

THERMAL & CHEMICAL EFFECTS OF CURRENT

- A bulb having voltage rating V and power rating W is supplied with current from n cells each of 1.5 volt and internal resistance r . The value of n to run lamp at rated power W is

A) $\frac{V^2}{(1.5V - rW)}$	B) $\frac{V^2}{rW}$
C) $\frac{(1.5V - rW)}{V^2}$	D) $\frac{V^2}{1.5V}$
- The charge flowing through a conductor of resistance R varies with time as $q = at - bt^2$ where a and b are constants. Total heat produced in R till current becomes zero is

A) $Ra^3/3b$	B) $Ra/6b$
C) $Ra^2/9b$	D) $Ra^3/6b$
- N lamp of resistance r each are fed by a source of resistance R . Let light be proportional to square of heat produced then the most efficient way of arranging lamps is to place them in parallel rows each containing n lamps when n is nearly equal to

A) $\sqrt{NR/r}$	B) $\sqrt{Nr/R}$
C) $\sqrt{R/Nr}$	D) $\sqrt{r/NR}$
- A constant voltage is applied between the two ends of a uniform metallic wire. Some heat is developed in it. If both length and radius of the wire are halved then the heat developed in the same duration will become

A) half	B) twice
C) one-fourth	D) same
- A series-parallel combination battery consisting of a large number $N = 300$ of identical cells, each with an internal resistance $r = 0.3 \Omega$, is loaded with an external resistance $R = 10 \Omega$. Then the number n of parallel groups consisting of an equal number of cells connected in series, at which the external resistance generates highest thermal power, is

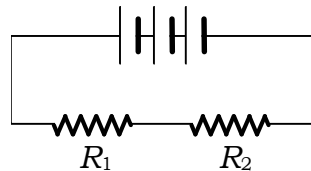
A) 3	B) 4
C) 5	D) none of the above
- Three resistors are connected in series across a 12 V battery. The first resistor has a value of 1Ω , second has a voltage drop of 4 V and the third has a power dissipation of 12 W. Then the value of the circuit current is

A) 2 A	B) 6 A
C) either 2 A or 6 A	D) none of the above
- If the length of the filament of a heater is reduced by 25%, the power of the heater will

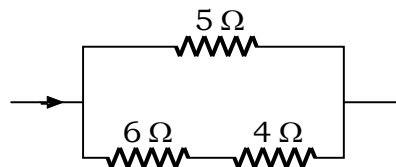
A) increase by about 25%	B) increase by about 33%
C) decrease by about 25%	D) decrease by about 33%

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8. Two heater wires of equal length are first connected in series and then in parallel. The ratio of heat produced in the two cases will be
 A) 2 : 1
 B) 1 : 2
 C) 4 : 1
 D) 1 : 4
9. Two electric lamps of 40 watt each are connected in parallel. The power consumed by the combination will be
 A) 20 W
 B) 60 W
 C) 80 W
 D) 100 W
10. In the circuit shown in figure the heat produced in resistance R_1 can be measured by

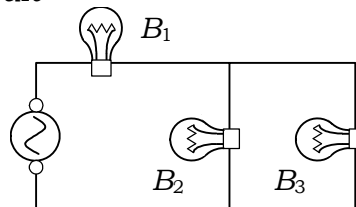


- A) Connecting both voltmeter and an ammeter in parallel to R_1
 B) Connecting ammeter in series with R_1 and voltmeter in parallel to both R_1 and R_2
 C) Connecting ammeter in parallel to R_1 and voltmeter in series with R_1
 D) Connecting voltmeter in parallel to R_1 and ammeter in series with R_1
11. If the current is flowing through a 10Ω resistor then indicate in which case the maximum heat will be generated
 A) 5 ampere in 2 minutes
 B) 4 ampere in 3 minutes
 C) 3 ampere in 6 minutes
 D) 2 ampere in 5 minutes.
12. In the circuit shown in figure, the heat produced in the 5Ω resistor due to the current flowing through it is 10 calorie per second. The heat generated in the 4Ω resistor is

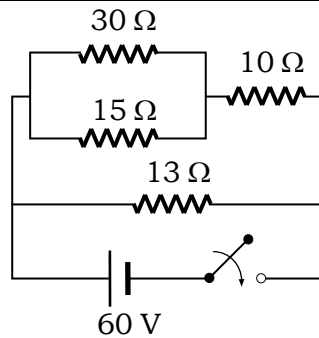


- A) 1 calories/sec
 B) 2 calories/sec
 C) 3 calories/sec
 D) 4 calories/sec
13. If R_1 and R_2 are respectively the filament resistance of a 200 watt bulb and a 100 watt bulb designed to operate on the same voltage:
 A) R_1 is two times R_2
 B) R_2 is two times R_1
 C) R_2 is four times R_1
 D) R_1 is four times R_2
14. Two electric bulb one of 200 volt and 40 watt and the other of 200 volt and 100 watt are connected in a house wiring circuit
 A) They have equal currents through them
 B) The resistance of the filaments of both the bulb is same
 C) The resistance of the filament of 40 W bulb is more than of 100 watt bulb
 D) The resistance of 100 W bulb is more than 40 watt bulb.
15. A lamp of 6 V and 30 W is used in a laboratory but the supply is of 120 V. What will be done to make use of the lamp?
 1) A resistance may be used
 2) A resistance may be used in series with lamp
 3) The resistance should be of 18Ω

- A) 1, 2 and 3 are correct
B) 1 and 2 are correct
C) 1 and 3 are correct
D) 2 and 3 are correct.
16. A 500 W heating unit is designed to operate from a 115 V line. If the line voltage drops to 110 V, the percentage drop in heat output will be
A) 10.2 %
B) 8.1 %
C) 8.6 %
D) 7.6 %
17. A uniform wire when connected directly across a 200 V line, produces heat H per second. If the wire is divided into n parts and all parts are connected in parallel across a 200 V line, the heat produced per second will be
A) H
B) nH
C) $\frac{H}{n^2}$
D) $n^2 H$
18. The resistance of a heater coil is 110Ω . A resistance R is connected in parallel with it and the combination is joined in series with a resistance of 11Ω to a 220 V main line. The heater operates with a power of 110 W. The value of R in ohm is
A) 12.22
B) 24.42
C) Negative
D) That the given value is not correct
19. Two electric bulb rated P_1 and P_2 watt at V volt are connected in series across V volts mains, then their total power consumption P is
A) $(P_1 + P_2)$
B) $\sqrt{P_1 P_2}$
C) $\frac{P_1 P_2}{(P_1 + P_2)}$
D) $\frac{(P_1 + P_2)}{P_1 P_2}$
20. Three bulbs B_1 , B_2 and B_3 are connected to the mains as shown in figure. How will the incandescence of the bulb B_1 be affected, if one of the bulbs B_2 or B_3 is disconnected from the circuit



- A) No change in the incandescence
B) Bulb B_1 will become brighter
C) Bulb B_1 will become less brighter
D) The bulb B_1 may become brighter or dimmer depending upon the candle power of the bulb which is disconnected
21. The maximum current I , which can be passed through a fuse without melting varies with its radius r as
A) $I \propto r$
B) $I \propto r^{3/2}$
C) $I \propto r^2$
D) $I \propto \left(\frac{1}{r^2}\right)$
22. Why does the light of a car dim when the starter is operated?
A) The starter motor draws a large current resulting in a larger potential drop in the battery, which reduced the thermal voltage of the battery
B) When the starter motor is switched on, it increases the resistance of the filament of the bulb in the car light



- A) 30 W
 B) 60 W
 C) 120 W
 D) 90 W

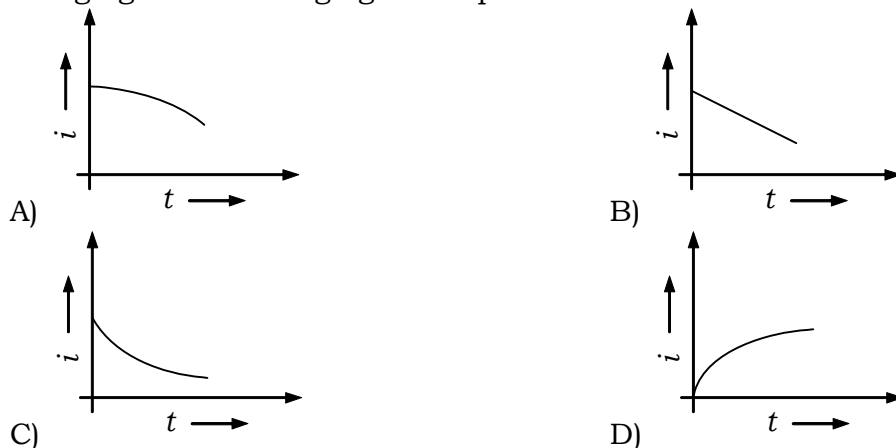
36. The resistance of the filament of a bulb increases with rise in temperature. A bulb rated 100 W, 220 V is connected across a 220 V supply. If the voltage drops by 10 %, then the power consumed by bulb will be
 A) 100 W
 B) 81 W
 C) less than 81 W
 D) more than 81 W

37. A cell has internal resistance r . It sends current through two resistances R_1 and R_2 separately. Then the heat produced in resistance R_1 and R_2 will be in the ratio
 A) $\frac{R_1}{R_2}$
 B) $\frac{R_2}{R_1}$
 C) $\frac{R_1 \left(\frac{R_2 + r}{R_1 + r} \right)^2}{R_2 \left(\frac{R_1 + r}{R_2 + r} \right)^2}$
 D) $\frac{R_2 + r}{R_1 + r}$

38. Two bulbs of 500 W and 200 W are rated to operate on 220 V. The ratio of heat produced in the combination when they are connected in series and in parallel
 A) $\frac{5}{2}, \frac{2}{5}$
 B) $\frac{5}{2}, \frac{5}{2}$
 C) $\frac{2}{5}, \frac{5}{2}$
 D) $\frac{2}{5}, \frac{2}{5}$

39. A current is divided in to two resistors connected in parallel according to Kirchhoff's law, then the heat produced in the combination is
 A) zero
 B) can not be predicted
 C) minimum
 D) maximum

40. Which of the following graphs shows the variation of current with time during charging and discharging of a capacitor



41. If q_0 is the maximum charge then while charging, the charge on a capacitor at time t is given by
- A) $q_0 e^{\frac{t}{RC}}$ B) $q_0 e^{-\frac{t}{RC}}$
 C) $q_0 \left(1 - e^{-\frac{t}{RC}}\right)$ D) $q_0 \left(1 - e^{\frac{-t}{RC}}\right)$
42. The capacitor gets almost fully charged after time t equal to
- A) RC B) $3RC$
 C) $4RC$ D) $2RC$
43. While studying the decay of current through LR circuit, the current at any time t , when maximum current is I_0 . Is given by
- A) $I_0 \left(1 - e^{-\frac{t}{RC}}\right)$ B) $I_0 \left(1 - e^{-\frac{t}{L}}\right)$
 C) $I_0 e^{-\frac{Rt}{L}}$ D) $I_0 e^{-\frac{Lt}{R}}$
44. The same mass of copper is drawn into two wires 2 mm and 3 mm thick. The two wires are connected in series and current is passed through them. The ratio of heats produced in the two wires is
- A) $\frac{9}{4}$ B) $\frac{3}{2}$
 C) $\frac{2}{3}$ D) $\frac{81}{16}$
45. A heater boils 1 kg of water in time t_1 and another heater boils the same water in time t_2 . If both are connected in series, the combination will boil the same water in time
- A) $\frac{t_1 t_2}{t_1 + t_2}$ B) $\frac{t_1 t_2}{t_1 - t_2}$
 C) $t_1 + t_2$ D) $2(t_1 + t_2)$
46. In a dc circuit the power generated per unit volume of the conductor is directly proportional to
- A) current B) electric field inside the conductor
 C) resistivity of the conductor D) square of the electric field
47. You are given a resistance wire of length 50 cm and a battery of negligible resistance. In which of the following cases is largest amount of heat generated.
- A) when the wire is connected to the battery directly
 B) When the wire is divided into two parts and both the parts connected to the battery in parallel.
 C) When the wire is divided into four parts and all the four connected to the battery in parallel
 D) When only half the wire is connected to the battery.
48. Two resistance thermometers are made, one of the platinum wire and the other of germanium wire. The resistance of both the thermometers are equal at room temperatures are equal at room temperature. The two resistance wires are connected to a battery. Now the two resistance wires are connected to a battery. Now the two resistance wires are heated to 100°C . The potential drop in the two resistances is measured. Which of the following statements is correct?

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- A) The potential drop across the platinum wire is equal to the potential drop across the germanium wire
 B) The potential drop across the platinum wire is greater than that across germanium
 C) The potential drop across the platinum wire is lesser than that across germanium
 D) The nature of the potential drop can not be ascertained unless the magnitude of the current is known
- 49.** An electric heater kept in vacuum is heated continuously by passing electric current. Its temperature
 A) Will go on rising with time
 B) will stop after some time as it will loose heat to the surroundings by conduction
 C) Will rise for some time and there after will starts falling
 D) Will become constant after some time because of loss of heat due to radiation
- 50.** A current i passes through a wire of length L , radius r and resistivity ρ . The rate of heat generated is
 A) $\frac{i\rho L}{\pi r^2}$
 B) $i^2 \left(\frac{L\rho}{\pi r^2} \right)$
 C) $\left(\frac{i^2 \rho L}{r} \right)$
 D) none of these.

Answer to Thermal & Chemical effect of Current

01. A)	02. D)	03. A)	04. A)	05. A)	06. C)	07. B)	08. D)	09. C)	10. D)
11. C)	12. B)	13. B)	14. C)	15. B)	16. C)	17. D)	18. A)	19. C)	20. C)
21. B)	22. A)	23. B)	24. C)	25. D)	26. A)	27. A)	28. A)	29. D)	30. D)
31. D)	32. C)	33. C)	34. D)	35. A)	36. D)	37. C)	38. C)	39. C)	40. C)
41. D)	42. C)	43. C)	44. D)	45. C)	46. D)	47. C)	48. B)	49. D)	50. B)