2025

(ix) In a closed circuit containing a bulb and a cell, the electromotive force ($\boldsymbol{\varepsilon}$) and the terminal voltage ($\boldsymbol{V}$) is related as.

*(Given **I** is current and **r** is internal resistance.)*

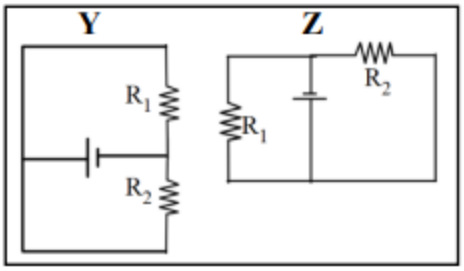
(a) $V = \varepsilon + Ir$

(b) $V = \varepsilon - Ir$

(c) $V = \varepsilon \div Ir$

(d) $V = \varepsilon \times Ir$

(xii) In the given circuits **Y** and **Z**, the resistors, $\mathbf{R_1}$ and $\mathbf{R_2}$, are connected in:



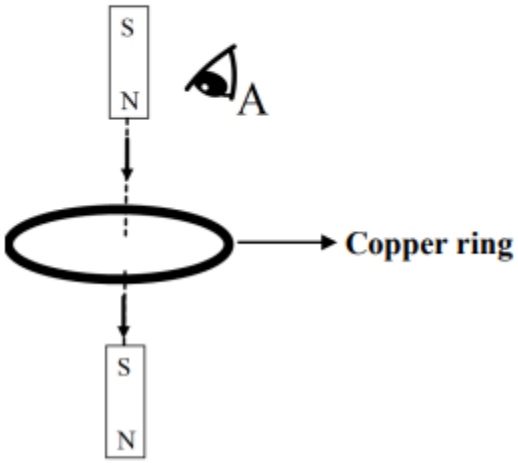
(a) series in both the circuits

(b) parallel in both the circuits

(c) parallel in **Y** and series in **Z**

(d) series in **Y** and parallel in **Z**

(xv) The following figure shows a small bar magnet falling freely through a copper ring. For the observer at **A**, the **direction of the induced current** will be:



(a) clockwise when magnet is above and below the ring

(b) anticlockwise when magnet is above and below the ring

(c) anticlockwise when magnet is above the ring and clockwise when the magnet is below the ring

(d) clockwise when magnet is above the ring and anticlockwise when the magnet is below the ring

(d) Emf of a cell is _____ *[greater than / less than / equal to]* the terminal voltage when the cell is in **open circuit**.

(e) In a step-up transformer the **turns ratio** is _____ *[more than 1 / less than 1 / equal to 1]*.

(ii) According to the **NEW** colour convention which colour of wire is connected to: [2]

(a) the metal body of the appliance

(b) the switch of the appliance?

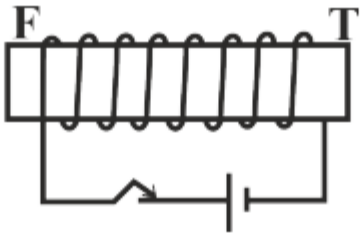
(iii) (a) Which of the two, *alternating current* or *direct current*, produces a varying magnetic field when it flows through a conductor? [2]

(b) State the frequency of the alternating current supply in India.

(v) Copper wire is wound around a **steel** bar **FT**. Current is allowed to pass through the coil for some time and then the bar is removed. [2]

(a) Draw **only** the magnetised bar **FT** and mark its poles.

(b) Trace **two** magnetic lines of force around **FT** clearly indicating the direction.



(vi) A current flows through a metallic conductor for a **long period** of time. State the change you would expect in its: [2]

(a) Resistance

(b) Resistivity

(iii) (a) Name the **radiations**: [4]

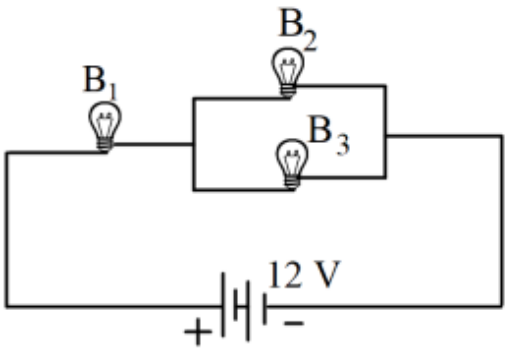
1. for which a quartz prism is used to study the spectrum.
2. which are used in remote sensing devices.
3. which are used in traffic signals in India.

(b) Name **one** property **common** to all electromagnetic radiations.

Question 6

(i) Akash takes a **uniform** meter scale and suspends a weight of 2 N at one end **'X'** and a weight of 5 N on the other end **'Y'**. He then balances the ruler horizontally on a knife edge placed at 70 cm from **X**. Draw a diagram of the arrangement and calculate the weight of the ruler. [3]

(iii) [4]



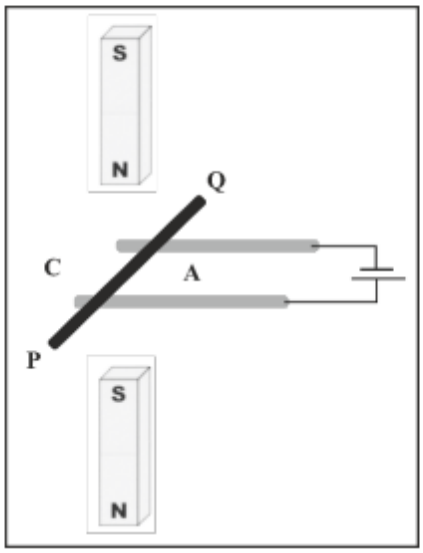
Three identical bulbs **B1**, **B2**, and **B3** each of power rating 18 W, 12 V are connected to a battery of 12 V.

(a) Calculate:

1. the resistance of each bulb
2. the current drawn from the cell

(b) If the bulb **B3** is removed from the circuit, then will the brightness of the bulb **B1** *increase, decrease or remain the same*?

(iii) A copper rod **PQ** carrying current is kept in a magnetic field as shown in the diagram. [4]



(a) The copper rod **PQ** will move towards **C**. State **True** or **False**.

(b) **Name** the law used to determine the direction of motion of **PQ**.

(c) What will be the effect on the force experienced, if the rod **PQ** is replaced by another copper rod of **same** length but of **greater** cross-sectional area?

(d) Justify your answer in (c).

(x) According to the **NEW** international convention, what is the colour coding for the live, neutral and earth wires in household circuits?

(a) Live – red, Neutral – black, Earth – green

(b) Live – green, Neutral – yellow, Earth – black

(c) Live – brown, Neutral – blue, Earth – yellow

(d) Live – red, Neutral – blue, Earth – yellow

(xi) An alloy ***constantan*** has resistivity $5 \times 10^{-7}\ \Omega$ m at 25°C. If the temperature of this alloy is increased to 50°C then its **resistivity** will be:

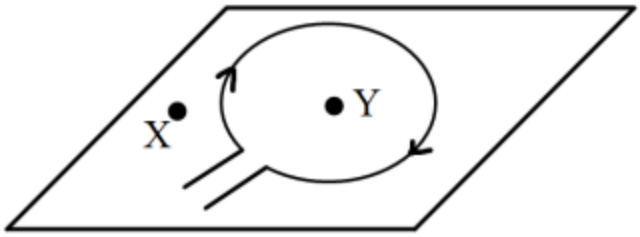
(a) $2.5 \times 10^{-7}\ \Omega$ m

(b) $5 \times 10^{-7}\ \Omega$ m

(c) $10 \times 10^{-6}\ \Omega$ m

(d) $20 \times 10^{-6}\ \Omega$ m

(xii) A current carrying circular loop is lying in a horizontal plane as shown in the diagram. Which of the following is the correct statement with respect to the direction of magnetic lines of force.



(a) upward at X and downward at Y

(b) downward at X and upward at Y

(c) upward at both X and Y

(d) downward at both X and Y

(d) The hole in the **right side** of the socket is for connection to the _____ *[live / neutral / earth]* wire.

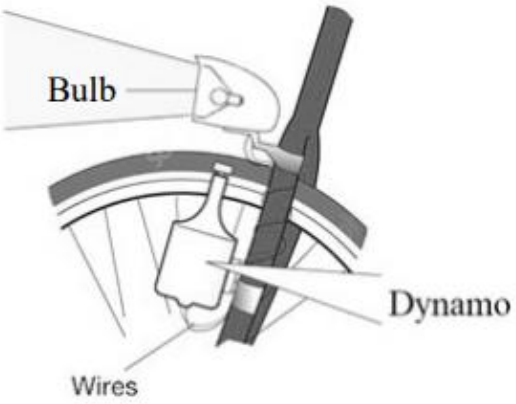
(e) The direction of the **induced current** in the coil of an AC generator is determined by _____ *[Fleming's left-hand rule / Fleming's right-hand rule / Clock Rule]*.

Question 3

(i) State the potential of the wire connected to the right hand side terminal of the **three pin plug** and also state its colour. [2]

(ii) State **two** properties of magnetic lines of force around a straight conductor carrying current. [2]

(v) The figure below shows a bicycle dynamo which is fitted to the tyre. When the wheels of the bicycle rotate, the spindle of dynamo attached to magnets rotate and the bulb glows. [2]



(a) Name the **phenomenon** that takes place when the bulb glows while the person rides the bicycle.

(b) What will be the effect on the brightness of the bulb when the rider **increases** the speed of the bicycle?

(iii) (a) Name the electromagnetic radiations which are used for **sterilising water** in a water purifier. [4]

(b) State any one property of the radiations mentioned by you in part (a).

(c) Why are the danger signals red in colour?

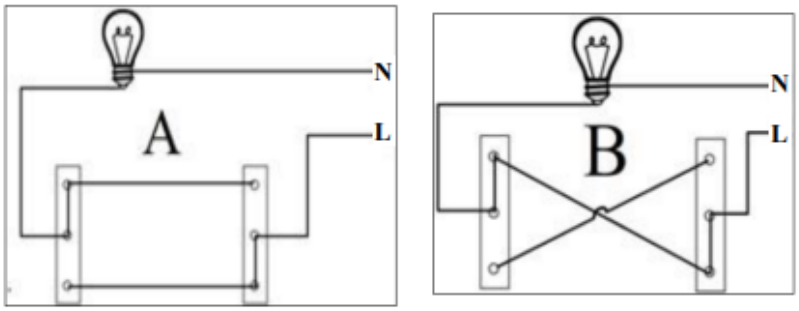
Question 6

(i) A **uniform metre ruler** is balanced horizontally on a knife edge placed at 60 cm mark when a mass ***m*** is suspended from 75 cm mark. **Draw** the diagram of the arrangement. State with reason *(through mathematical steps)* whether the mass of the scale *is greater than, less than or equal to the mass* ***m***? [3]

Question 8

(i) The diagram given below shows a bulb connected by dual control switches. [3]

Observe the diagrams and answer the questions that follow.

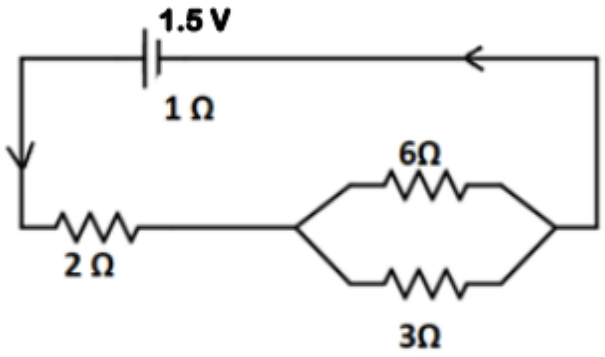


(a) Which switch can successfully turn the bulbs **ON** or **OFF**? (Circuit **A**, Circuit **B**, or both)

(b) At present, in which circuit is the bulb glowing?

(c) If the **L** and **N** wires are swapped in the circuit (your answer to (b)), will the circuit still function?

(iii) A cell of e.m.f 1.5 V and internal resistance 1 Ω is connected to two resistors of resistances 6 Ω and 3 Ω in parallel and a resistor of resistance 2 Ω in series as shown in the diagram. [4]



Calculate the current through:

(a) 2 Ω resistor

(b) 6 Ω resistor

Question 9

(i) A spirit lamp supplying heat at a rate of 50 W is used to melt 0.025 kg of ice at 0°C taken in a container. If all the ice in the container is melted in 168 s, then what is the specific latent heat of fusion of ice? [3]

(The heat capacity of the container is negligible.)

(iii) A student wants to design a **device** to connect a bulb rated 10 W, 22 V, to the mains 220 V, so that the bulb operates at its rated voltage. [4]

(a) Name the device he uses.

(b) **State** the principle involved in the working of this device.

(c) When the bulb is connected to the output of the device, calculate:

1. Current drawn

2. Resistance of the bulb

(viii) The specific resistance of a conductor depends on its:

(a) length

(b) material

(c) area of cross section

(d) radius

(ix) When a current I flows through a wire of resistance R for time t then the electrical energy produced is given by:

(a) I^2Rt

(b) IR^2t

(c) IRt

(d) IRt^2

(x) Choose the correct relation for e.m.f. (ε) and terminal voltage V:

(a) $\varepsilon = V$ (always)

(b) $V > \varepsilon$ [always]

(c) $V < \varepsilon$ [when the cell is in use]

(d) None of these

(xi) If the strength of the current flowing through a wire is increased, the strength of the magnetic field produced by it:

(a) decreases

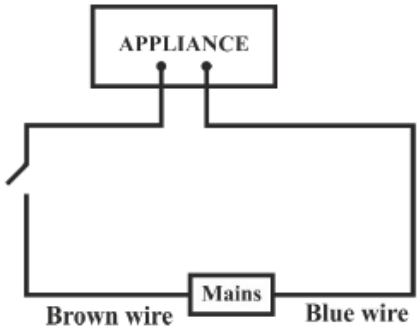
(b) increases

(c) remains the same

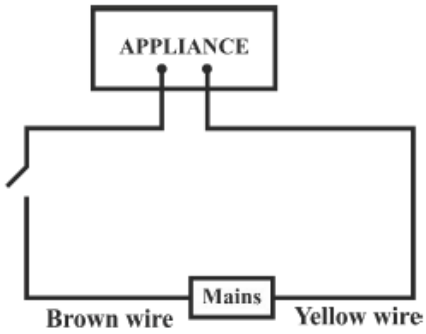
(d) first increases then decreases

(ix) Identify the option that displays the **correct wiring** with **correct colour code**:

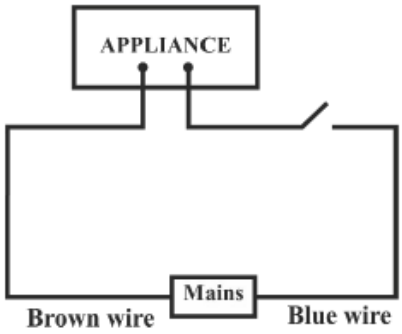
(a)



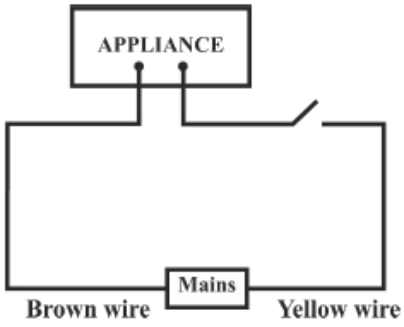
(b)



(c)



(d)



(x) The potential difference between terminals of a cell in a closed electric circuit is:

(a) terminal voltage

(b) electro motive force

(c) voltage drop

(d) none of these

(vi) 5 bulbs are connected in **series** in a room. One bulb is fused. It is removed and remaining 4 bulbs are again connected in **series** to the same circuit. What will be the effect on the following physical quantities? (Increases, Decreases, Remain Same) [2]

(a) Resistance

(b) Intensity of light

(ii) A fuse is rated 5 A. Can it be used with a geyser rated 1540 W, 220 V. Write **Yes** or **No**. Give supporting calculations to justify your answer. [2]

(iii) State *two* factors affecting the speed of rotation of the coil in a D.C. motor. [2]

Question 8

(i) The voltage - current readings of a certain material are shown in the table given below: [3]

Voltage (V)	10 V	20 V	30 V
Current (I)	2 A	3 A	4 A

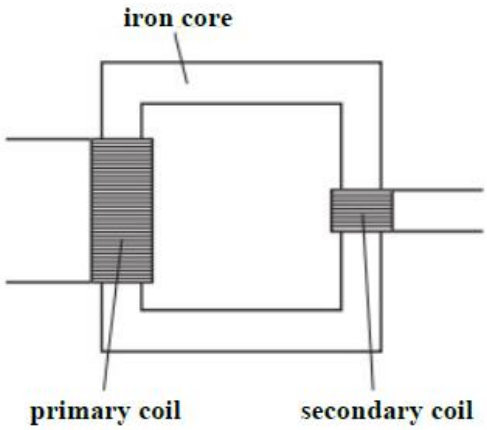
Study the table.

(a) State whether the conductor used is ohmic or non-ohmic.

(b) Justify your answer.

(c) State Ohm's law.

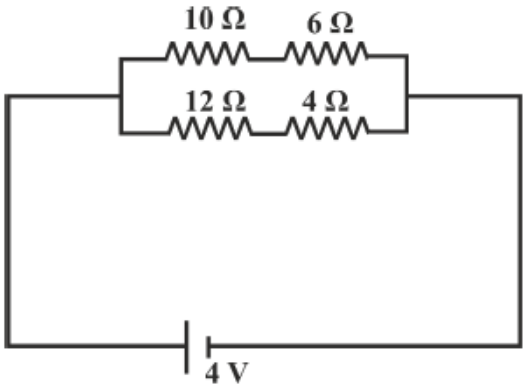
(ii) Below is the diagram of a transformer: [3]



(a) Identify the type of transformer.

(b) In this type of transformer which of the wire is **thicker**, the primary or the secondary? Give a reason.

(iii) Study the diagram:



(a) Calculate the total resistance of the circuit.

(b) Calculate the current drawn from the cell.

(c) State whether the current through 10 Ω resistor is greater than, less than or equal to the current through the 12 Ω resistor.

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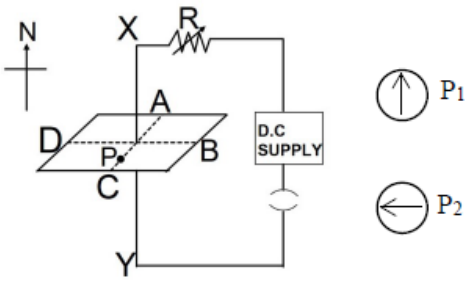
(iii) (a) State one factor that affects the magnitude of induced current in an AC generator. [4]

(b) Given below is a circuit to study the magnetic effect of electric current. ABCD is a cardboard kept perpendicular to the conductor XY. A magnetic compass is placed at the point **P** of the cardboard. $\mathbf{P_1}$ and $\mathbf{P_2}$ are the positions of the magnetic compass, before and after passing a current through XY respectively.



1. Name the **rule** that is used to predict the direction of deflection of the magnetic compass.
2. State the direction of current in the conductor (X to Y or Y to X) when the circuit is complete.
3. If resistance R is increased, then what will be the effect on the magnetic lines of force around the conductor?

(vii) 'A geyser is rated 240 W – 220 V'. Explain the meaning of this statement. [2]

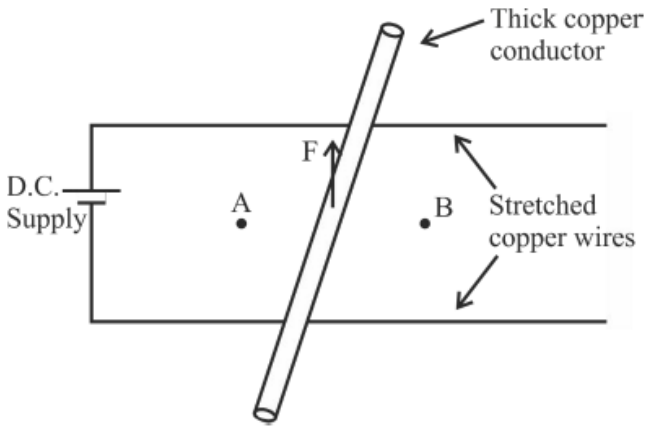
(ii) (a) Which electrical component protects the electric circuit in case of excess current and which can also be used as a switch? [2]

(b) Name the wire to which this electrical component is connected in an electric circuit.

(iii) A copper conductor is placed over two stretched copper wires whose ends are connected to a D.C. supply as shown in the diagram. [2]

(a) What should be the magnetic poles at the points **A** and **B** lying on either side of the conductor to experience the force in the upward direction?

(b) Name the law used to find these polarities.



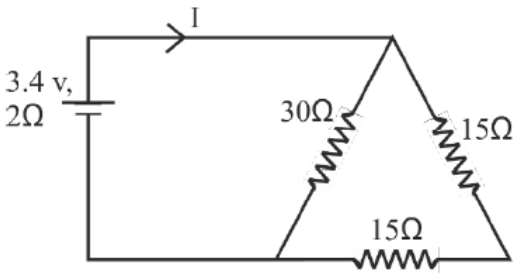
Question 8

(i) (a) Define specific resistance. [3]

(b) What happens to the specific resistance of a conductor if its length is doubled?

(c) Name a substance whose specific resistance remains almost unchanged with the increase in its temperature.

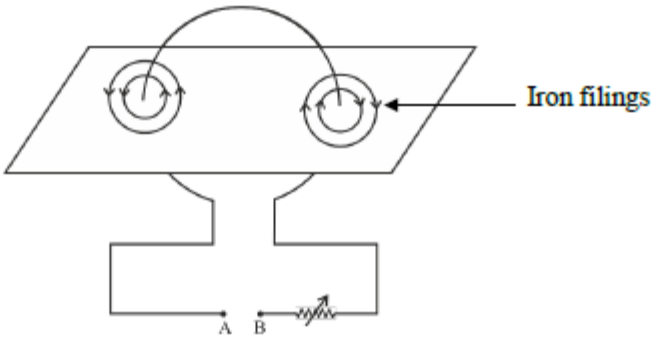
(iii) Find the value of current **I** drawn from the cell. [4]



(a) Calculate the current **I**.

(b) Calculate the terminal voltage.

(iii) The diagram below shows a cardboard on which iron filings are kept. A wire bent in the form of a loop is seen passing through the cardboard. When current flows through it the iron filings arrange themselves as shown below. [4]



(a) State the polarities of the *battery* at **A** and **B**.

(b) State the effect on the magnetic field if an iron rod is held along the axis of the coil.

(c) State one way to:

1. Change the polarity of the *coil*.
2. *Decrease* the strength of the magnetic field around the coil.

(iii) The graph plotted for potential difference (V) against current (I) for ohmic resistors is

(a) A curve passing through the origin.

(b) A straight line not passing through origin.

(c) A straight line passing through the origin.

(d) A circle centred at the origin.

(iv) A main switch in the main distribution board is present in

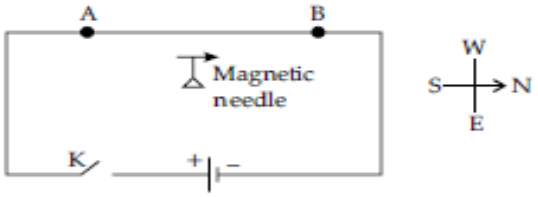
(a) a live wire

(b) a neutral wire

(c) a live as well as neutral wire

(d) an earth wire

(v) A conductor AB is kept along north south direction of the earth above a magnetic needle as shown below. When the key K is closed then



(a) the needle will not show any deflection.

(b) the needle will deflect towards east.

(c) the needle will turn in the opposite direction i.e., towards south.

(d) the needle will deflect towards west.

(vi) A coil wound around a piece of soft iron can become an electromagnetic only when

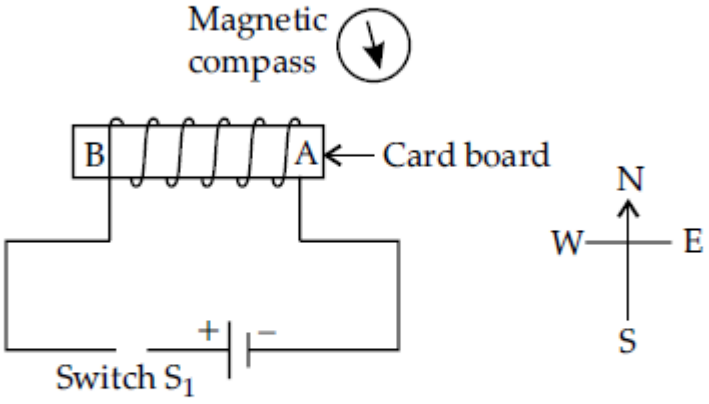
(a) the circuit is open.

(b) a magnetic compass is present in the vicinity.

(c) a galvanometer is connected to the circuit.

(d) a current flows in the circuit.

Q. 2. (i) **The diagram below shows a magnetic compass kept closer to a coil AB wound around a hollow cylindrical cardboard:** [3]

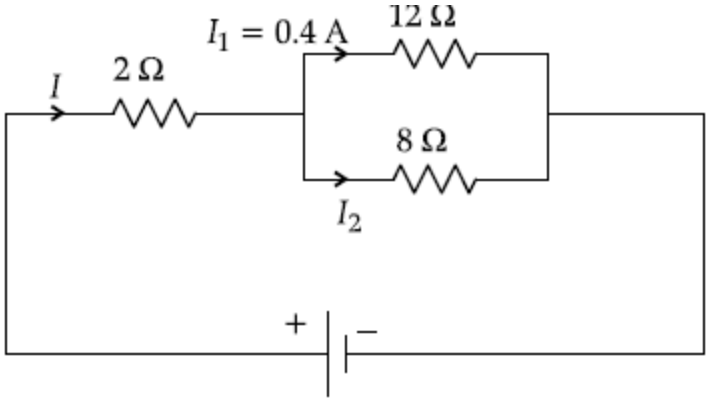


(a) **After studying the circuit and the magnetic compass carefully, state whether the switch S_1 is open or closed.**

(b) **How did you arrive at the conclusion in (a)?**

(c) **What is the purpose of placing the magnetic compass in the above setup?**

(iii)



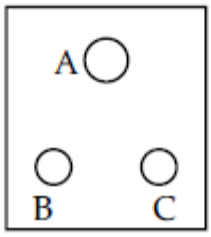
In the above circuit diagram, calculate:

(a) the external resistance of the circuit

(b) the current I_2

(c) the current I.

Q. 3. (i) Three wires with proper colour coding are connected to the three terminals of a three-pin socket. Match the colour of the wire with the proper terminals A, B and C of the socket. [3]



(a) Brown

(b) Green

(c) Light blue

(ii) (a) Name two factors on which the force experienced by a conductor carrying current, placed in a magnetic field, depends. Also, state how these factors affect the force. [3]

(b) With the help of which rule you can determine the direction of force acting on a current carrying conductor placed in a magnetic field?

Q. 5. (i) An appliance rated 440 W, 220V is connected across 220V supply. [3]

(a) Calculate the maximum current that the appliance can draw.

(b) Calculate the resistance of the appliance.

(iii) If a wire of resistance 2Ω gets stretched to thrice its original length : [4]

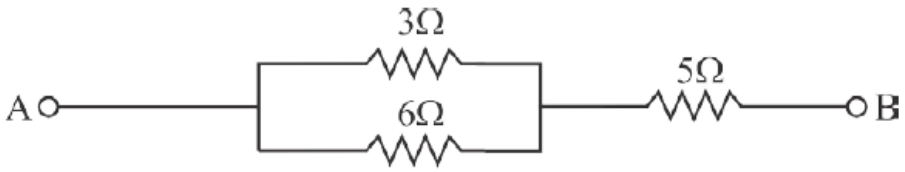
(a) Calculate the new resistance of the wire.

(b) What happens to the specific resistance of the wire?

(e) Why is it not advisable to use a piece of copper wire as fuse wire in an electric circuit? [2]

Question 4

(a) Calculate the total resistance across AB: [2]



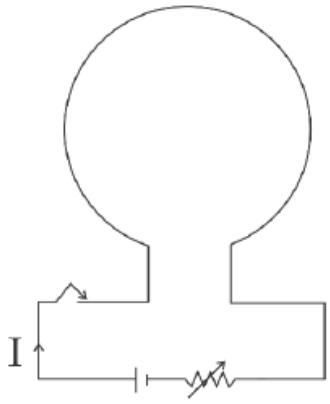
(b) Two metallic blocks P and Q having masses in ratio 2:1 are supplied with the same amount of heat. If their temperatures rise by same degree, compare their specific heat capacities. [2]

(c) When a current carrying conductor is placed in a magnetic field, it experiences a mechanical force. What should be the angle between the magnetic field and the length of the conductor so that the force experienced is: [2]

(i) Zero

(ii) Maximum?

(e) The diagram below shows a loop of wire carrying current I: [2]

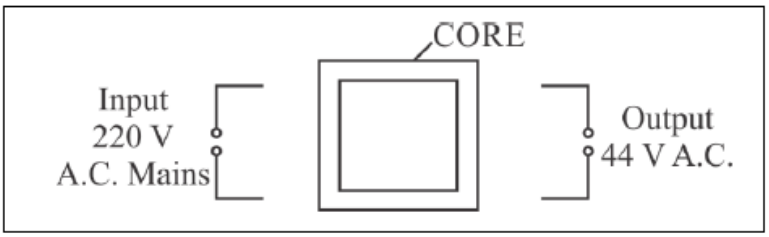


(i) What is the magnetic polarity of the loop that faces us?

(ii) With respect to the diagram how can we increase the strength of the magnetic field produced by this loop?

Question 8

(a) The diagram below shows the core of a transformer and its input and output connections [3]



(i) State the material used for the core.

(ii) Copy and complete the diagram of the transformer by drawing input and output coils.

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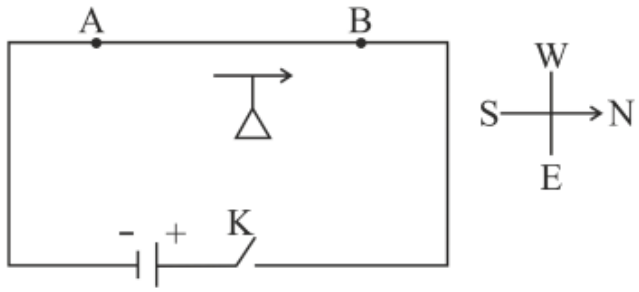
(b) (i) What are superconductors? [3]

(ii) Calculate the current drawn by an appliance rated 110 W, 220 V when connected across 220 V supply.

(iii) Name a substance whose resistance decreases with the increase in temperature.

(c) The diagram below shows a magnetic needle kept just below the conductor AB which is kept in North South direction. [4]



(i) In which direction will the needle deflect when the key is closed?

(ii) Why is the deflection produced?

(iii) What will be the change in the deflection if the magnetic needle is taken just above the conductor AB?

(iv) Name one device which works on this principle.

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(b) State the energy changes in the following cases while in use: [2]

(i) An electric iron.

(ii) A ceiling fan.

(b) You have three resistors of values 2Ω, 3Ω and 5Ω. How will you join them so that the total resistance is more than 7Ω? [2]

(i) Draw a diagram for the arrangement.

(ii) Calculate the equivalent resistance.

(e) (i) How is the e.m.f. across primary and secondary coils of a transformer related with the number of turns of coil in them? [2]

(ii) On which type of current do transformers work?

(c) Identify the following wires used in a household circuit: [2]

(i) The wire is also called as the phase wire.

(ii) The wire is connected to the top terminal of a three pin socket.

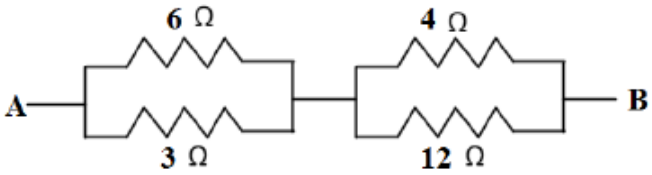
(e) State any two advantages of electromagnets over permanent magnets. [2]

Question 8

(a) (i) A fuse is rated 8A. Can it be used with an electrical appliance rated 5 KW, 200 V? Give a reason. [3]

(ii) Name two safety devices which are connected to the live wire of a household electric circuit.

(b) (i) Find the equivalent resistance between A and B. [3]



(ii) State whether the resistivity of a wire changes with the change in the thickness of the wire.

(e) Define specific resistance and state its SI unit. [2]

Question 4

(a) An electric bulb of resistance 500Ω, draws a current of 0.4A. Calculate the power of the bulb and the potential difference at its end. [2]

(b) State two causes of energy loss in a transformer. [2]

(c) State two characteristics of a good thermion emitter. [2]

(d) State two factors upon which the rate of emission of thermions depends. [2]

(e) When does the nucleus of an atom tend to be radioactive? [2]

Question 9

(a) (i) Name the colour code of the wire which is connected to the metallic body of an appliance. [3]

(ii) Draw the diagram of a dual control switch when the appliance is switched 'ON'.

(b) (i) Which particles are responsible for current in conductors? [3]

(ii) To which wire of a cable in a power circuit should the metal case of a geyser be connected?

(iii) To which wire should the fuse be connected?

(c) (i) Explain the meaning of the statement 'current rating of a fuse is 5A'. [4]

(ii) In the transmission of power the voltage of power generated at the generating stations is stepped up from 11kV to 132kV before it is transmitted. Why?

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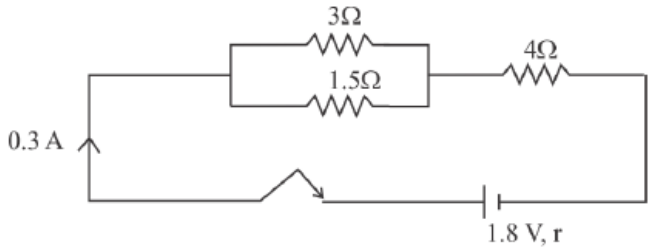
(c) [4]



The diagram above shows three resistors connected across a cell of e.m.f. 1.8 V and internal resistance r. Calculate:

(i) Current through 3 Ω resistor.

(ii) The internal resistance r.

Question 10

(a) (i) Draw a neat labeled diagram of a d.c. motor. [3]

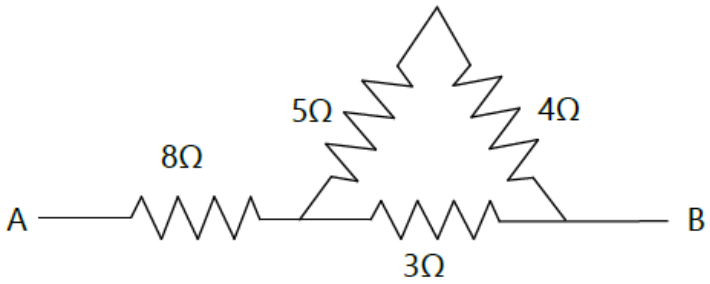
(ii) Write any one use of a d.c. motor.

(e) Is it possible for a hydrogen ($_1^1H$) nucleus to emit an alpha particle? [2]

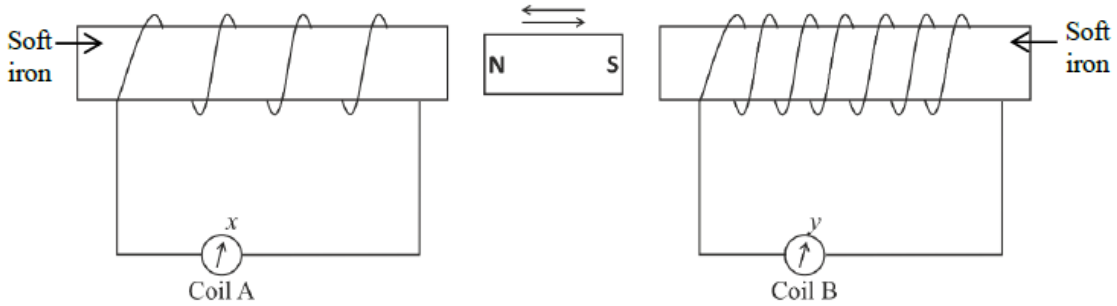
Give a reason for your answer.

Question 4

(a) Calculate the effective resistance across AB: [2]



(c) A magnet kept at the centre of two coils A and B is moved to and fro as shown in the diagram. The two galvanometers show deflection. [2]



State with a **reason** whether:

$x > y$

or

$x < y$. [x and y are magnitudes of deflection.]

(e) State two ways to increase the speed of rotation of a D.C. motor. [2]

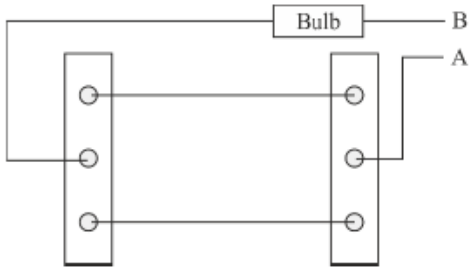
Question 8

(a) (i) Write one advantage of connecting electrical appliances in parallel combination. [3]

(ii) What characteristics should a fuse wire have?

(iii) Which wire in a power circuit is connected to the metallic body of the appliance?

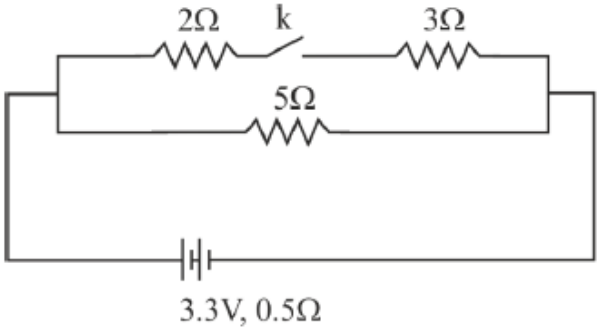
(b) The diagram below shows a dual control switch circuit connected to a bulb. [3]



(i) Copy the diagram and complete it so that the bulb is switched ON.

(ii) Out of A & B which one is the live wire and which one is the neutral wire?

(c) [4]



The diagram above shows a circuit with the key k open. Calculate:

(i) the resistance of the circuit when the key k is open.

(ii) the current drawn from the cell when the key k is open.

(iii) the resistance of the circuit when the key k is closed.

(iv) the current drawn from the cell when the key k is closed.

Question 10

(a) Draw a neat labeled diagram of an A.C. generator. [3]

(xi) According to the old convention, the colour of the earth wire is:

(a) black

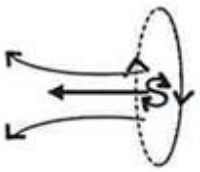
(b) green

(c) yellow

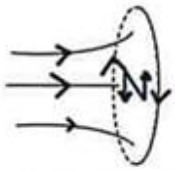
(d) red

(xii) Current is flowing through a coil as shown in the figure. Which one of the given figures will correctly depict the magnetic polarity and the direction of the lines of force along the axis of the coil.

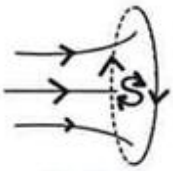
(a)



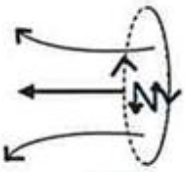
(b)



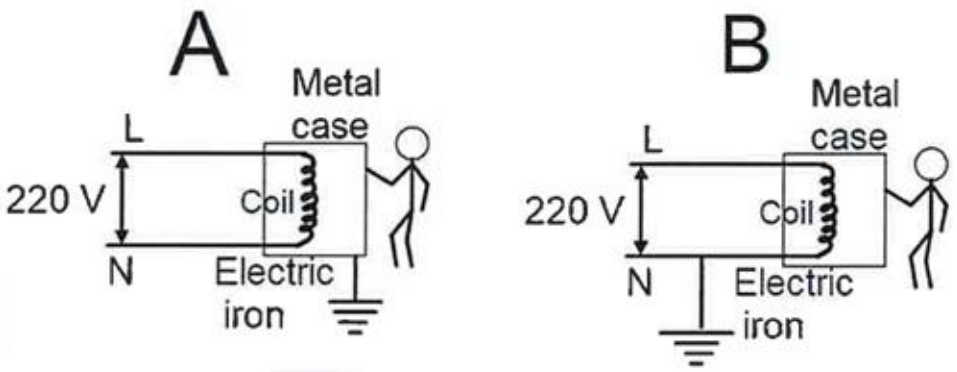
(c)



(d)



(ii) If live wire makes an accidental contact with the metal case, which circuit (A or B) in the diagram, illustrating an electric iron, is considered safe for the user (Assuming the fuse is present in the live wire in both circuits)? Justify your answer.



(iii) A transformer is used to change a high alternating e.m.f. to a low alternating e.m.f. of the same frequency.

(a) Identify the type of transformer used for the above purpose.

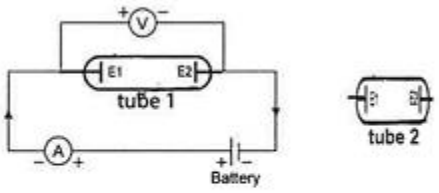
(b) State whether the turns ratio of the above transformer is =1 or >1 or <1.

(v) (a) Name the principle of AC generator.

(b) State its one use.

Question 8

(i) The circuit depicted in the figure is employed for studying Ohm's Law. Instead of using a standard resistor, a student opts for a glass tube **filled** with mercury ***(tube 1)***, connected to the circuit through two electrodes E1 &E2. He records the readings of the ammeter and voltmeter, thereby calculates the resistance. The student repeats the experiment by substituting ***tube 1*** with ***tube 2,*** where the same amount of mercury **fills** the **tube 2**.



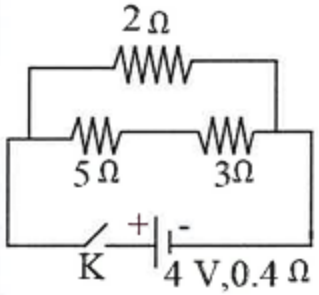
Neglecting internal resistance of the cell use (> or < or =) to compare

(a) the resistance in both the cases.

(b) the voltmeter readings in both the cases.

(c) the specific resistance in both the cases.

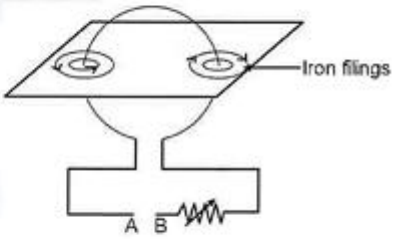
(iii) Observe the given circuit diagram and answer the questions that follow:



(a) Calculate the resistance of the circuit when the key K completes the circuit.

(b) Calculate the current through 3Ω resistance when the circuit is complete.

(iii) The diagram below shows a cardboard on which iron filings are kept. A wire bent in the form of a loop is seen passing through the cardboard. When current flows through it the iron filings arrange themselves as shown below with the direction of magnetic field.



(a) State the polarities of the battery at A and B.

(b) State the effect on the magnetic field if an iron rod is held along the axis of the coil.

(c) State one way to:

1. change the polarity of the coil.
2. decrease the strength of the magnetic field around the coil.