ratio 2 : 3. Find the current drawn from the battery of 5 V having negligible resistance.

(A) 1 A (B) 1.5 A (C) 2 A (D) 5 A

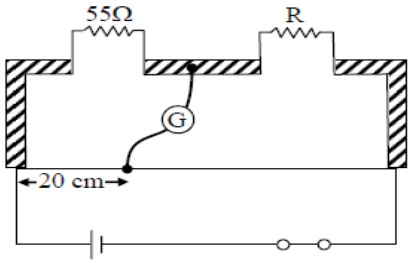
14. A potentiometer wire has length 4 m and resistance 8 Ω. The resistance that must be connected in series with the wire and an accumulator of e.m.f. 2 V, so as to get a potential gradient 1 mV per cm on the wire is

(A) 32 Ω (B) 40 Ω (C) 44 Ω (D) 48 Ω

15. When 5 V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is 2.5 × 10–4 ms^{-1}.If the electron density in the wire is 8 × 1028 m^{-3}, the resistivity of the material is close to

(A) 1.6×10^{-8} Ω-m (B) 1.6×10^{-7} Ω-m (C) 1.6×10^{-6} Ω-m (D) 1.6×10^{-5} Ω-m

16. Shown in the figure below is a meter-bridge set up with null deflection in the galvanometer.



The value of the unknown resistor R is

(A) 220 Ω (B) 110 Ω (C) 55 Ω (D) 13.75 Ω

17. A thermocouple is made from two metals, Antimony and Bismuth. If one junction of the couple is kept hot and the other is kept cold then, an electric current will

(A) flow from Antimony to Bismuth at the cold junction

(B) flow from Antimony to Bismuth at the hot junction

(C) flow from Bismuth to Antimony at the cold junction

(D) not flow through the thermocouple

18. Across a metallic conductor of non-uniform cross section a constant potential difference is applied. The quantity which remains constant along the conductor is

(A) Current density (B) Current (C) Drift velocity (D) Electric field

19. The resistances in left and right gap of a meter bridge are 20 Ω and 30 Ω respectively. When the resistance in the left gap is reduced to half its value, the balance point shifts by

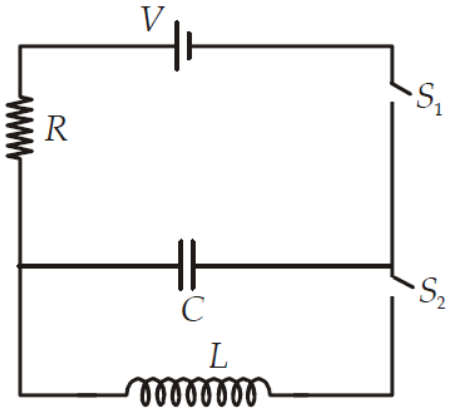
(A) 15 cm to the right (B) 15 cm to the left

(C) 20 cm to the right (D) 20 cm to the left

20. Three resistances 2Ω, 3Ω and 4Ω are connected in parallel. The ratio of currents passing through them when a potential difference is applied across its ends will be

(A) 5 : 4 : 3 (B) 6 : 3 : 2 (C) 4 : 3 : 2 (D) 6 : 4 : 3

21. In an LCR circuit as shown below both switches are open initially. Now switch S_1 is closed, S_2 kept open (q charge on the capacitor and τ = RC is Capacitive time constant). Which of the following statement is correct?



(A) Work done by the battery is half of the energy dissipated in the resistor

(B) At $t = \tau$, $q = CV/2$

(C) At $t = 2\tau$, $q = CV(1 - e^{-2})$

(D) At $t = \tau/2$, $q = CV(1 - e^{-1})$

22. The Kirchhoff's first law ($\Sigma i = 0$) and second law ($\Sigma iR = \Sigma E$), where the symbols have their usual meanings, are respectively based on

(A) conservation of charge, conservation of energy

(B) conservation of charge, conservation of momentum

(C) conservation of energy, conservation of charge

(D) conservation of momentum, conservation of charge

23. Two heating coils of resistances 10 Ω and 20 Ω are connected in parallel and connected to a battery of emf 10 V and internal resistance 1 Ω. The power consumed by them are in the ratio

(A) 1: 4 (B) 1: 3 (C) 2: 1 (D) 4: 1

24. In a large building, there are 15 bulbs of 40 W, 5 bulbs of 100 W, 5 fans of 80 W and 1 heater of 1 kW. The voltage of the electric mains is 220 V. The minimum capacity of the main fuse of the building will be:

(A) 10 A (B) 12 A (C) 14 A (D) 8 A

25. The resistance of hot tungsten filament is about 10 times the cold resistance. What will be the resistance of 100 W and 200 V lamp when not in use?

(A) 40 Ω (B) 20 Ω (C) 400 Ω (D) 200 Ω

26. A heater coil is cut into two equal parts and only one part is now used in the heater. The heat generated will now be

(A) doubled (B) four times (C) one fourth (D) halved

27. The thermo emf of a thermocouple varies with the temperature θ of the hot junction as $E = a^{\theta} + bq^2$ (in volts) where the ratio a/b is 700°C. If the cold junction is kept at 0°C, then the neutral temperature of the thermocouple is:

(A) 700°C (B) 350°C (C) 1400°C

(D) no neutral temperature is possible for this thermocouple

28. The resistance of a bulb filament is 100 Ω at a temperature of 100°C. If its temperature coefficient of resistance be 0.005 per °C, its resistance will become 200 Ω at a temperature of

(A) 200°C (B) 300°C (C) 400°C (D) 500°C

29. A material 'B' has twice the specific resistance of 'A'. A circular wire made of 'B' has twice the diameter of a wire made of 'A'. Then for the two wires to have the same resistance, the ratio l_A / l_B of their respective lengths must be

(A) 1 (B) 2 (C) 1/2 (D) 1/4

30. In a potentiometer experiment, the balancing length with a cell is 240 cm. On shunting the cell with a resistance of 2 Ω, the balancing length becomes 120 cm. The internal resistance of the cell is

(A) 1 Ω (B) 0.5 Ω (C) 4 Ω (D) 2 Ω

31. The thermistors are usually made of:

(A) metals with low temperature coefficient of resistivity

(B) metals with high temperature coefficient of resistivity

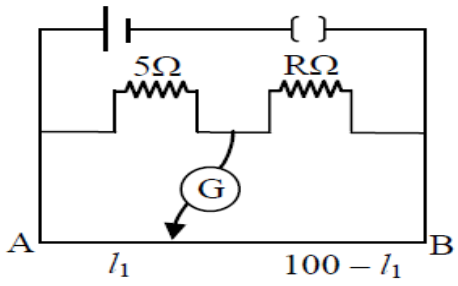
(C) metal oxides with high temperature coefficient of resistivity

(D) semiconducting materials having low temperature coefficient of resistivity

32. A 220 volt, 1000 watt bulb is connected across a 110 volt mains supply. The power consumed will be

(A) 1000 watt (B) 750 watt (C) 500 watt (D) 250 watt

33. The resistance in the two arms of the meter bridge are 5 Ω and R Ω, respectively. When the resistance R is shunted with an equal resistance, the new balance points is at 1.6 l_1. The resistance 'R', is:

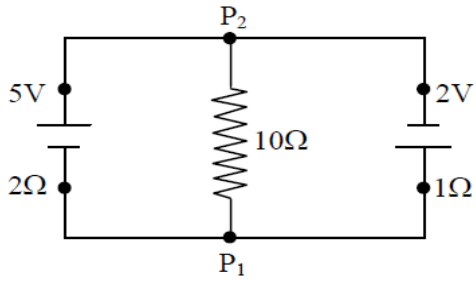


(A) 10 Ω (B) 15 Ω (C) 20 Ω (D) 25 Ω

34. Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is 0.5 Ω. The power loss in the wire is

(A) 19.2 W (B) 19.2 kW (C) 19.2 J (D) 12.2 kW

35. A 5V battery with internal resistance 2 Ω and a 2V battery with internal resistance 1 Ω are connected to a 10 Ω resistor as shown in the figure.



The current in the 10 Ω resistor is

(A) 0.03 A P_1 to P_2 (B) 0.03 A P_2 to P_1

(C) 0.27 A P_1 to P_2 (D) 0.27 A P_2 to P_1

36. In a metre bridge experiment, null point is obtained at 20 cm from one end of the wire when resistance X is balanced against another resistance Y.

If X < Y, then where will be the new position of the null point from the same end, if one decides to balance a resistance of 4X against Y?

(A) 50 cm (B) 80 cm (C) 40 cm (D) 70 cm

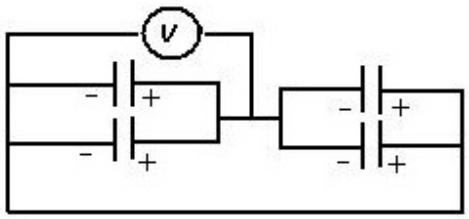
37. The length of a given cylindrical wire is increased by 100 %. Due to the consequent decrease in diameter the change in the resistance of the wire will be

(A) 300 % (B) 200% (C) 100 % (D) 50%

38. A particle of mass m and charge q is placed at rest in a uniform electric field E and then released. The kinetic energy attend by the particle after moving a distance y is

a) q^2Ey b) qEy c) qE^2y d) qEy^2

39. Four capacitors each of 25 µF are connected as shown in diagram. The DC voltmeter reads 200 volt. The charge on each plate of capacitor will be



a) $5\times10^{-2}C$ b)$2\times 10^{-2}C$ c)5×10^{-3} C d) 2×10^{-3} C