



## PHYSICS

### BOOKS - S CHAND PHYSICS (HINGLISH)

## ELECTRICITY

#### Solved Examples

1. Calculate the number of electrons constituting one coulomb of charge.

A.  $6.25 \times 10^{17}$

B.  $6.25 \times 10^{18}$

C.  $6.25 \times 10^{19}$

D.  $6.25 \times 10^{20}$

**Answer: B**



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2. How much work is done in moving a charge of 2 coulombs from a point at 118 volts to a point at 128 volts?

A. 10 J

B. 15 J

C. 20 J

D. 25 J

**Answer: C**



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3. How much energy is given to each coulomb of charge passing through a  $6V$  battery ?

A. 2 J

B. 3 J

C. 5 J

D. 6 J

**Answer: D**



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4. An electric bulb draws a current of  $0.25\text{ A}$  for 20 minutes. Calculate the amount of electric charge that flows through the circuit.

A.  $300C$

B. 400C

C. 500C

D. 600C

**Answer: A**



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5. Potential difference between two points of a wire carrying 2 ampere current is 0.1 volt. Calculate the resistance between these points.

A. 0.05 ohm

B. 0.06 ohm

C. 0.07 ohm

D. 0.08 ohm



**Answer: A**



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6. A simple electric circuit has a 24V battery and a resistor of 60 ohms. What will be the current in the circuit? The resistance of the connecting wires is negligible.

A. 0.4 A

B. 0.5 A

C. 0.6 A

D. 0.7 A

**Answer: A**



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7. An electric iron draws a current of 3.4A from the 220V supply line. What current will this electric iron draw when connected to 110 V supply line?

A. 1.7A

B. 1.8A

C. 1.9A

D. 2.0A

**Answer: A**



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8. A copper wire of length 2m and area of cross-section  $1.7 \times 10^{-6} m^2$  has a resistance of  $2 \times 10^{-2}$  ohms. Calculate the resistivity of copper.

A.  $1.7 \times 10^{-8}$

B.  $1.7 \times 10^{-9}$

C.  $1.7 \times 10^{-10}$

D.  $1.7 \times 10^{-11}$

**Answer: A**



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**9.** A copper wire has a diameter of  $0.5mm$  and a resistivity of  $1.6 \times 10^{-6} \Omega cm$ . How much of this wire would be required to make a  $10\Omega$  coil ? How much does the resistance change if the diameter is doubled ?



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10. A  $6\Omega$  resistance wire is doubled up by folding. Calculate the new resistance of the wire.

A.  $1.6\Omega$

B.  $1.8\Omega$

C.  $1.5\Omega$

D.  $1.9\Omega$

**Answer: C**



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11. If four resistance, each of value 1 ohm, are connected in series, what will be the resultant resistance?



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**12.** A resistance of 6 ohms is connected in series with another resistance of 4 ohms. A potential difference of 20 volts is applied across the combination. Calculate the current through the circuit and potential difference across the 6 ohm resistance.

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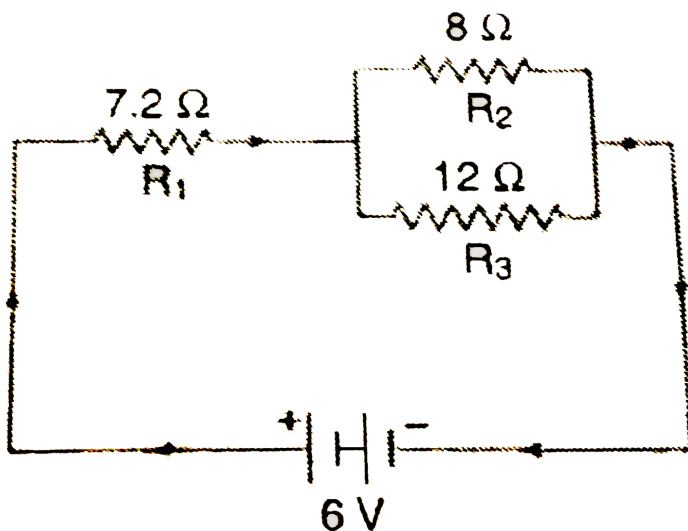
**13.** Redraw the circuit of *Q.12*, putting in an ammeter to measure the current through the resistors and a voltmeter to measure the voltage across the *12ohm* resistor. What would be the readings in the ammeter and the voltmeter ?

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**14.** Calculate the equivalent resistance when two resistances of 3 ohms and 6 ohms are connected in parallel.

15. In the circuit diagram given alongside, find:

- (i) total resistance of the circuit,
- (ii) total current flowing in the circuit, and
- (iii) the potential difference across  $R_1$



16. What will be the current drawn by an electric bulb of 40W when it is connected to a source of 220V?



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17. An electric bulb is rated 220V and 100W. When it is operated on 110V, the power consumed will be :

A. 100W

B. 75W

C. 50W

D. 25W

**Answer: D**



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18. Which of the following terms does not represent electrical power in a circuit :

A.  $I^2 R$

B.  $IR^2$

C.  $VI$

D.  $\frac{V^2}{R}$

**Answer: B**



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19. A radio set of 60 watts runs for 50 hours. How many 'units' (kWh) of electrical energy are consumed ?



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**20.** A current of 4A flows through a 12V car headlight bulb for 10 minutes. How much energy transfer occurs during this time?



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**21.** Calculate the energy transferred by a 5A current flowing through a resistor of 2 ohms for 30 minutes.



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**22.** A refrigerator having a power rating of 350W operates for 10 hours a day. Calculate the cost of electrical energy to operate if for a month of 30 days. The rate of electrical energy is Rs. 340 per kWh.



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**23.** An electric heater draws a current of 10A from a 220V supply. What is the cost of using the heater for 5 hours everyday for 30 days if the cost of 1 unit (1 kWh) is Rs 5.20?

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**24.** A potential difference of 250 volts is applied across a resistance of 500 ohms in an electric iron. Calculate (i) current, and (ii) heat energy produced in joules in 10 seconds.

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**25.** Compute the heat generated while transferring 96000 coulombs of charge in one hour through a potential difference of 50V.

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**26.** Two conducting wires of the same material and of equal length and equal diameters are first connected in series and then in parallel in an electric circuit. The ratio of the heat produced in series and parallel combinations would be :

A. 1 : 2

B. 2 : 1

C. 1 : 4

D. 4 : 1

**Answer: C**



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**Sample Problem**

1. A bulb is rated at 20 V -100 W. What is its resistance? Five such bulbs burn for 4 hours. What is the electrical energy consumed? Calculate the cost if the rate is Rs 4.60 per unit.



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## Exercise

1. What is represented by Joule/coulomb ?

A. VOLT

B. AMPERE

C. WATT

D. OHM

**Answer: A**



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2. How much work is done when one coulomb charge moves against a potential difference of 1 volt?



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3. What do you mean by electric potential difference ? How is it measured ? Define its *SI* unit.



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4. How much work is done in moving a charge of  $2C$  across two points having a potential difference of  $12V$  ?



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5. What is the unit of electric current?

A. joule/coulomb

B. coulomb/sec

C. volt/sec

D. sec/coulomb

**Answer: B**



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6. Define one coulomb charge.



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7. Fill in the following blanks with suitable words:

(a) Potential difference is measured in.....by using a.....placed

in.....across a component.

(b) Copper is a good.....Plastic is an..... .



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## 8. CONDUCTORS AND INSULATORS



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9. Which of the following are conductors and which are insulators?

Sulphur, Silver, Copper, Cotton, Aluminium, Air, Nichrome, Graphite,  
Paper, Porcelain, Mercury, Mica, Bakelite, Polythene, Manganin.



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10. What do you understand by the term "electric potential"? (or potential) at a point? What is the unit of electric potential?

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11. (a) State the relation between potential difference, work done and charge moved.

(b) Calculate the work done in moving a charge of 4 coulombs from a point at 220 volts to another point at 230 volts.

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12. (a) Name a device that helps to measure the potential difference across a conductor.

(b) How much energy is transferred by 12 V power supply to each coulomb of charge which it moves around a circuit?



13. (a) What do you understand by the term "potential difference"?
- (b) What is meant by saying that the potential difference between two points is 1 volt?
- (c) What is the potential difference between the terminals of a battery if 250 joules of work is required to transfer 20 coulombs of charge from one terminal of battery to the other?
- (d) What is a voltmeter? How is a voltmeter connected in the circuit to measure the potential difference between two points. Explain with the help of a diagram.
- (e) State whether a voltmeter has a high resistance or a low resistance. Give reason for your answer.

14. The work done in moving a unit charge across two points in an electric circuit is a measure of:

- A. current
- B. potential difference
- C. resistance
- D. power

**Answer: B**



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15. The device used for measuring potential difference is known as:

- A. potentiometer
- B. ammeter

C. galvanometer

D. voltmeter

**Answer: D**



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**16.** Which of the following units could be used to measure electric charge?

A. ampere

B. joule

C. volt

D. coulomb

**Answer: D**



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17. The unit for measuring potential difference is:

A. watt

B. ohm

C. volt

D. kWh

**Answer: C**



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18. Calculate the number of electrons constituting one coulomb of charge.

A.  $2.6 \times 10^{19}$  electrons

B.  $6.2 \times 10^{19}$  electrons

C.  $2.65 \times 10^{18}$  electrons

D.  $6.25 \times 10^{18}$  electrons

**Answer: D**



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**19.** Three 2V cells are connected in series and used as a battery in a circuit.

(a) What is the p.d at the terminals of the battery?

(b) How many joules of electrical energy does 1 C gain on passing through (i) one cell (ii) all three cells ?



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**20.** The atoms of copper contain electrons and the atoms of rubber also contain electrons. Then why does copper conduct electricity but rubber does not conduct electricity?



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**21.** By what name is the physical quantity coulomb/second called?



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**22.** What is the flow of charge called?



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**23.** What actually travels through the wires when you switch on a light?



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**24.** Which particles constitute the electric current in a metallic conductor?



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**25.** (a) In which direction does conventional current flow around a circuit?

(b) In which direction do electrons flow?



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**26.** Which of the following equation shows the correct relationship between electrical units?

$$1A = 1C/s \text{ or } 1C = 1A/s$$



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**27.** What is an electric current ? Give its *SI* unit.



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**28.** (a) How many milliamperes are there in 1 ampere?

(b) How many microamperes are there in 1 ampere?



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**29.** Which of the two is connected in series: ammeter or voltmeter?



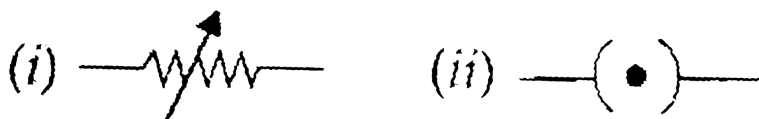
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30. Compare how an ammeter and a voltmeter are connected in a circuit.

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31. What do the following symbols mean in circuit diagrams?



A. (i) Closed plug key (ii) Variable resistance

B. (i) resistance (ii) closed plug key

C. (i) Variable resistance (ii) Closed plug key

D. (i) variable resistance (ii) open plug key

**Answer: C**

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**32.** If 20 C of charge pass a point in a circuit in 1s, what current is flowing?



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**33.** A current of 4A flows around a circuit for 10s. How much charge flows past a point in the circuit in this time?



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**34.** What is the current in a circuit if the charge passing each point is 20 C in 40s?



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**35.** Fill in the following blanks with suitable words:

(a) A current is a flow of.....For this to happen there must be a.....circuit.

(b) Current is measured in.....using an.....placed in.....in a circuit.



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**36.** (a) Name a device which helps to maintain potential difference across a conductor (say, a bulb).

(b) If a potential difference of 10V causes a current of 2A to flow for 1 minute, how much energy is transferred?



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**37. (a)** What is an electric current? What makes an electric current flow in a wire?

**(b)** Define the unit of electric current (or Define ampere).



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**38.** What is an ammeter? How is it connected in a circuit? Draw a diagram to illustrate your answer.



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**39. (a)** Write down the formula which relates electric charge, time and electric current.

**(b)** A radio set draws a current of  $0.36\text{A}$  for 15 minutes. Calculate the amount of electric charge that flows through the circuit.



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**40.** आदर्श अमीटर का प्रतिरोध क्या होना चाहिए ?

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**41.** Draw circuit symbols for (a) fixed resistance (b) variable resistance (c) a cell (d) a battery of three cells (e) an open switch (f) a closed switch.

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**42.** What is a circuit diagram? Draw the labelled diagram of an electric circuit comprising of a cell, a resistor, an ammeter, a voltmeter and a closed switch (or closed plug key). Which of the two has a large resistance: an ammeter or a voltmeter?

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**43.** If the charge on an electron is  $1.6 \times 10^{-19}$  coulombs, how many electrons should pass through a conductor in 1 second to constitute 1 ampere current?



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**44.** The p.d. across a lamp is 12 V. How many joules of electrical energy are changed into heat and light when: (a) a charge of 1C passes through it?

(b) a charge of 5C passes through it?

(c) a current of 2A flows through it for 10s?



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**45.** In 20s, a charge of 25 C leaves a battery, and 200J of energy are delivered to an outside circuit as a result.

(a) What is the p.d across the battery?

(b) What current flows from the battery?



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**46.** (a) Define electric current. What is the SI unit of electric current.

(b) One coulomb of charge flows through any cross-section of a conductor in 1 second. What is the current flowing through the conductor?

(c) Which instrument is used to measure electric current? How should it be connected in a circuit?

(d) What is the conventional direction of the flow of electric current? How does it differ from the direction of flow of electrons?

(e) A flash of lightning carries 10C of charge which flows for 0.01s.

what is the current? If the voltage is 10MV, what is the energy?



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47. The other name of potential difference is:

A. ampereage

B. wattage

C. voltage

D. potential energy

**Answer: C**



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**48.** Which statement/statement is/are correct?

1. An ammeter is connected in series in a circuit and a voltmeter is connected in parallel.
2. An ammeter has a high resistance.
3. A voltmeter has a low resistance.

A. 1,2,3

B. 1,2

C. 2,3

D. 1

**Answer: D**



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**49.** Which unit could be used to measure current?

A. Watt

B. Coulomb

C. Voly

D. Ampere

**Answer: D**



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**50.** If the current through a flood lamp is 5A, what charge passes in 10 seconds?

A.  $0.5C$

B.  $2C$

C.  $5C$

D.  $50C$

**Answer: D**



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**51.** If the amount of electric charge passing through a conductor in 10 minutes is 300C, the current flowing is:

A. 30A

B. 0.3A

C. 0.5A

D. 5A

**Answer: C**



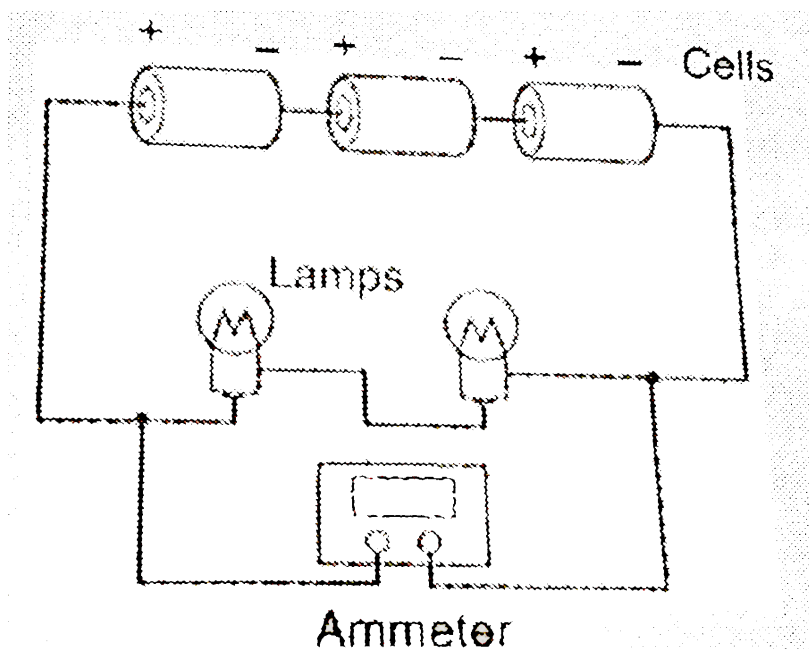
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52. A student made an electric circuit shown here to measure the current through two lamps.

(a) Are the lamps in series or parallel?

(b) The student has made a mistake in this circuit. What is the mistake? ,

(c) Draw a circuit diagram to show the correct way to connect the circuit. Use the proper circuit symbols in your diagram.



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**53.** Draw a circuit diagram to show how 3 bulbs can be lit from a battery so that 2 bulbs are controlled by the same switch while the third bulb has its own switch.



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**54.** An electric heater is connected to the 230V mains supply. A current of 8A flows through the heater.

(a) How much charge flows around the circuit each second?

(b) How much energy is transferred to the heater each second?



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**55.** How many electrons are flowing per second past a point in a circuit in which there is a current of 5 amp?

A.  $31.25 \times 10^{17}$

B.  $31.25 \times 10^{16}$

C.  $31.25 \times 10^{18}$

D.  $31.25 \times 10^{20}$

**Answer: C**



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**56.** Name the law which relates the current in a conductor to the potential difference across its ends.



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**57.** What do you mean by electrical resistance ? How does it arise ?  
Give its *SI* unit.



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**58.** Name the physical quantity whose unit is "ohm".



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**59.** The substance having infinitely high electrical resistance is called:

A. conductor

B. semiconductor

C. superconductor

D. insulator

**Answer: D**



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**60.** Keeping the resistance constant, the potential difference applied across the ends of a components is halved. By how much does the current change?

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**61.** State the factors on which the strength of electric current flowing in a given conductor depends.

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**62.** Which has less electrical resistance: a thin wire or a thick wire (of the same length and same material)?

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**63.** Keeping the resistance constant, the potential difference applied across the ends of a components is halved. By how much does the current change?



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**64.** A potential difference of 20 volts is applied across the ends of a resistance of 5 ohms. What current will flow in the resistance?



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**65.** A resistance of 20 ohms has a current of 2 amperes flowing in it. What potential difference is there between its ends?



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**66.** A current of 5 amperes flows through a wire whose ends are at a potential difference of 3 volts. Calculate the resistance of the wire.



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**67.** Fill in the following blank with a suitable word:

Ohm's law states a relation between potential difference and.....

.



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**68.** Distinguish between good conductors, resistors and insulators.

Name two good conductors, two resistors and two insulators.



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**69.** Which of the following are conductors and which are insulators?

Sulphur, Silver, Copper, Cotton, Aluminium, Air, Nichrome, Graphite, Paper, Porcelain, Mercury, Mica, Bakelite, Polythene, Manganin.



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**70.** What is Ohm's law? Explain how it is used to define the unit of resistance.



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**71. (a)** What is meant by the "resistance of a conductor"? Write the relation between resistance, potential difference and current.

**(b)** When a 12V battery is connected across an unknown resistor,

there is a current of 2.5 mA in the circuit. Calculate the value of the resistance of the resistor.



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**72.** (a) Define the unit of resistance (or Define the unit "ohm").

(b) What happens to the resistance as the conductor is made thinner?

(c) Keeping the potential difference constant, the resistance of a circuit is doubled. By how much does the current change?



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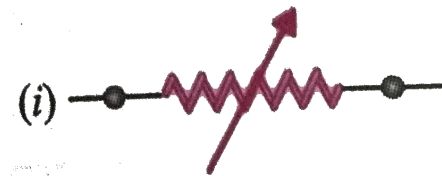
**73.** (a) Why do electricians wear rubber hand gloves while working with electricity?

(b) What p.d is needed to send a current of 6A through an electrical appliance having a resistance of  $40\Omega$ ?



74. (a) Name an instrument that measures electric current in a circuit. Define the unit of electric current.

(b) What do the following symbols, (Fig. 3.58) mean in a circuit diagram ?



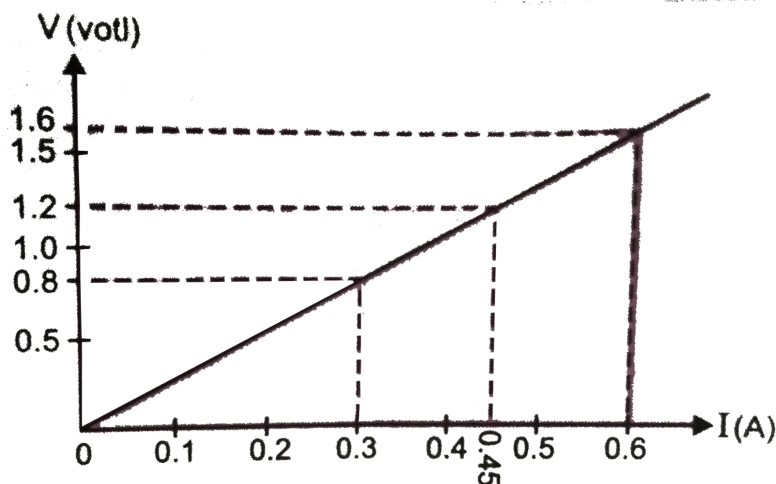
(c) An electric circuit consisting of a  $0.5m$  long nichrome wire  $XY$ , an ammeter, a voltmeter, four cells of  $1.5V$  each and a plug key was set up.

(i) Draw a diagram of this electric circuit to study the relation between the potential difference maintained between the points  $X$  and  $Y$  and the electric current flowing through  $XY$ .

(ii) Graph shown in (Fig. 3.59) was plotted  $V$  and  $I$  values.

What would be the values of  $V/I$  ratios when the potential

differences are  $0.8V$ ,  $1.2V$  and  $1.6V$  respectively ? What conclusion do you draw from these values ?



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75. (a) What is the ratio of potential difference and current known as?

(b) The values of potential difference  $V$  applied across a resistor and the corresponding values of current  $I$  flowing in the resistor are given below:

Potential difference $V$ (in volts)	:	2.5	5.0	10.0	15.0	20.0	25.0
Current, $I$ (in amperes)	:	0.1	0.2	0.4	0.6	0.8	1.0

Plot a graph between V and I, and calculate the resistance of the resistor.

(c) Name the law which is illustrated by the above V-I graph.

(d) Write down the formula which states the relations between potential difference, current and resistance.

(d) The potential difference between the terminals of an electric iron is 240V and the current is 5.0A. What is the resistance of the electric iron?



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**76.** The p.d. across a  $3\Omega$  resistor is 6V. The current flowing in the resistor will be:

A.  $\frac{1}{2}A$

B.  $1A$

C.  $2A$

D.  $6A$

**Answer: C**



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77. A car headlight bulb working on a 12V car battery draws a current of 0.5A. The resistance of the light bulb is:

A.  $0.5\Omega$

B.  $6\Omega$

C.  $9.2\Omega$

D.  $24\Omega$

**Answer: D**



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78. An electrical appliance has a resistance of  $25\Omega$ . When this electrical appliance is connected to a 230V supply line, the current passing through it will be:

A.  $0.92A$

B.  $2.9A$

C.  $9.2A$

D.  $92A$

**Answer: C**



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79. When a  $4\Omega$  resistor is connected across the terminals of a 12V battery, the number of coulombs passing through the resistor per second is:

A. 0.3

B. 3

C. 4

D. 12

**Answer: B**



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**80.** OHM'S LAW is a relation between :

A. current and resistance

B. resistance and potential difference

C. potential difference and electric charge

D. current and potential difference

**Answer: D**



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**81.** The unit of electrical resistance is:

A. ampere

B. volt

C. coulomb

D. ohm

**Answer: D**



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**82.** The substance having infinitely high electrical resistance is called:

- A. conductor
- B. resistor
- C. superconductor
- D. insulator

**Answer: D**



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**83.** Keeping the potential difference constant, the resistance of a circuit is doubled. The current will becomes:

- A. double

B. half

C. one-fourth

D. four times

**Answer: B**



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**84.** Keeping the p.d. constant, the resistance of a circuit is halved.

The current will become:

A. one-fourth

B. four times

C. half

D. double

**Answer: D**



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**85.** An electric room heater draws a current of  $2.4\text{A}$  from the  $120\text{V}$  supply line. What current will his room heater draw when connected to  $240\text{V}$  supply line?



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**86.** Name the electrical property of a material whose symbol is " $\omega$ ".



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**87.** The graph between  $V$  and  $I$  for a conductor is a straight line passing through the origin.

(a) Which law is illustrated by such a graph?

(b) What should remain constant in a statement of this law?



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**88.** A p.d. of 10V is needed to make a current of 0.02A flow through a wire. What p.d. is needed to make a current of 250mA flow through the same wire?



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**89.** A current of 200mA flows through a  $4k\Omega$  resistor. What is the p.d. across the resistor?



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**90.** What happens to the resistance as the conductor is made thicker?

- A. Resistance decreases
- B. Resistance increase
- C. remains same
- D. Double

**Answer: A**



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**91.** If the length of a wire is doubled by taking more of wire, what happens to its resistance?



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**92.** On what factors does the resistance of a conductor depend ?

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**93.** Name the material which is the best conductor of electricity.

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**94.** Which among iron and mercury is a better conductor of electricity?

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**95.** Why are copper and aluminium wires usually used for electricity transmission?

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**96.** Name the material which is used for making the heating element of an electric iron.



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**97.** What is nichrome? State its one use.



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**98.** Why is nichrome used as a heating element ?



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**99.** Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal ?

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**100.** Which has more resistance:

(a) a long piece of nichrome wire or short one?

(b) a thick piece of nichrome wire or a thin piece?

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**101.** (a) How does the resistance of a pure metal change if its temperature decreases?

(b) How does the presence of impurities in a metal affect its resistance?

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**102.** Fill in the following blanks with suitable words:

Resistance is measured in.....This resistance of a wire increases as the length.....as the temperature.....and as the cross-section area..... .



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**103.** (a) What do you understand by the "resistivity" of a substance?

(b) A wire is 1.0m long, 0.2 mm in diameter and has a resistance of  $10\Omega$ . Calculate the resistivity of its material?



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**104.** (a) Write down an expression for the resistance of a metallic wire in terms of the resistivity.

(b) What will be the resistance of metal wire of length 2 metres and area of cross-section  $1.55 \times 10^{-6} \text{ m}^2$ , if the resistivity of the metal be  $2.8 \times 10^{-8} \Omega \text{ m}$ ?



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**105.** (a) Give two examples of substances which are good conductors of electricity. Why do you think they are good conductors of electricity?

(b) Calculate the resistance of a copper wire 1.0 km long and 0.50 mm diameter if the resistivity of copper is  $1.7 \times 10^{-8} \Omega \text{ m}$ .



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**106.** Will current flow more easily through a thick wire or a thin wire of the same material when connected to the same source ?  
Why ?



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**107.** How does the resistance of a conductor depend on:

- (a) length of the conductor?
- (b) area of cross-section of the conductor?
- (c) temperature of the conductor?



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**108.** (a) Give one example to show how the resistance depends on the nature of material of the conductor.

(b) Calculate the resistance of an aluminium cable of length 10 km

and diameter 2.0 mm if the resistivity of aluminium is  $2.7 \times 10^{-8} \Omega m$ .



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**109.** What would be the effect on the resistance of a metal wire of:

- (a) increasing its length?
- (b) increasing its diameter?
- (c) increasing its temperature?



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**110.** How does the resistance of a wire vary with its:

- (a) area of cross-section?
- (b) diameter?



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**111.** How does the resistance of a wire change when:

(i) its length is tripled?

(ii) its diameter is tripled?

(iii) its material is changed to one whose resistivity is three times?



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**112.** Calculate the area of cross-section of a wire if its length is  $1.0m$ , its resistance is  $23\Omega$  and the resistivity of the material is  $1.84 \times 10^{-6}\Omega m$ .



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**113.** (a) Define resistivity. Write an expression for the resistivity of a substance. Give the meaning of each symbol which occurs in it.

(b) State the SI unit of resistivity.



(c) Distinguish between resistance and resistivity.

(d) Name two factors on which the resistivity of a substance depends and two factors on which it does not depend.

(e) The resistance of a metal wire of length 1m is  $26\Omega$  at  $20^\circ C$ . if the diameter of the wire is 0.3mm, what will be the resistivity of the metal at that temperature?



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**114.** The resistance of a wire of length 330m and cross-section area  $1.0mm^2$  made of material of resistivity  $1.0 \times 10^{-7}\Omega m$  is:

A.  $2\Omega$

B.  $3\Omega$

C.  $20\Omega$

D.  $3\Omega$

**Answer: D**



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**115.** When the diameter of a wire is doubled, its resistance becomes:

- A. double
- B. four times
- C. one-half
- D. one-fourth

**Answer: D**



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**116.** If the resistance of a certain copper wire is  $1\Omega$ , then the resistance of a similar nichrome wire will be about:

A.  $25\Omega$

B.  $30\Omega$

C.  $60\Omega$

D.  $45\Omega$

**Answer: C**



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**117.** If the diameter of a resistance wire is halved, then its resistance becomes:

A. four times

B. half

C. one-fourth

D. two times

**Answer: A**



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**118.** The resistivity of a certain material is  $0.6\Omega m$ . The material is most likely to be:

A. an insulator

B. a superconductor

C. a conductor

D. a semiconductor

**Answer: D**



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**119.** When the area of cross-section of a conductor is doubled, its resistance becomes:

- A. double
- B. half
- C. four times
- D. one-fourth

**Answer: B**



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**120.** The resistivity of copper metal depends on only one of the following factors. This factor is:

A. length

B. thickness

C. temperature

D. area of cross-section

**Answer: C**



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**121.** If the area of cross-section of a resistance wire is halved, then its resistance becomes:

A. one-half

B. 2 times

C. one-fourth

D. 4 times

**Answer: B**



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**122.** A piece of wire of resistance  $20\Omega$  is drawn so that its length is increased to twice its original length. Calculate resistance of the wire in the new situation.



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**123.** The electrical resistivities of three materials P, Q and R are given below:

$$P \quad 2.3 \times 10^3 \Omega m$$

$$Q \quad 2.63 \times 10^{-8} \Omega m$$

$$R \quad 1.0 \times 10^{15} \Omega m$$

Which material will you use for making (a) electric wires (b) handle for soldering iron, and (c) solar cells ? Give reasons for your choices.

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**124.** The electrical resistivities of four materials A,B,C and D are given below:

$$A \quad 110 \times 10^{-8} \Omega m$$

$$B \quad 1.0 \times 10^{10} \Omega m$$

$$C \quad 10.0 \times 10^{-8} \Omega m$$

$$D \quad 2.3 \times 10^3 \Omega m$$

Which material is: (a) good conductor (b) resistor (c) insulator, and (d) semiconductor?

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**125.** The electrical resistivities of five substances A,B,C,D and E are given below:

$$A \quad 5.20 \times 10^{-8} \Omega m$$

$$B \quad 110 \times 10^{-8} \Omega m$$

$$C \quad 2.60 \times 10^{-8} \Omega m$$

$$D \quad 10.0 \times 10^{-8} \Omega m$$

$$E \quad 1.70 \times 10^{-8} \Omega m$$



(a) Which substance is the best conductor of electricity? why?

(b) Which one is a better conductor: A or C? Why?

(c) Which substance would you advise to be used for making heating elements of electric irons? Why?

(d) Which two substances should be used for making electric wires? Why?



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## 126. SERIES COMBINATION



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127. If five resistances, each of value  $0.2 \text{ ohm}$ , are connected in series, what will be the resultant resistance?



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**128.** State Ohm's law. Derive an expression for the equivalent resistance of a number of resistances in parallel.



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**129.** If 3 resistances of 3 ohm each are connected in parallel, what will be their total resistance?



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**130.** How should the two resistances of 2 ohms each be connected so as to produce an equivalent resistance of 1 ohm?



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**131.** Two resistances  $X$  and  $Y$  are connected turn by turn: (i) in parallel, and (ii) in series. In which case the resultant resistance will be less than either of the individual resistances?



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**132.** What possible values of resultant resistance one can get by combining two resistances, one of value 2 ohms and the other 6 ohm?



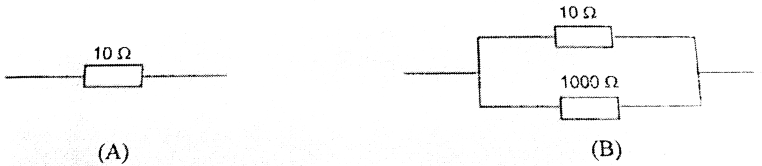
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**133.** Show how you would connect two 4 ohm resistors to produce a combined resistance of (a) 2 ohms (b) 8 ohms.



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**134.** Which of the following resistor arrangement, A or B, has the lower combined resistance?

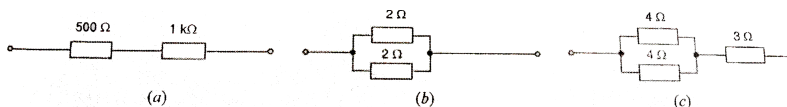


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**135.** A wire that has resistance  $R$  is cut into two equal pieces. The two parts are joined in parallel. What is the resistance of the combination?

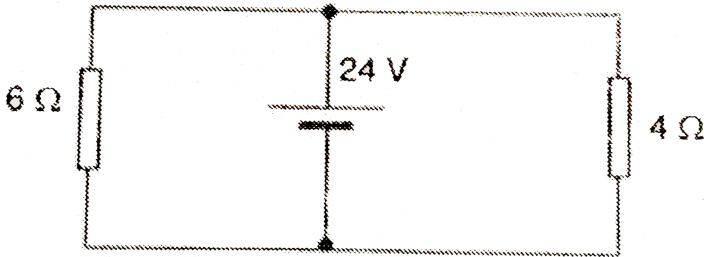
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**136.** Calculate the combined resistance in each case:



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**137.** Find the current in each resistor in the circuit shown below:



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**138.** Explain with diagrams what is meant by the "series combination" and "parallel combination" of resistances. In which case the resultant resistance is: (i) less, and (ii) more, than either of the individual resistances?

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**139.** A battery of  $9V$  is connected in series with resistors of  $0.2\Omega$ ,  $0.3\Omega$ ,  $0.4\Omega$ ,  $0.5\Omega$  and  $12\Omega$ . How much current would flow through the  $12\Omega$  resistor ?

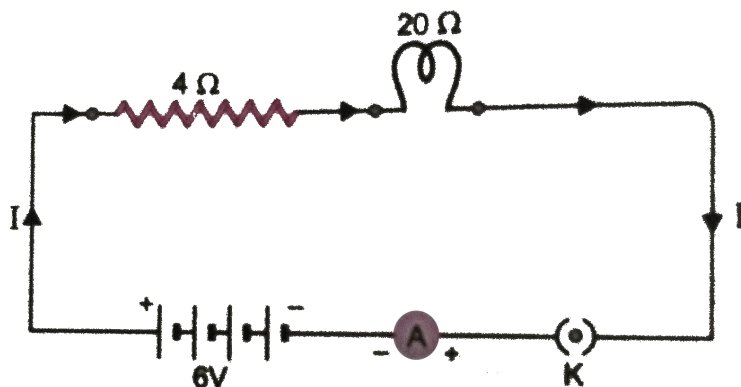


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**140.** An electric lamp, whose resistance is  $20\Omega$  and a conductor of  $4\Omega$  resistance are connected to a  $6V$  battery as shown in (Fig. 3.18) Calculate.

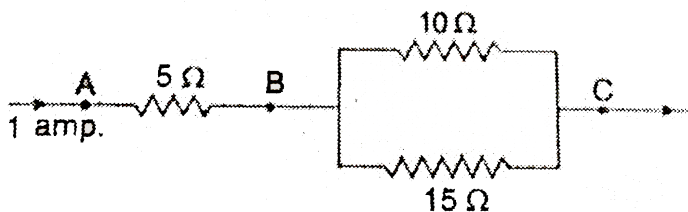
- (a) the total resistance of the circuit,
- (b) the current through the circuit, and
- ( c) the potential difference across the electric lamp and the

conductor.



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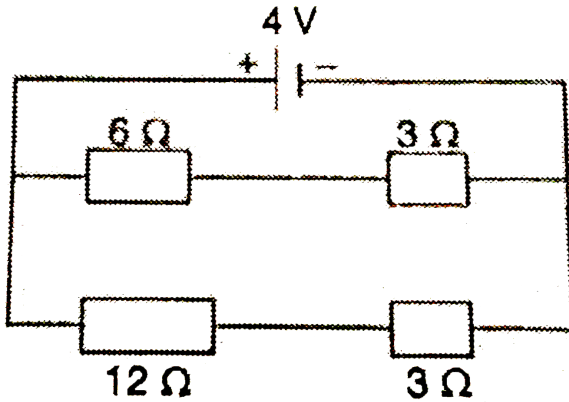
141. Three resistors are connected as shown in the diagram.



Though the resistor 5 ohm, a current of 1 ampere is flowing.

- (i) What is the current through the other two resistors?
- (ii) What is the p.d. across AB and across AC?
- (iii) What is the total resistance?

142. For the circuit shown in the diagram below:



What is the value of:

- (i) Current through  $6\ \Omega$  resistor?
- (ii) potential difference across  $12\ \Omega$  resistor?

A.  $0.44\ \text{A}$ ,  $3.2\ \text{V}$

B.  $0.22\ \text{A}$ ,  $3.2\ \text{V}$

C.  $0.44\ \text{A}$ ,  $6.4\ \text{V}$



D. 0.11 A , 2.0 V

**Answer: A**



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**143.** The resistors, with resistances  $5\Omega$  and  $10\Omega$  respectively are to be connected to a battery of emf 6V so as to obtain:

(i) minimum current flowing (ii) maximum current flowing

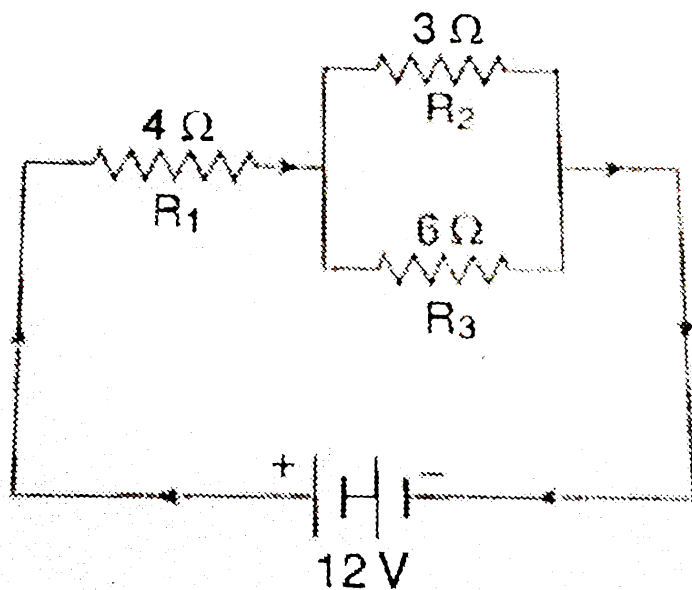
(c) How will you connect the resistances in each case?

(b) Calculate the strength of the total current in the circuit in the two cases.



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**144.** The circuit diagram given below shows the combination of three resistors  $R_1$ ,  $R_2$  and  $R_3$ :



Find: (i) total resistance of the circuit.

(ii) total current flowing in the circuit.

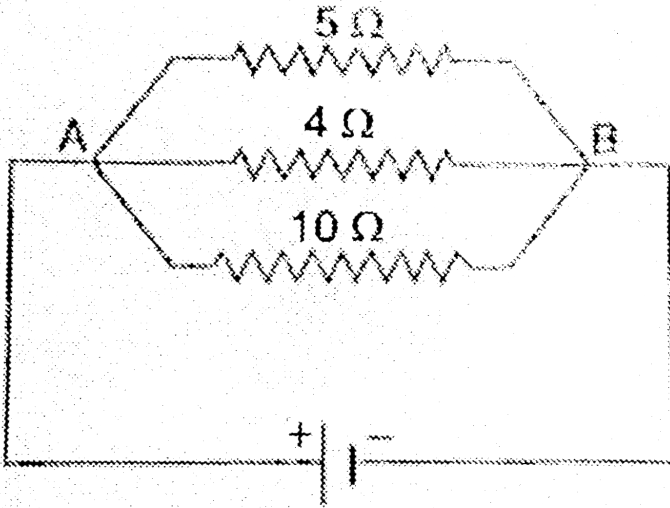
(iii) the potential difference across  $R_1$ .



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**145.** In the circuit diagram given below, the current flowing across 5 ohm resistor is 1 amp. Find the current flowing through the other

two resistors.



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**146.** A resistor has a resistance of 176 ohms. How many of these resistors should be connected in parallel so that their combination draws a current of 5 amperes from a 220 volt supply line?



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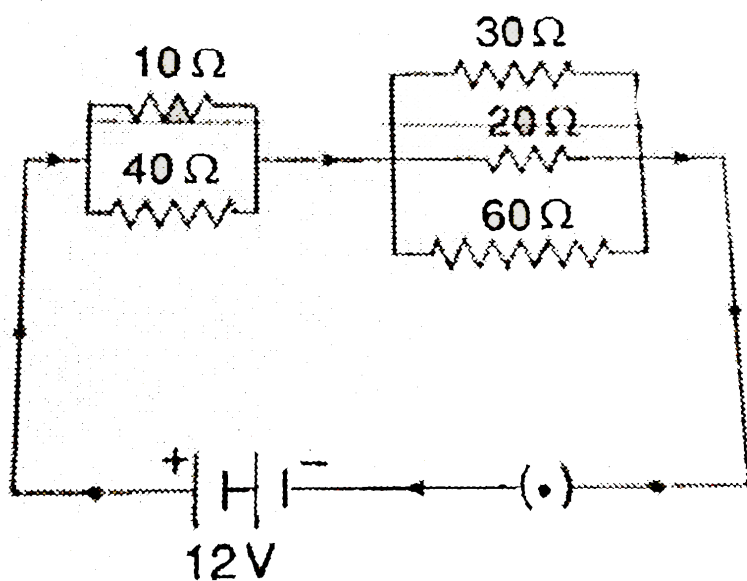
**147.** An electric heater which is connected to a 220V supply line has two resistance coils A and B of  $24\Omega$  resistance each. These coils be used separately (one at a time), in series or in parallel. Calculate the current drawn when:

- (a) only one coil A is used.
- (b) coils A and B are used in series.
- (c) coils A and B are used in parallel.



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**148.** In the circuit diagram given below five resistances of  $10\Omega$ ,  $40\Omega$ ,  $30\Omega$ ,  $20\Omega$  and  $60\Omega$  are connected as shown to a 12 V battery.



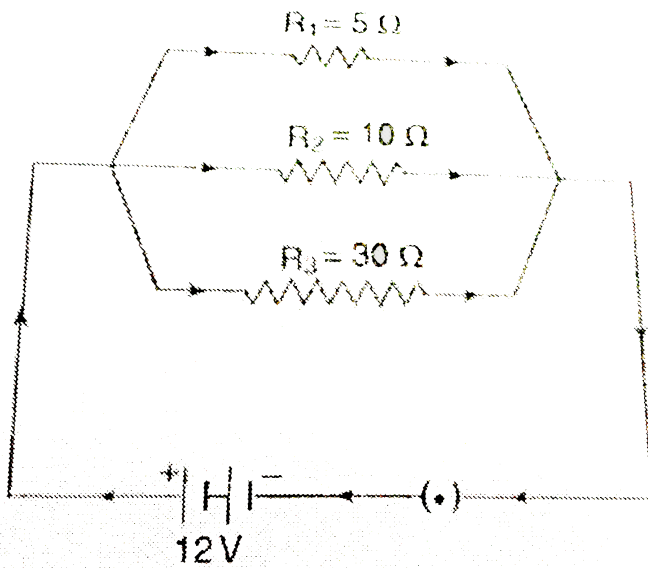
Calculate:

- (a) total resistance in the circuit
- (b) total current flowing in the circuit.



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**149.** In the circuit diagram given below, three resistors  $R_1$ ,  $R_2$ , and  $R_3$  of  $5\ \Omega$ ,  $10\ \Omega$  and  $30\ \Omega$ , respectively are connected as shown.



Calculate:

- (a) current through each resistor.
- (b) total current in the circuit.
- (c) total resistance in the circuit.



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**150.** A p.d. of 4V is applied to two resistors of  $6\ \Omega$  and  $2\ \Omega$  connected in series. Calculate:

- (a) the combined resistance

(b) the current flowing

(c) the p.d. across the  $6\Omega$  resistor



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**151.** A p.d. of 6V is applied to two resistors of  $3\Omega$  and  $6\Omega$  connected in parallel. Calculate:

(a) the combined resistance

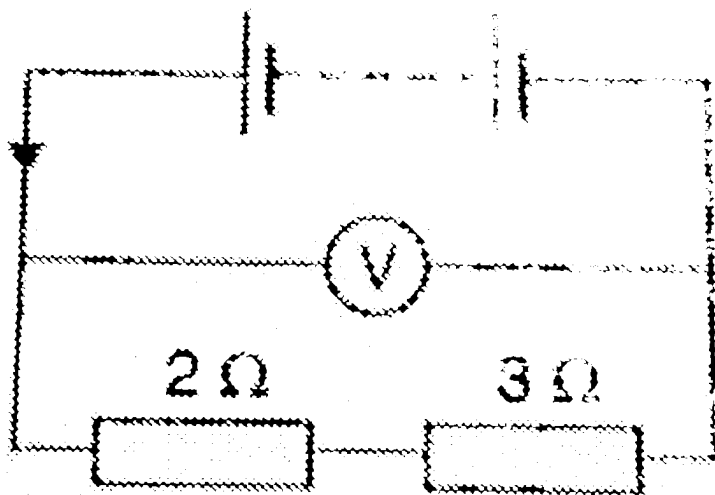
(b) the current flowing in the main circuit.

(c) the current flowing in the  $3\Omega$  resistor.



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152. In the circuit shown below, the voltmeter reads 10V.



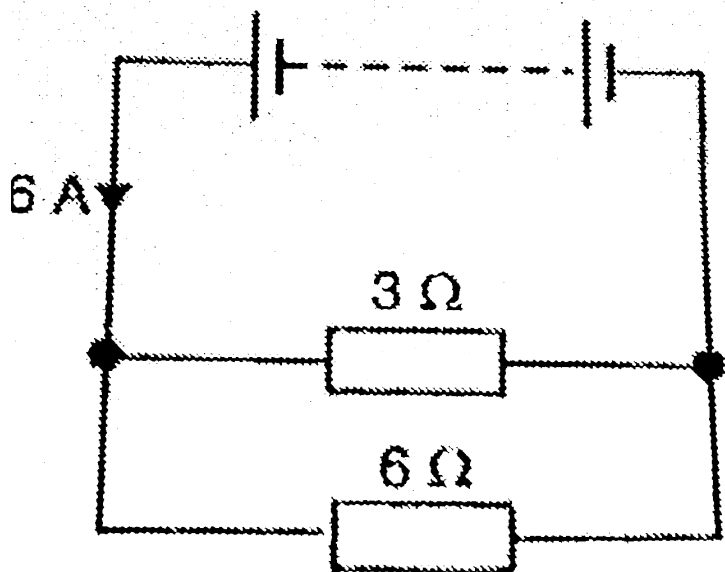
- (a) What is the combined resistance?
- (b) What current flows?
- (c) What is the p.d. across  $2\ \Omega$  resistor?
- (d) What is the p.d. across  $3\ \Omega$  resistor?



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153. In the circuit given below:



- (a) What is the combined resistance?
- (b) What is the p.d. across the combined resistance?
- (c) What is the p.d. across the  $3\ \Omega$  resistor?
- (d) What is the current in the  $3\ \Omega$  resistor?
- (e) What is the current in the  $6\ \Omega$  resistor?



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**154.** A 5V battery is connected to two  $20\Omega$  resistors which are joined together in series.

(a) Draw a circuit diagram to represent this. Add an arrow to indicate the direction of conventional current flow in the circuit.

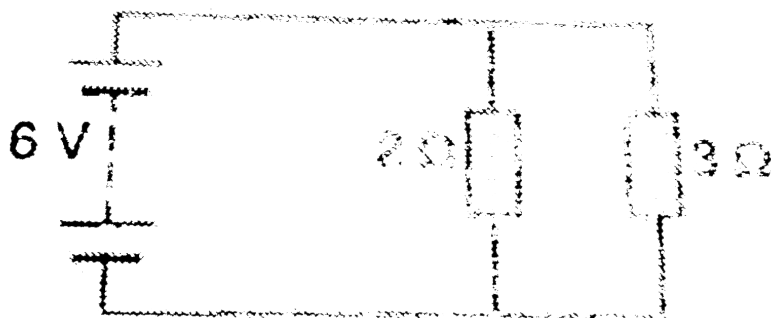
(b) What is the effective resistance of two resistors?

(c) Calculate the current that flows from the battery.

(d) What is the p.d. across each resistor?

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**155.** The figure given below shows an electric circuit in which current flows from a 6V battery through two resistors.



- (a) Are the resistors connected in series with each other or in parallel?
- (b) For each resistor, state the p.d. across it.
- (c) The current flowing from the battery is shared between the two resistors. Which resistor will have bigger share of the current?
- (d) Calculate the effective resistance of the two resistors.
- (e) Calculate the current that flows from the battery.



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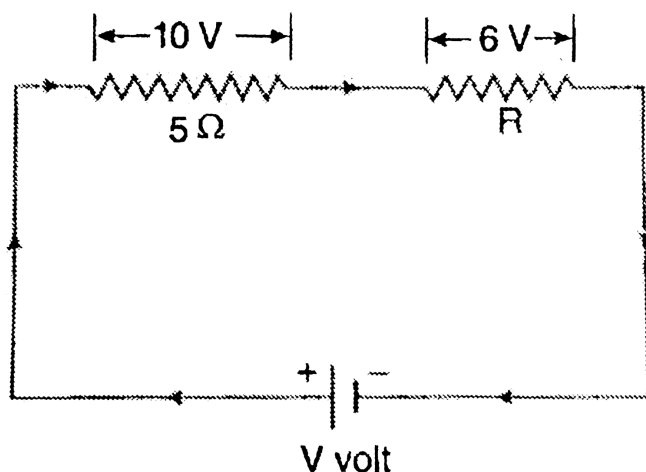
**156.** A  $4\Omega$  coil and a  $2\Omega$  coil are connected in parallel. What is their combined resistance? A total current of 3A passes through the coils. What current passes through the  $2\Omega$  coil?



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157. (a) With the help of a circuit diagram, deduce the equivalent resistance of two resistances connected in series.

(b) Two resistances are connected in series as shown in the diagram:



(i) What is the current through the 5 ohm resistance?

(ii) What is the current through R?

(iii) What is the value of R?

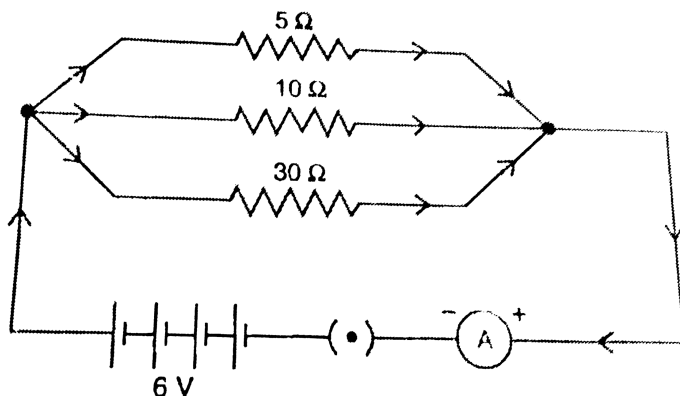
(iv) What is the value of V?



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**158.** (a) With the help of a diagram, derive the formula for the resultant resistance of these resistors connected in series.

(b) For the circuit shown in the diagram given below:



Calculate:

- (i) the value of current each resistor.
- (ii) the total current in the circuit.
- (iii) the total effective resistance of the circuit.

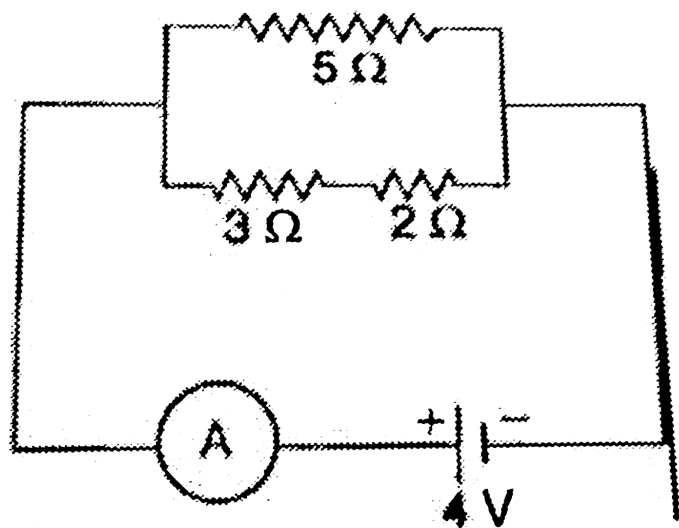
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**159.** (a) With the help of a circuit diagram, obtain the relation for the equivalent resistance of two resistances connected in parallel.

(b) In the circuit diagram shown below, find:

(i) Total resistance.

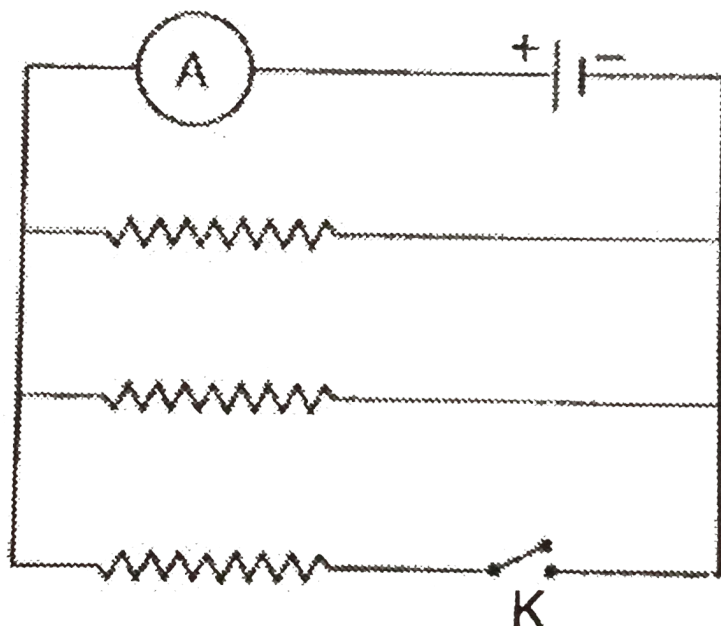
(ii) Current shown by the ammeter A



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**160.** (a) Explain with the help of a labelled circuit diagram, how you will find the resistance of a combination of three resistors of resistances  $R_1$ ,  $R_2$  and  $R_3$  joined in parallel.

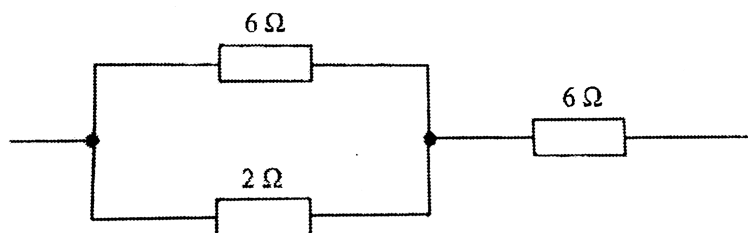
(b) In the diagram shown below, the cell and the ammeter both have negligible resistance. The resistors are identical.



With the switch K open, the ammeter reads 0.6A. What will be the ammeter reading when the switch is closed?

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**161.** The figure given below shows three resistors:



Their combined resistance is:

A.  $1\frac{5}{7}\Omega$

B.  $14\Omega$

C.  $6\frac{2}{3}\Omega$

D.  $7\frac{1}{2}\Omega$

**Answer: D**



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**162.** If two resistors of  $25\Omega$  and  $15\Omega$  are joined together in series and then placed in parallel with a  $40\Omega$  resistor, the effective resistance of the combination is:

A.  $0.1\Omega$

B.  $10\Omega$



C.  $20\Omega$

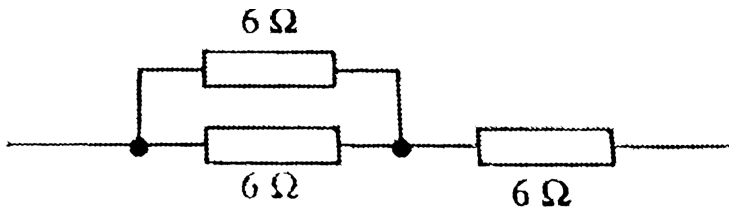
D.  $40\Omega$

**Answer: C**



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**163.** The diagram below shows part of a circuit:



If this arrangement of three resistors was to be replaced by a single resistor, its resistance should be:

A.  $9\Omega$

B.  $4\Omega$

C.  $6\Omega$

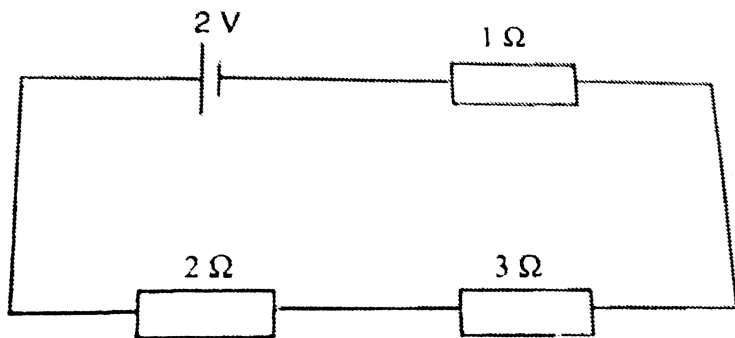
D.  $18\Omega$

**Answer: A**



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**164.** In the circuit shown below:



The potential difference across the  $3\Omega$  resistor is:

A.  $\frac{1}{9}V$

B.  $\frac{1}{2}V$

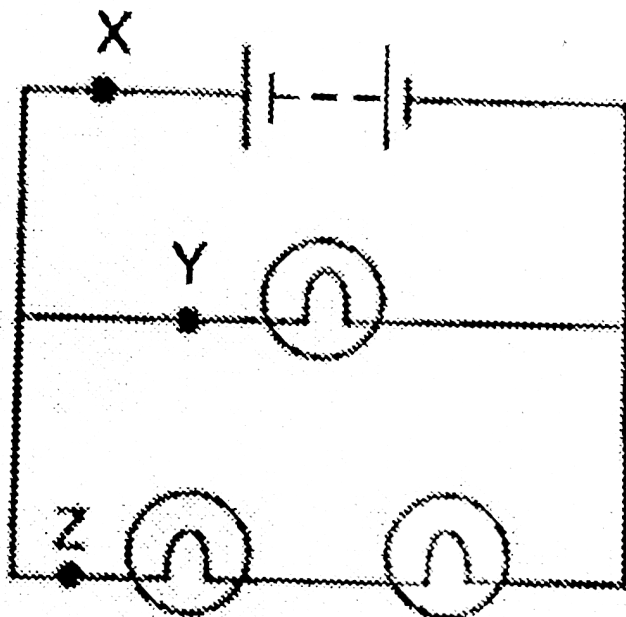
C.  $1V$

D.  $2V$

Answer: C

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165. A battery and three lamps are connected as shown:



Which of the following statements about the currents at X, Y and Z is correct?

A. The current at Z is greater than that at Y

B. The current at Y is greater than that at Z s

C. The current at X equals the current at Y

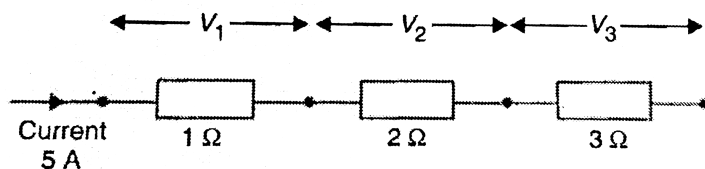
D. The current at X equals the current at Z

**Answer: B**



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**166.**  $V_1$ ,  $V_2$  and  $V_3$  are the p.ds. across the  $1\Omega$ ,  $2\Omega$  and  $3\Omega$  resistors in the following diagram, and the current is 5A.



Which one of the columns (a) to (d) shows the correct values of  $V_1$ ,  $V_2$  and  $V_3$  measured in volts?

A. 

$V_1$	$V_2$	$V_3$
1.0	2.0	3.0

B.  $\begin{array}{ccc} V_1 & V_2 & V_3 \\ 5.0 & 10.0 & 15.0 \end{array}$

C.  $\begin{array}{ccc} V_1 & V_2 & V_3 \\ 5.0 & 2.5 & 1.6 \end{array}$

D.  $\begin{array}{ccc} V_1 & V_2 & V_3 \\ 4.0 & 3.0 & 2.0 \end{array}$

**Answer: B**



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**167.** A wire of resistance  $R_1$  is cut into five equal pieces. These five pieces of wire are then connected in parallel. If the resultant resistance of this combination be  $R_2$ , then the ratio  $\frac{R_1}{R_2}$  is:

A.  $\frac{1}{25}$

B.  $\frac{1}{5}$

C. 5

D. 25

**Answer: A::B::C::D**



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**168.** Show with the help of diagrams, how you would connect three resistors each of resistance  $6\Omega$ , so that the combination has resistance of (i)  $9\Omega$  (ii)  $4\Omega$ .



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**169.** Two resistances when connected in parallel give resultant value of 2 ohm, when connected in series the value becomes 9 ohm. Calculate the value of each resistance.



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**170.** A resistor of 8 ohms is connected in parallel with another resistor X. The resultant resistance of the combination is 4.8 ohms.

What is the value of the resistor X?



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**171.** You are given three resistances of 1, 2 and 3 ohms. Show by diagrams, how with the help of these resistances you can get:

(i)  $6\Omega$  (ii)  $\frac{6}{11}\Omega$  (iii)  $15\Omega$



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**172.** How will you connect three resistors of  $2\Omega$ ,  $3\Omega$  and  $5\Omega$  respectively so as to obtain a resultant resistance of  $2.5\Omega$ ? Draw the diagram to show the arrangement.



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**173.** How will you connect three resistors of  $2\Omega$ ,  $3\Omega$  and  $6\Omega$  to obtain a total resistance of : (a)  $4\Omega$ , and (b)  $1\Omega$ ?



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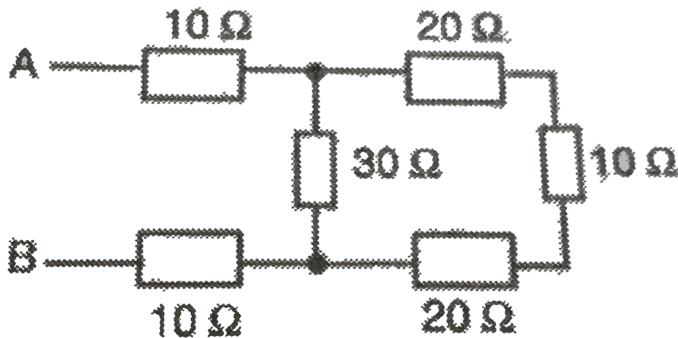
**174.** What is : (a) the highest (b) the lowest total resistances that can be obtained by combinations of four coils of resistances  $4\Omega$ ,  $8\Omega$ ,  $12\Omega$ ,  $24\Omega$  ?



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**175.** What is the resistance between A and B in the figure given below?





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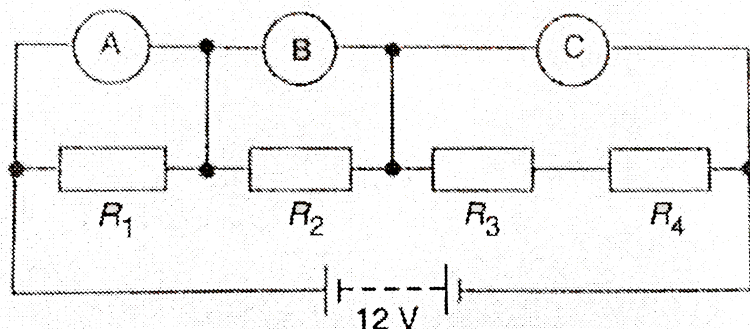
**176.** You are given one hundred  $1\ \Omega$  resistors. What is the smallest and largest resistance you can make in a circuit using these?

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**177.** You are supplied with a number of  $100\ \Omega$  resistors. How could you combine some of these resistors to make a  $250\ \Omega$  resistor?

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178. The resistors  $R_1$ ,  $R_2$ ,  $R_3$  and  $R_4$  in the figure given below are all equal in value.



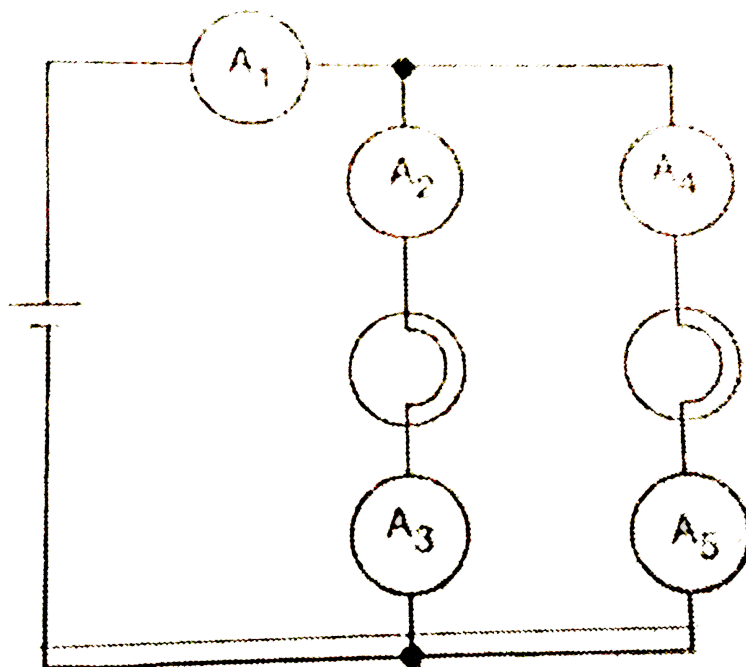
What would you expect the voltmeters A,B and C to read assuming that the connecting wires in the circuit have negligible resistance ?

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179. Four resistances of 16 ohms each are connected in parallel. Four such combinations are connected in series. What is the total resistance?

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**180.** If the lamps are both the same in the figure given below and if  $A_1$  reads  $0.50A$ , what do  $A_2$ ,  $A_3$ ,  $A_4$  and  $A_5$  read?



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**181.** Are the lights in your house wired in series?

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**182.** What happens to the other bulbs in a series circuit if one bulb blows off?



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**183.** What happens to the other bulbs in a parallel circuit if one bulb blows off?



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**184.** Which types of circuit, series or parallel, is preferred while connecting a large number of bulbs:

(a) for decorating a hotel building from outside?

(b) for lighting inside the rooms of the hotel?



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**185.** Draw a circuit diagram to show how two 4V electric lamps can be lit brightly from two 2V cells.



**Watch Video Solution**

**186.** Why is a series arrangement not used for connecting domestic electrical appliances in a circuit?



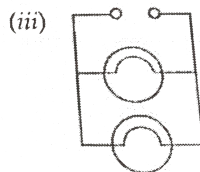
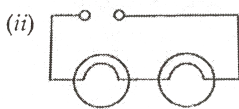
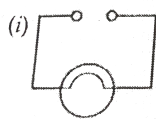
**Watch Video Solution**

**187.** Why is a series arrangement not used for connecting domestic electrical appliances in a circuit?



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**188.** Consider the circuits given below:



(a) In which circuit are the lamps dimmest?

(b) In which circuit or circuits are the lamps of equal brightness to the lamps in circuit (i)?

(c) Which circuit gives out the maximum light?



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**189.** If you were going to connect two light bulbs to one battery, would you use a series or a parallel arrangement? Why? Which arrangement takes more current from the battery?



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**190.** (a) Which is the better way to connect lights and other electrical appliances in domestic wiring: series circuits or parallel circuits? Why?

(b) Christmas tree lamps are usually wired in series. What happens if one lamp breaks?

(c) An electrician has wired a house in such a way that if a lamp gets fused in one room of the house, all the lamps in other rooms of the house stop working. What is the defect in the wiring?

(d) Draw a circuit diagram showing two electric lamps connected in parallel together with a cell and a switch that works both lamps. Mark an A on your diagram to show where an ammeter should be placed to measure the current.



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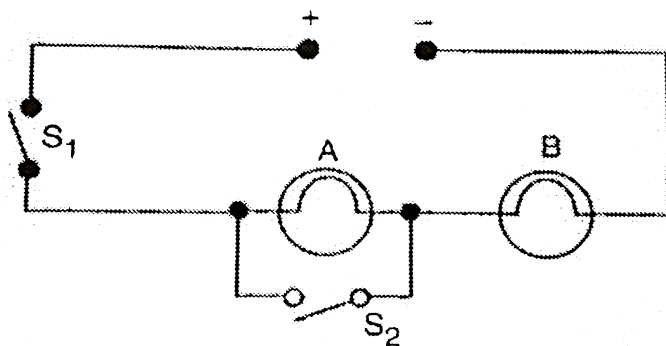
**191.** The lamps in a household circuit are connected in parallel because:

- (a) this way they require less current
- (b) if one lamp fails the others remain lit
- (iii) this way they require less power
- (d) if one lamp fails the others also fail



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**192.** Using the circuit given below, state which of the following statemet is correct?



- (a) When  $S_1$  and  $S_2$  are closed, lamps A and B are lit.
- (b) With  $S_1$  open and  $S_2$  closed, A is lit and B is not lit.
- (c) With  $S_2$  open and  $S_1$  closed A and B are lit.



(d) With  $S_1$  closed and  $S_2$  open, lamp A remains lit even if lamp B gets fused.

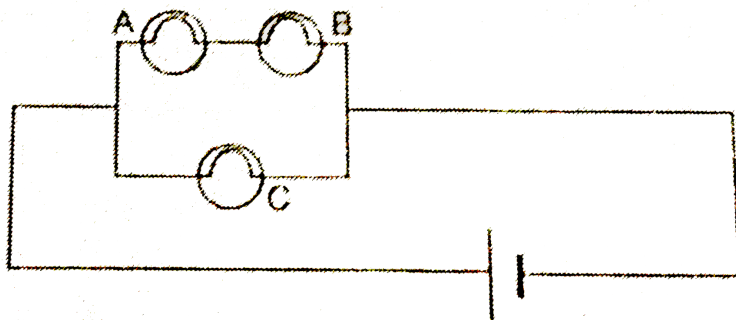
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**193.** (a) Draw a circuit diagram showing two lamps, one cell and a switch connected in series.

(b) How can you change the brightness of the lamps?

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**194.** Consider the circuit given below where A,B and C are three identical light bulbs of constant resistance.



(a) List the bulbs in order of increasing brightness.

(b) If C burns out, what will be the brightness of A now compared with before?

(c) If B burns out instead, what will be the brightness of A and C compared with before?



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**195.** How do you think the brightness of two lamps arranged in parallel compares with the brightness of two lamps arranged in series (both arrangements having one cell)?



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**196.** If current flows through two lamps arranged:

(a) in series,

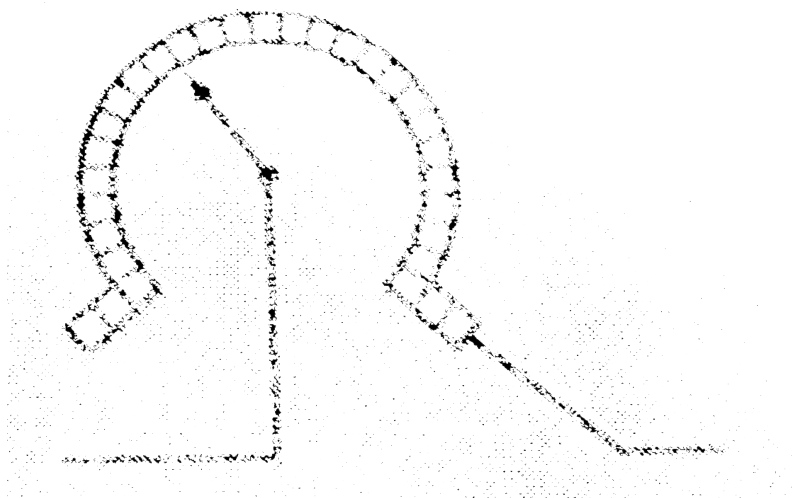
(b) in parallel,

and the filament of one lamp breaks, what happens to the other lamp? Explain your answer.



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**197.** The figure below shows a variable resistor in a dimmer switch.



How would you turn the switch to make the lights: (a) brighter, and (b) dimmer? Explain your answer.



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**198.** State two factors on which the electrical energy consumed by an electrical appliance depends.



**Watch Video Solution**

**199.** Which one has a higher electrical resistance: a 100 watt bulb or a 60 watt bulb?

- A. 60 watt
- B. 100 watt
- C. Same for both
- D. None of these

**Answer: A**



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## 200. COMMERCIAL UNIT OF ENERGY



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201. An electric bulb is rated at 220V, 100W. What is its resistance?



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202. What is the SI unit of (i) electric energy, and (ii) electric power?



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203. Distinguish between kilowatt and kilowatt hour.



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**204.** Name the physical quantity whose unit is watt.



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**205.** What is the meaning of the symbol kWh? Which quantity does it represent?



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**206.** If the potential difference between the end of a wire of mixed resistance is doubled, by how much does the electric power increase?



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**207.** An electric lamp is labelled 12V, 36W. This indicates that it should be used with a 12 V supply. What other information does the label provide?



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**208.** What current will be taken by a 920 W appliance if the supply voltage is 230 V?



**Watch Video Solution**

**209.** Define watt. Write down an equation linking watts, volts and amperes.



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**210.** Define watt-hour. How many joules are equal to 1 watt-hour?



**Watch Video Solution**

**211.** How much energy is consumed when a current of 5 amperes flows through the filament (or element) of a heater having resistance of 100 ohms for two hours? Express it in joules.



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**212.** An electric bulb is connected to a 220V power supply line. If the bulb draws a current of 0.5A, calculate the power of the bulb.



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**213.** In which of the following cases more electrical energy is consumed per hour?

(i) A current of 1 ampere passed through a resistance of 300 ohms.

(ii) A current of 2 amperes passed through a resistance of 100 ohms.



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**214.** An electric kettle rated at 220V, 2.2kW, works for 3 hours. Find the energy consumed and the current drawn.



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**215.** In a house two 60W electric bulbs are lighted for 4 hours, and three 100 W bulbs for 5 hours everyday. Calculate the electric energy consumed in 30 days.



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**216.** A bulb is rated as 250V, 0.4A. Find its : (i) power and (ii) resistance.



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**217.** For a heater rated at 4kW and 220V, calculate:

- (a) the current,
- (b) the resistance of the heater,
- (c) the energy consumed in 2 hours, and
- (d) the cost if 1kWh is priced at Rs 4.60.



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**218.** An electric motor takes 5 amperes current from a 220 volt supply line. Calculate the power of the motor and electrical energy consumed by it in 2 hours.



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**219.** Which uses more energy: a 250 WTV set in 1 hour or a 1200 W toaster in 10 minutes?



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**220.** Compare the power used in the  $2\Omega$  resistor in each of the following circuits :

- (i) a  $6V$  battery in series with  $1\Omega$  and  $2\Omega$  resistors, and
- (ii) a  $4V$  battery in parallel with  $12\Omega$  and  $2\Omega$  resistors.



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**221.** Two lamps, one rated 40W at 220V and the other 60W at 220V, are connected in parallel to the electric supply at 220V.

- (a) Draw a circuit diagram to show the connections.
- (b) Calculate the current drawn from the electric supply.
- (c) Calculate the total energy consumed by the two lamps together when they operate for one hour.



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**222.** An electric kettle connected to the 230V mains supply draws a current of 10 A. Calculate:

- (a) the power of the kettle.
- (b) the energy transferred in 1 minute.



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**223.** A 2 kW heater, a 200 WTV and three 100W lamps are all switched on from 6 p.m. to 10 p.m. What is the total cost at Rs. 5.50 per kWh?



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**224.** What is the maximum power in kilowatts of the appliance that can be connected safely to a 13A, 230V mains socket?



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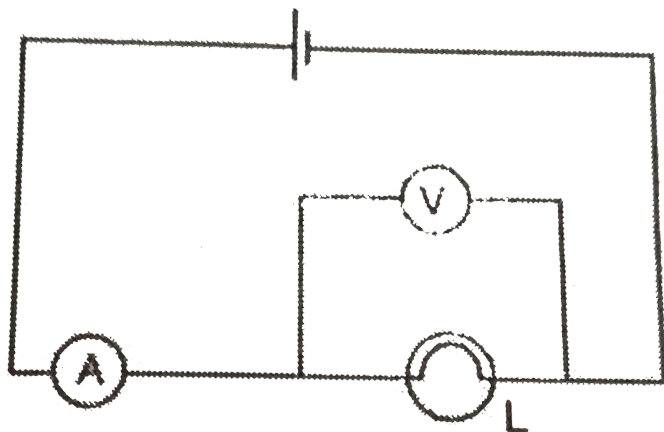
**225.** An electric fan runs from the 230V mains. The current flowing through it is 0.4A. At what rate is electrical energy transferred by the fan?



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226. (a) What is meant by "electric power"? Write the formula for electric power in terms of potential difference and current.

(b) The diagram below shows a circuit containing a lamp L, a voltmeter and an ammeter. The voltmeter reading is 3V and the ammeter reading is 0.5A.



(i) What is the resistance of the lamp?

(ii) What is the power of the lamp?

(c) Define kilowatt-hour. How many joules are there in one kilowatt-hour?

(d) Calculate the cost of operating a heater of 500 W for 20 hours at the rate of Rs 3.90 per unit.



**227.** When an electric lamp is connected to 12V battery, it draws a current of 0.5A. The power of the lamp is:

A. 0.5W

B. 6W

C. 12W

D. 24W

**Answer: B**



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**228.** The unit for expressing electric power is:

A. volt

B. joule

C. coulomb

D. watt

**Answer: D**



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**229.** Which of the following is likely to be the correct wattage for an electric iron used in our homes?

A. 60W

B. 250W

C. 850W

D. 2000W

**Answer: C**





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**230.** An electric heater is rated at 2 kW. Electrical energy costs Rs 4 per kWh. What is the cost of using the heater for 3 hours?

- A. Rs 12
- B. Rs 24
- C. Rs 36
- D. Rs 48

**Answer: B**



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**231.** Unit of energy in SI system is

A. joule

B. coulomb

C. watt

D. ohm-metre

**Answer: A**



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### **232. Commercial Unit Of Energy**

A. watt

B. watt-hour

C. kilowatt-hour

D. kilo-joule

**Answer: C**



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**233.** How much energy does a 100W electric bulb transfer in 1 minute?

A. 100J

B. 600 J

C. 3600 J

D. 6000 J

**Answer: D**



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**234.** An electric kettle for use on a 230V supply is rated at 300 W. for safe working the cable connected to it should be able to carry at least:

- A. 2A
- B. 5A
- C. 10A
- D. 15A

**Answer: D**



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**235.** How many joules of electrical energy are transferred per second by a 6V, 0.5A lamp?

- A.  $30J/s$

B.  $12J/s$

C.  $0.83J/s$

D.  $3J/s$

**Answer: D**



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**236.** At a given time, a house is supplied with 100A at 220V. How many 75W, 220V light bulbs could be switched on in the house at the same time (if they are all connected in parallel)?

A. 93

B. 193

C. 293

D. 393

**Answer: C**



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**237.** If the potential difference between the ends of a fixed resistor is halved, the electric power will become:

- A. double
- B. half
- C. four times
- D. one-fourth

**Answer: D**



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**238.** State whether an electric heater will consume more electrical energy or less electrical energy per second when the length of its heating element is reduced. Give reason for your answer.



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**239.** The table below shows the current in three different electrical appliances when connected to the 240V mains supply:

Appliance	Current
Kettle	8.5A
Lamp	0.4A
Toaster	4.8A

(a) Which appliance has the greatest electrical resistance? How does the data show this?

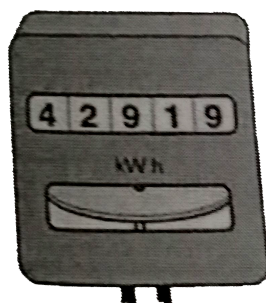
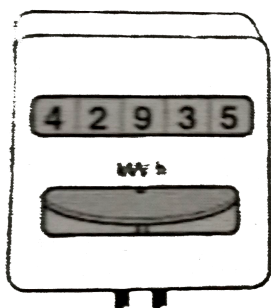
(b) The lamp is connected to the mains supply by using a thin, twin-cored cable consisting of live and neutral wires. State two reasons why this cable should not be used for connecting the kettle to the mains supply.

(c) Calculate the power rating of the kettle when it is operated from the 240V mains supply.

(d) A man takes the kettle abroad where the mains supply is 120V. What is the current in the kettle when it is operated from the 120 supply?

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**240.** A boy noted the readings on his home's electricity meter on Sunday at 8AM and again on Monday at 8 AM



- (a) What was the meter reading on Sunday?
- (b) What was the meter reading on Monday?
- (c) How many units of electricity have been used?



(d) In how much time these units have been used?

(e) If the rate is Rs 5 per unit, what is the cost of electricity used during this time?



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**241.** Several electric bulbs designed to be used on a  $220V$  electric supply line, are rated  $10W$ . How many lamps can be connected in parallel with each other across the two wires of  $220V$  line if the maximum allowable current is  $5A$  ?



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**242.** Two exactly similar electric lamps are arranged (i) in parallel, and (ii) in series. If the parallel and series combination of lamps are connected to  $220V$  supply line one by one, what will be the ratio of electric power consumed by them?



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**243.** How does the heat  $H$  produced by a current passing through a fixed resistance wire depend on the magnitude of current  $I$ ?



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**244.** The current passing through an electric kettle has been doubled. The heat produced will become:



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**245.** Name two effect produced by electric current.



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**246.** Which effect of current is utilised in an electric light bulb?



**Watch Video Solution**

**247.** Which effect of electric current is used in the working of an electric fuse?



**Watch Video Solution**

**248.** Name two effect produced by electric current.



**Watch Video Solution**

**249.** Explain why, filament type electric bulbs are not power efficient.



**Watch Video Solution**

**250.** Why does the cord of an electric heater not glow while the heating element does ?



**Watch Video Solution**

**251.** (a) Write down the formula for the heat produced when a current  $I$  is passed through a resistor  $R$  for time  $t$ .

(b) An electric iron of resistance 20 ohms draws a current of 5 amperes. Calculate the heat produced in 30 seconds.



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**252.** Why is an electric light bulb not filled with air? Explain why argon or nitrogen is filled in an electric bulb.



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**253.** Explain why, tungsten is used for making the filaments of electric bulbs.



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**254.** Explain why, the current that makes the heater element very hot, only slightly warms the connecting wires leading to the heater.



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**255.** When a current of  $4.0\text{A}$  passes through a certain resistor for 10 minutes,  $2.88 \times 10^4\text{J}$  of heat are produced. Calculate:

(a) the power of the resistor.

(b) the voltage across the resistor.

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**256.** A heating coil has a resistance of  $200\Omega$ . At what rate will heat be produced in it when a current of  $2.5A$  flows through it?

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**257.** An electric heater of resistance  $8\Omega$  draws  $15A$  from the service mains for 2 hours. Calculate the rate at which heat is developed in the heater.

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**258.** A resistance of  $25\Omega$  is connected to a  $12V$  battery. Calculate the heat energy in joules generated per minute.

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**259.**  $100J$  of heat are produced each second in a  $4\Omega$  resistance.

Find the potential difference across the resistor.



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**260.** (a) Derive the expression for the heat produced due to a current ' $I$ ' flowing for a time interval ' $t$ ' through a resistor ' $R$ ' having a potential difference ' $V$ ' across its ends. With which name is this relation known?

(b) How much heat will an instrument of  $12W$  produce in one minute if it is connected to a battery of  $12V$ ?

(c) The current passing through a room heater has been halved. what will happen to the heat produced by it?

(d) What is meant by the heating effect of current? Give two applications of the heating effect of current.

(e) Name the material which is used for making the filaments of an electric bulb.



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**261.** The heat produced by passing an electric current through a fixed resistor is proportional to the square of:

- A. magnitude of resistance of the resistor
- B. temperature of the resistor
- C. magnitude of current
- D. time for which current is passed

**Answer: C**



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**262.** The current passing through an electric kettle has been doubled. The heat produced will become:

- A. half
- B. double
- C. four times
- D. one-fourth

**Answer: C**



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**263.** What is an electric fuse? How does it function?

- A. chemical effect of current
- B. magnetic effect of current

C. lighting effect of current

D. heating effect of current

**Answer: D**



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**264.** The elements of electrical heating devices are usually made of:

A. tungsten

B. bronze

C. nichrome

D. argon

**Answer: C**



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**265.** The heat produced in a wire of resistance 'x' when a current 'y' flows through it in time 'z' is given by:

A.  $x^2 \times y \times z$

B.  $x \times z \times y^2$

C.  $y \times z^2 \times x$

D.  $y \times z \times x$

**Answer: B**



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**266.** Which of the following characteristic is not suitable for a fuse wire?

A. thin and short

B. thick and short

C. low melting point

D. higher resistance than rest of wiring

**Answer: B**



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**267.** In a filament type light bulb, most of the electric power consumed appears as:

A. visible light

B. infra-red-rays

C. ultraviolet rays

D. fluorescent light

**Answer: B**

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**268.** Which of the following is the most likely temperature of the filament of an electric light bulb when it is working on the normal 220 V supply line?

A.  $500^{\circ}C$

B.  $1500^{\circ}C$

C.  $2500^{\circ}C$

D.  $4500^{\circ}C$

**Answer: C**

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**269.** If the current flowing through a fixed resistor is halved, the heat produced in it will become:

- A. double
- B. one-half
- C. one-fourth
- D. four times

**Answer: C**



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**270.** The electrical resistivities of four materials P,Q,R and S are given below:

$$P \quad 6.84 \times 10^{-8} \Omega m$$

$$Q \quad 1.70 \times 10^{-8} \Omega m$$

$$R \quad 1.0 \times 10^{15} \Omega m$$

$$S \quad 11.0 \times 10^{-7} \Omega m$$

Which material will you use for making: (a) heating element of electric iron (b) connecting wire of electric iron (c) covering of connecting wires? Give reason for your choice in each case.



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**271.** (a) How does the wire in the filament of a light bulb behave differently to the other wires in the circuit when the current flows?

(b) What property of the filament wire accounts for this difference?



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**272.** Two exactly similar heating resistances are connected (i) in series, and (ii) in parallel, in two different circuits, one by one. If the same current is passed through both the combinations, is more heat obtained per minute when they are connected in series or when they are connected in parallel? Give reason for you answer.



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**273.** Which electric heating devices in your home do you think have resistors which control the flow of electricity?



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**274.** What does an electric circuit mean ?



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**275.** Define the unit of current.



**Watch Video Solution**



**276.** Calculate the number of electrons constituting one coulomb of charge.



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**277.** Name a device that helps to maintain a potential difference across a conductor.



**Watch Video Solution**

**278.** What is meant by saying that the potential difference between two points is  $1V$  ?



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**279.** How much energy is given to each coulomb of charge passing through a  $6V$  battery ?

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**280.** On what factors does the resistance of a conductor depend ?

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**281.** Will current flow more easily through a thick wire or a thin wire of the same material when connected to the same source ?  
Why ?

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**282.** Let the resistance of an electrical component remain constant while the potential difference across the two ends of the component decreases to half its former value. What change will occur in the current through it ?



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**283.** Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal ?



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**284.** Draw a schematic diagram of a circuit consisting of a battery of three cells of  $2V$  each, a  $5\text{ ohm}$  resistor, an  $8\text{ ohm}$  resistor, and a  $12\text{ ohm}$  resistor, and a plug key, all connected in series.



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**285.** Judge the equivalent resistance when the following are connected in parallel.

(a)  $1\Omega$  and  $10^6\Omega$

(b)  $1\Omega$  and  $10^8\Omega$  and  $10^6\Omega$ .

- A. For (a) less than 1 and for (b) greater than 1
- B. For (a) greater than 1 and for (b) greater than 1
- C. For (a) less than 1 and for (b) less than 1
- D. For (a) less than 1 and for (b) greater than 10000

**Answer: C**



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**286.** An electric lamp of  $100\Omega$ , a toaster of resistance  $50\Omega$  and a water filter of resistance  $500\Omega$  are connected in parallel to a  $220V$  source. What is the resistance of an electric iron connected to the same source that takes as much current as all three appliances and what is the current through it ?

A.  $R = 31.25 \text{ ohm}$  ,  $I = 7.04A$

B.  $R = 35.25 \text{ ohm}$  ,  $I = 7.04A$

C.  $R = 45.50 \text{ ohm}$  ,  $I = 5.09A$

D.  $R = 25.25 \text{ ohm}$  ,  $I = 40.04A$

**Answer: A**



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**287.** What are the advantages of connecting electrical devices in parallel with the battery instead of connected them in series ?



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**288.** How can three resistors of resistances  $2\Omega$ ,  $3\Omega$ , and  $6\Omega$  be connected to give a total resistance of

(a)  $4\Omega$

(b)  $1\Omega$  ?



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**289.** What is : (a) the highest (b) the lowest total resistances that can be obtained by combinations of four coils of resistances  $4\Omega$ ,  $8\Omega$ ,  $12\Omega$ ,  $24\Omega$  ?



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**290.** Why does the cord of an electric heater not glow while the heating element does ?

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**291.** Compute the heat generated while transferring 96000 coulombs of charge in one hour through a potential difference of 50V.

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**292.** An electric iron of resistance  $20\Omega$  takes a current of 5A. Calculate the heat developed in 30s.

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**293.** What determines the rate at which energy is delivered by a current ?



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**294.** An electric motor takes  $5A$  from a  $220V$  line. Determine the power and energy consumed in  $2h$ .



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**295.** A piece of wire of resistance  $R$  is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is  $R'$ , then the ratio  $R/R'$  is :

A.  $1/25$

B.  $1/5$



C. 5

D. 25

**Answer: D**



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**296.** Which of the following terms does not represent electrical power in a circuit :

A.  $I^2 R$

B.  $IR^2$

C.  $VI$

D.  $V^2 / R$

**Answer: B**



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**297.** An electric bulb is rated  $220V$  and  $100W$ . When it is operated on  $110V$ , the power consumed will be :

A.  $100\text{ W}$

B.  $75\text{ W}$

C.  $50W$

D.  $25W$

**Answer:**



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**298.** Two conducting wires of the same material and of equal length and equal diameters are first connected in series and then

in parallel in an electric circuit. The ratio of the heat produced in series and parallel combinations would be :

A. 1 : 2

B. 2 : 1

C. 1 : 4

D. 4 : 1

**Answer:**



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**299.** How is voltmeter connected in the circuit to measure potential difference between two points ?



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**300.** A copper wire has a diameter of  $0.5\text{mm}$  and a resistivity of  $1.6 \times 10^{-6} \Omega\text{cm}$ . How much of this wire would be required to make a  $10\Omega$  coil ? How much does the resistance change if the diameter is doubled ?



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**301.** The value of current,  $I$ , flowing in a given resistor for the corresponding values of potential difference,  $V$ , across the resistor are given below :

$I(\text{ampere})$	0.5	1.0	2.0	3.0	4.0
$V(\text{volt})$	1.6	3.4	6.7	10.2	13.2

Plot a graph between  $V$  and  $I$  and calculate the resistance of the resistor.



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**302.** When a  $12V$  battery is connected across an unknown resistor, there is a current of  $2.5mA$  in the circuit. Find the value of the resistance of the resistor.



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**303.** A battery of  $9V$  is connected in series with resistors of  $0.2\Omega$ ,  $0.3\Omega$ ,  $0.4\Omega$ ,  $0.5\Omega$  and  $12\Omega$ . How much current would flow through the  $12\Omega$  resistor ?



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**304.** How many  $176\Omega$  resistors (in parallel) are required to carry  $5A$  in  $220V$  line ?



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**305.** Show how you would connect three resistors, each of resistance  $6\Omega$ , so that the combination has a resistance of

(i)  $9\Omega$

(ii)  $2\Omega$ .



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**306.** Several electric bulbs designed to be used on a  $220V$  electric supply line, are rated  $10W$ . How many lamps can be connected in parallel with each other across the two wires of  $220V$  line if the maximum allowable current is  $5A$  ?



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**307.** A hot plate of an electric oven connected to a  $220V$  lines has two resistance coils  $A$  and  $B$ , each of  $24\Omega$  resistance, which may

be used separately, in series or in parallel. What are the currents in the three cases ?



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**308.** Compare the power used in the  $2\Omega$  resistor in each of the following circuits :

(i) a  $6V$  battery in series with  $1\Omega$  and  $2\Omega$  resistors, and

(ii) a  $4V$  battery in parallel with  $12\Omega$  and  $2\Omega$  resistors.



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**309.** Two lamps, one rated  $100W$  at  $220V$ , and the other  $60W$  at  $220V$ , are connected in parallel to the electric mains supply. What current is drawn from the line if the supply voltage is  $220V$  ?



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**310.** Which uses more energy, a  $250W$  TV set in  $1h$  or a  $1200W$  toaster in 10 minutes ?



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**311.** Explain the following :

- (a) Why is tungsten used almost exclusively for filament of incandescent lamp ?
- (b) Why are the conductors of electric heating devices, such as toaster and electric irons, made of an alloy rather than a pure metal ?
- (c) Why is the series arrangement not used for domestic circuits ?
- (d) How does the resistance of a wire vary with its cross-sectional area ?
- (e) Why are copper and aluminium wires usually employed for electricity transmission.





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### Very Short Answer Type Questions

1. Which of the following statements correctly defines a volt?

- (a) a volt is a joule per ampere.
- (b) a volt is a joule per coulomb.



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### Short Answer Type Questions

1. Ten bulbs are connected in a series circuit to a power supply line. Ten identical bulbs are connected in a parallel circuit to an identical power supply line.

- (a) Which circuit would have the highest voltage across each bulb?

(b) In which circuit would the bulbs be brighter?

(c) In which circuit, if one bulb blows out, all others will stop glowing?

(d) Which circuit would have less current in it?



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2. A resistance of 40 ohms and one of 60 ohms are arranged in series across 220 volt supply. Find the heat in joules produced by this combination of resistances in half a minute.



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**Hots**

1. An electric iron is connected to the mains power supply of 220V. When the electric iron is adjusted at 'minimum heating' it

consumes a power of 360W but at 'maximum heating' it takes a power of 840W. Calculate the current and resistance in each case.



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Ncert

1. Use the data in Table on page 23 of this book to answer the following:

(a) Which among iron and mercury is a better conductor?

(b) Which material is the best conductor?



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2. Redraw the circuit of question 1, putting in an ammeter to measure the current through the resistors and a voltmeter to

measure potential difference across the  $12\ \Omega$  resistor. What would be the readings in the ammeter and the voltmeter?



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3. An electric heater of resistance  $8\Omega$  draws 15 A from the service mains for 2 hours. Calculate the rate at which heat is developed in the heater.



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