(v) Concurrent forces
(vi) Line of action
(vii) Pivot
(viii) Axis of rotation
(ix) Static equilibrium
(x) Centre of gravity

b) Outline at least three effects of forces on a body
c) Discuss the application of the Principle of moment in a See saw.
d) The condition for equilibrium depends on three characteristics of forces. (Name them)
e) With clear illustration, show how you can determine the Centre of gravity of a meter rule
f) Explain how 20g mass can be used to determine the mass of a meter rule (Illustration is very important)
g) Briefly explain why wheels of trucks are slightly tittered
h) Are our bodies in a state, unstable or neural equilibrium when walking?
i) Explain why Chassis and engines are placed low in vehicle?
j) What kind of equilibrium a ball shows when in a state of rest?

401. A uniform rod RS has a length of 10m and a weight of 20kN, A heavy block of weight 55kN hung at a distance of 2m from the centre of gravity. If two upward forces P and Q are acted at point P and Q respectively, find the reaction due to upward force

402.
A meter rule is pivoted at its midpoint. If two objects of weight 1.0N and 2.0N are suspended at 30cm and 90cm respectively from one end, calculate the position where an upward force of 3.0N must be applied in order for the meter rule to balance horizontally

ANSWERS (QN: 376-4

(v) Concurrent forces
(vi) Line of action
(vii) Pivot
(viii) Axis of rotation
(ix) Static equilibrium
(x) Centre of gravity

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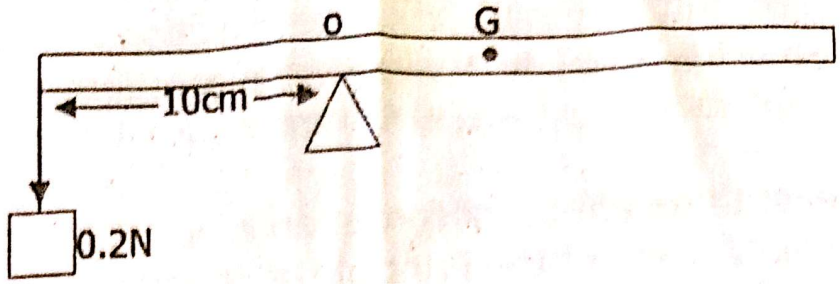
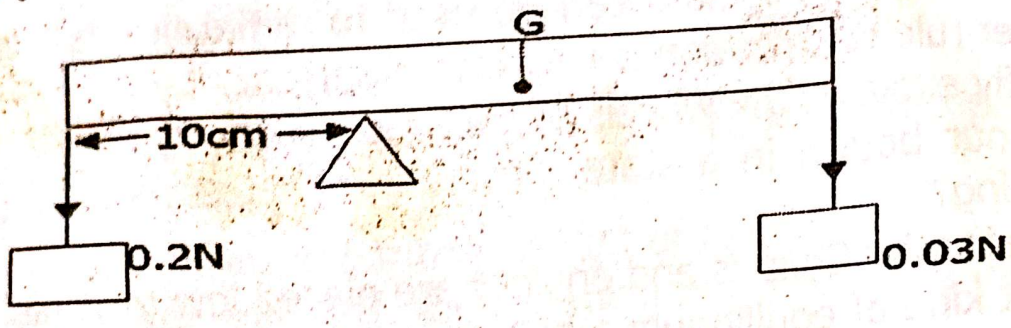


(b) If another force of 0.03N act horizontally at another end, what mass must be added to 0.2N so as to balance the meter rule horizontally.

(Consider the figure below)

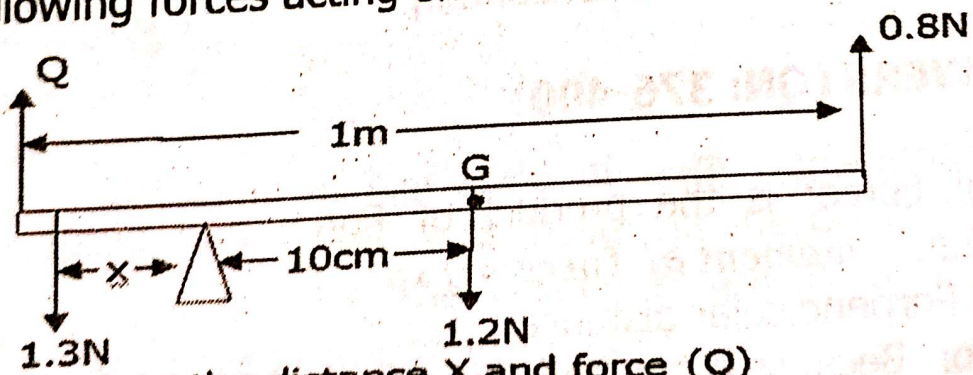


397

a) Outline three types of equilibrium
b) A uniform meter rule is pivoted at its Centre. A 20g mass is placed at10 cm mark and 50g mass at the 40cm mark from one end. At what mark must a 50g mass be placed for the system to be in rotational balance?

398

A uniform meter rule weights 1.3N when it is in a state of balance, it has the following forces acting on it



Calculate the distance X and force (Q)

399. Outline the application of principle of moment in our daily life

400. (a) Discuss the meaning of the following terms,

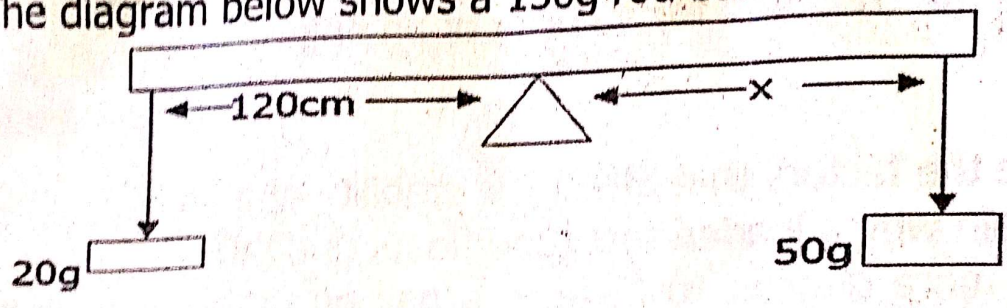
(i) Turning forces (ii) Rotational motion
(iii) Translational motion (iv) Dynamic equilibrium

390:
A uniform meter rule (AB) is pivoted at a distance 40cm from end A. If 80g and 50g mass hang at a distance 30cm and 90cm from end B respectively, find the reaction of upward force P at end A and Q at end B. (Take the mass of a meter rule 52g).

391: Does an object have to be at rest to be in a state of equilibrium? Explain your answer.

392. A pole AB of length 10.0m and weight 800N has its Centre of gravity 4.0m from the end A and lies on a horizontal ground. The end B is to be lifted by a vertical force applied at B. Calculate the least force that is required to do this.

393 The diagram below shows a 150g rod balanced on a Fulcrum



(a) How far from the pivot must the 50g mass be placed for the system to be in equilibrium?
(b) What upward force does the pivot exert on the rod?

394:
a) Outline two (2) equilibrium conditions
b) State any three (3) factors upon which these equilibrium conditions depends on.

395. Explain how each of the three characteristics of forces, magnitude, direction and point of application plays a role in determining an object's state of equilibrium?

396
(a) A meter rule is pivoted at point o as shown in the diagram below and is balanced by a load of 0.2N. Calculate the mass of the meter rule. (Take g=10N/kg)

384:

a) Define unstable equilibrium
b) State the condition for a body to be in unstable equilibrium.
c) Explain why tall structures such as buildings are never built with narrow foundation?

385

a) Differentiate between stable and unstable equilibrium
b) Why it is more dangerous for passengers to stand inside the bus especially when a bus negotiates a corner?
c) Explain why ships have long and wide projecting plates extending from their bases into the water?

386

a) Differentiate between Centre of gravity and Centre of mass
b) Why are luggage compartments placed at the bottom of a bus?
c) State the condition for stability of an object

387

a) State the factors that affect the stability of a body
b) Explain why a loaded test tube floats upright?
c) It is more difficult to balance a nail on its tip than on its base. Explain

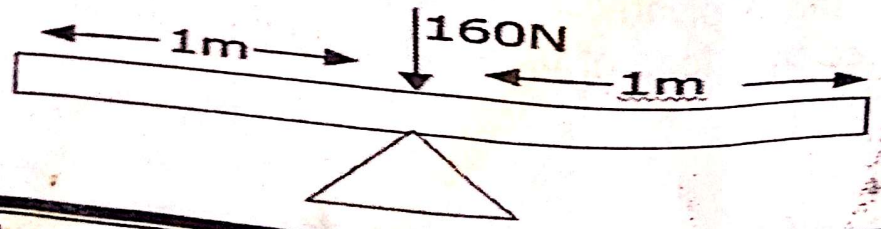
388.

A uniform half meter rule is freely pivoted at 15cm mark and it balances horizontally when a body of mass 40g is hung from the 2cm mark

a) Draw a clear force diagram of the arrangement
b) Calculate the mass of the rule
c) If a pivot is removed and a half meter rule is suspended by a wire at the same point where the meter rule was pivoted, What will be the tension in the wire?

389:

(a) A boy of mass 60kg is sitting on a see-saw at a distance of 2.5m from the pivot. Calculate the moment due to his weight?
(b) Find the moment in the figure below



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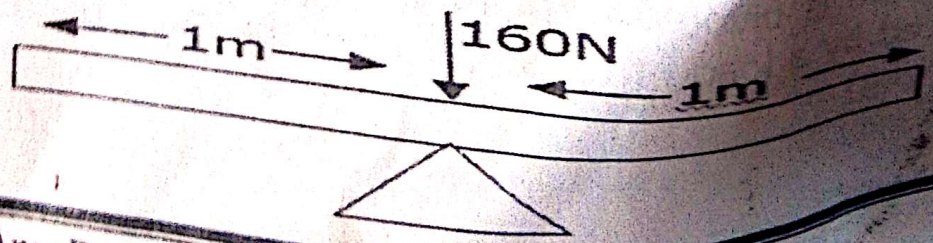
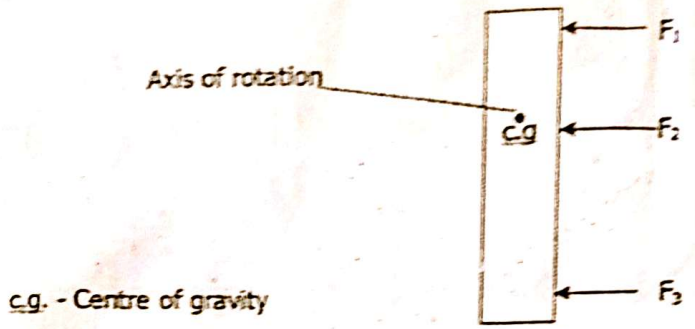


(c) The diagram below shows three forces of equal magnitude applied at different points along a uniform rod. The rod's axis of rotation is located at its Centre of gravity.



(i) Which force(s) could cause translational motion?
(ii) Which force(s) could cause rotational motion?
(iii) Which force has a clockwise moment?
(iv) Which force has an anticlockwise moment?
(v) Which force has the largest moment?
(vi) Is the rod in a state of translational or rotational equilibrium? Explain

381:

(a) Define the term Centre of gravity
(b) At what point a Centre of gravity on the uniform meter rule act?
(c) A meter rule of mass 52g is pivoted at 10cm from the Centre of a meter rule. At what distance from the Centre of gravity of a meter rule must 100g be placed so as to balance a meter rule?

382:

(a) What is Equilibrium?
(b) Outline two (2) conditions for a body to be in equilibrium.
(c) Using well labeled diagrams, distinguish between Stable, Unstable and Neutral equilibrium.

383

a) What is stable equilibrium?
b) Explain why cars and heavy truck are designed to have wide wheel bases?
c) It is not advised to put passenger luggage on top of a bus. Explain?
d) Cars and trucks are not normally deigned to be at a very high height from the ground?

MOMENT AND EQUILIBRIUM

376:

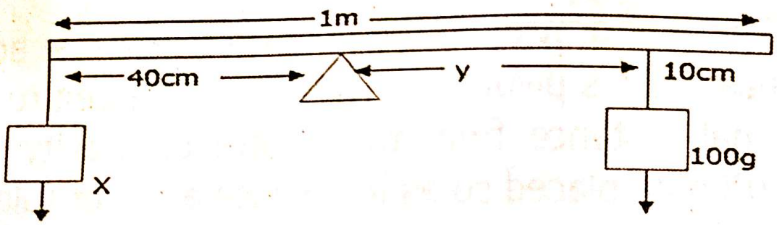
(a) Define the term moment of force
(b) Outline two (2) factors in which moment of force depends on
(c) Is the moment of force a vector or scalar? Explain your answer

377:

(a) What do you understand by the term Centre of mass of an object?
(b) State the relation of moment of force defining each term
(c) It is more technical to use along spanner than a short spanner when loosening a nut. Explain your answer?

378:

(a) State the principle of moment
(b) What is the SI unit of moment of force?
(c) Find the mass of a block "X" in the meter rule below



379:

(a) What do you understand by turning effect of force?
(b) Explain why the knob on a door is placed as far as possible from the hinges?
(c) A uniform meter rule AB is pivoted at a distance of 80cm from end B. if 20g mass hang at end B, at what distance from end A must 100g mass hang on a meter rule to balance the meter rule horizontally. (Neglect the mass of meter rule).

380

(a) What is a line of action of a force?
(b) What happens to a body if a line?
    (i) Passes through the Centre of gravity
    (ii) Do not pass through a Centre of gravity

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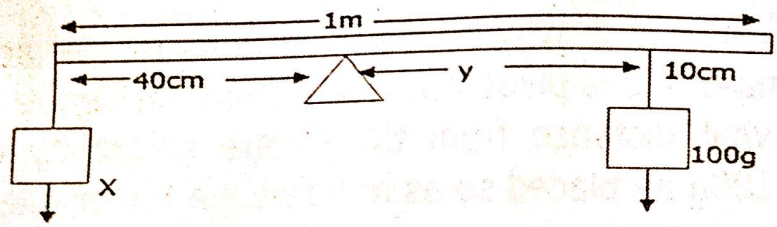

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but also they found that, groups of these magnetic dipoles form a magnetic domain. In this case a material that is not a magnet becomes a magnet if all of its magnetic dipoles are aligned in the same direction. To succeed this, it should be exposed to external magnetic field such as applying electric current, bringing it near a magnet and even by stroking. This is what is referred as magnetization. Also after the substances have acquired magnetism, it can be demagnetized by heating it in the absence of magnetic field and also by randomly stroking it with another magnet. Therefore magnetism is the force that exists almost everywhere.

After reading the above paragraph, answer the questions below

(a) Which motions of electron are similar to Earth's rotation on its own axis and Earth's revolution around the sun?

(b) Explain how materials can acquire magnetism?

(c) Are all materials magnet? Explain

(d) State any three possible ways of removing magnetism from a magnet

(e) If you have a non-magnetic material in your school laboratory, how can you make it magnet?

(f) What is magnetic domain in relation to the above paragraph

ANSWERS (QN 351-375)

351

a) **A Magnet** is the piece of metal that attracts other metals e.g. iron

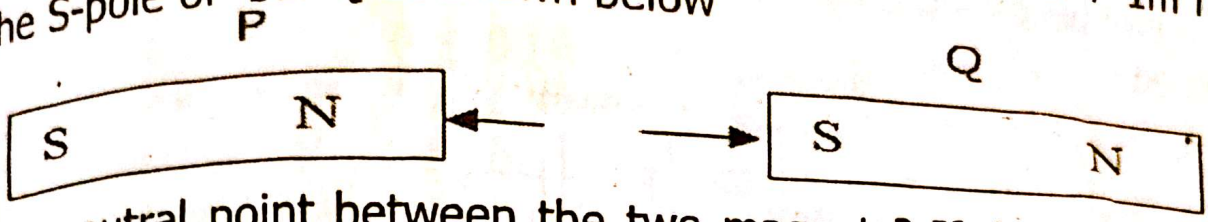
b) **Magnetic substances** are substances which can be easily attracted by magnets **e.g.** Iron, nickel or cobalt WHILE **Non-magnetic substances** are substances that cannot be attracted by a magnet **e.g.** wood, plastic and ceramics

c)

- Magnets tend to attract magnetic substance
- When two magnets are brought near each other, like poles tend to attract while unlike poles tend to repel each other
- A magnetic has magnetic dipoles aligned in the same direction

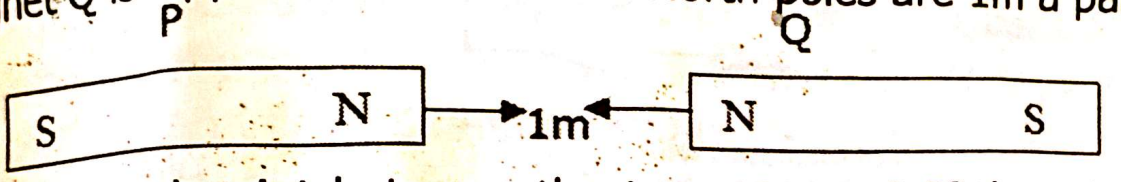
352

368.
Bar magnet P is the same as strong as bar magnet Q
(a) The two magnets are arranged with the N-Pole of bar P 1m from the S-pole of bar Q as shown below



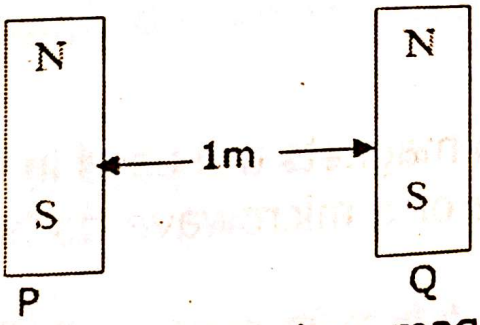
Is there a neutral point between the two magnets? If there is, how far from magnet P is it located? If there is no neutral point, explain why?

(b) Magnet Q is flipped so that the two North poles are 1m a part



Is there a neutral point between the two magnets? If there is, how far from magnet P is it located? If there is no neutral point explain why not? (Hint; $F \propto 1/r^2$)

369. The two magnets described below are placed parallel to each other as shown



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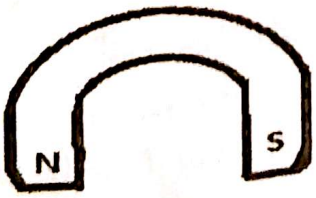
370.
Copy the image of a horse shoes magnet shown below and sketch the field line



371

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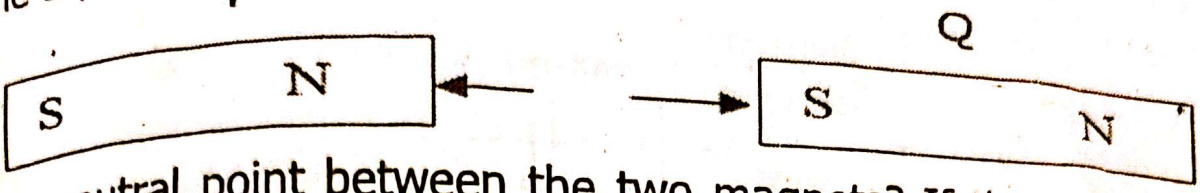

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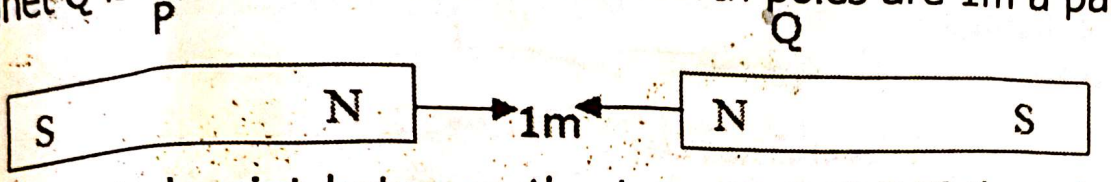

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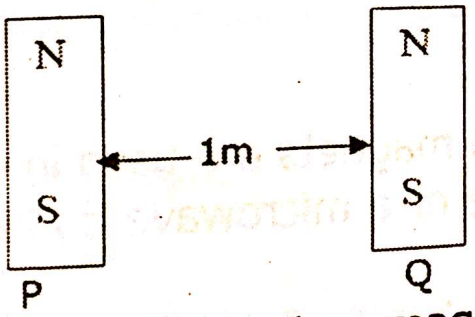

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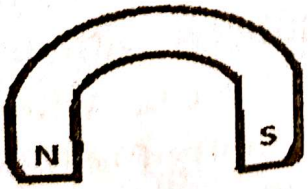


371
Explain why compasses designed to be used in cars equipped with a ...nted on the wind shield

(b) Explain what would happen if you cut a bar magnet into half.

364

a) Distinguish between angle of declination and angle of inclinatio (angle of dip)

b) How can you determine the direction of the Earth's magnet field?

c) Outline at least three (3) applications of the Earth's magne field

365

a) Differentiate between magnetic force and the force due to grav on the Earth.

b)

(i) How can you use the N-pole of a fixed bar magnet to determi the unknown poles of an unlabeled bar magnet?

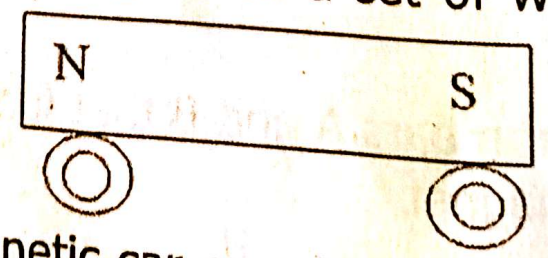
(ii) Is the attraction test better? Explain your answer

366 (a) Match the terms in list A with the corresponding ones from lis

LIST A	LIST B	
(a) Magnetic materials	(i)	Like poles repel, un pole attract
(b) Law of magnetism	(ii)	Magnetic field is Zero
(c) Magnetic shielding	(iii)	Redirect magnetic li of force
(d) Neutral Point	(iv)	Iron nail
(e) Aluminum	(v)	Strong magnetic
	(vi)	Paramagnetic
	(vii)	Direct neutral Point

367.

Suppose you mount a bar magnet on a set of wheels as shown be



If you place it in the magnetic car on a N-S line with the front of the pointing North, would it roll towards the North or South? Explain y answer.

358

a) What is magnetic domain?
b) Illustrate how magnetic domains are aligned in a magnetic object.
c) How can you store magnets for effective and durable use of their magnetism?

359

a) Define the term magnetic field and magnetic lines of force
b) Write the properties of lines of force
c) Explain how a non-magnet can be a magnet by means of stroking

360

a) What is a neutral point?
b) Explain the meaning of the term magnetic shielding?
c) Draw the following diagram
   (i) Arrangement of atoms or magnetic domains in a non-magnetic iron bar
   (ii) Arrangement of atoms in a magnetic iron bar

361

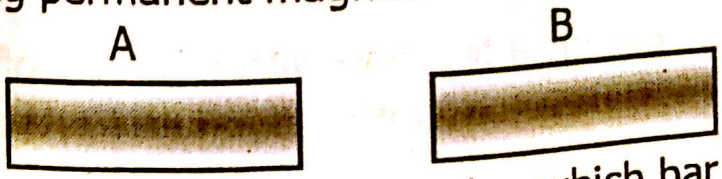
Suppose you are given a bar magnet whose poles are not labeled. Explain how you can determine which end of the bar is the North Pole in the laboratory

362

a) Draw magnetic field around a bar magnet using magnetic lines of force
b) How can you use the N pole of a fixed bar magnet to determine the unknown pole of an unlabeled bar magnet?
c) Is the attraction test better? Explain your answer.

363

(a) You are given two iron bars A and B that look identical. One of them is a strong permanent magnet



Explain how you can determine which bar is a magnet.

MAGNETISM

351

a) Define the term magnet
b) Giving at least two (2) examples in each, differentiate between magnetic and non-magnetic substances
c) Outline three (3) properties of magnets

352

a) What is a ferromagnetic material? Give two examples of ferromagnetic materials
b) Distinguish between temporally and permanent magnets
c) State any three applications of magnets

353

a) What do you understand by the term Magnetism?
b) Differentiate between hard magnetic materials and soft magnetic materials giving two examples in each
c) Explain why temporally magnets are made of Iron materials?

354

(a) What is magnetization?
(b) Outline three methods of magnetizing a magnet
(c) Explain how an object can be made to be a magnet?

355

a) Explain the meaning of the term demagnetization
b) Outline the ways through which a magnetic material can be demagnetized

356

Explain three (3) ways which can maintain magnetism in magnets for long period of time

357

a) State the basic law of magnetism?
b) Explain why it is not advised to overheat magnets?
c) What is likely to happen to a nail if a long wire is wrapped around it and connected to a battery?

339

(a) **Voltmeter** is the device for measuring voltage.

- The SI unit of P.d is Volts (V)

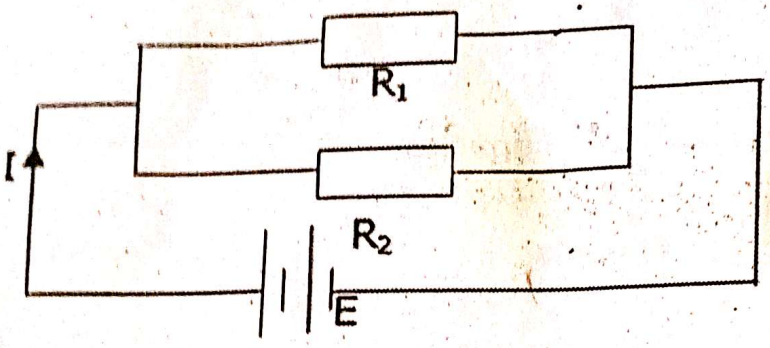
(b) This because a Voltmeter has very high resistance. Therefore it w resist the flow of current.

(c) Resistance (R) = 3kΩ

340

a) Series arrangement and Parallel arrangement

b) Consider the circuit below



$I_T = I_1 + I_2$ (But V= 1R, 1=V/R

$$\frac{V_1}{R_T} = \frac{V_1}{R_1} + \frac{V_2}{R_2}$$

$$V\left(\frac{1}{R_T}\right) = V\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_T} = \frac{R_1 + R_2}{R_1 R_2}$$

$$R_T = \frac{R_1 R_2}{R_1 + R_2}$$

c) Bulbs at home are connected in parallel and not in series becaus of the following reasons.

- All bulbs will glow with the same brightness
- The equivalent resistance across all bulbs is very low
- Burni

339

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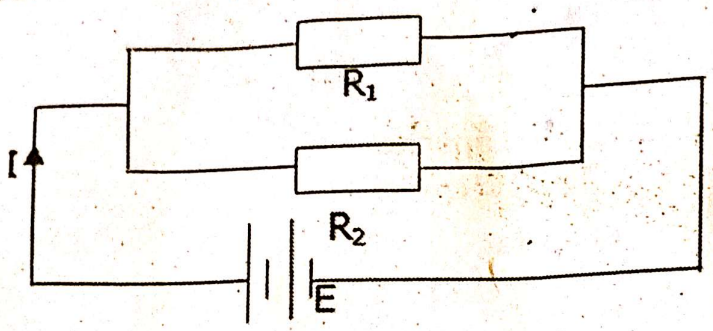
a) Series arrangement and Parallel arrangement

b) Consider the circuit below



$I_T = I_1 + I_2$ (But V= 1R, 1=V/R

$$\frac{V_1}{R_T} = \frac{V_1}{R_1} + \frac{V_2}{R_2}$$

$$V\left(\frac{1}{R_T}\right) = V\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_T} = \frac{R_1 + R_2}{R_1 R_2}$$

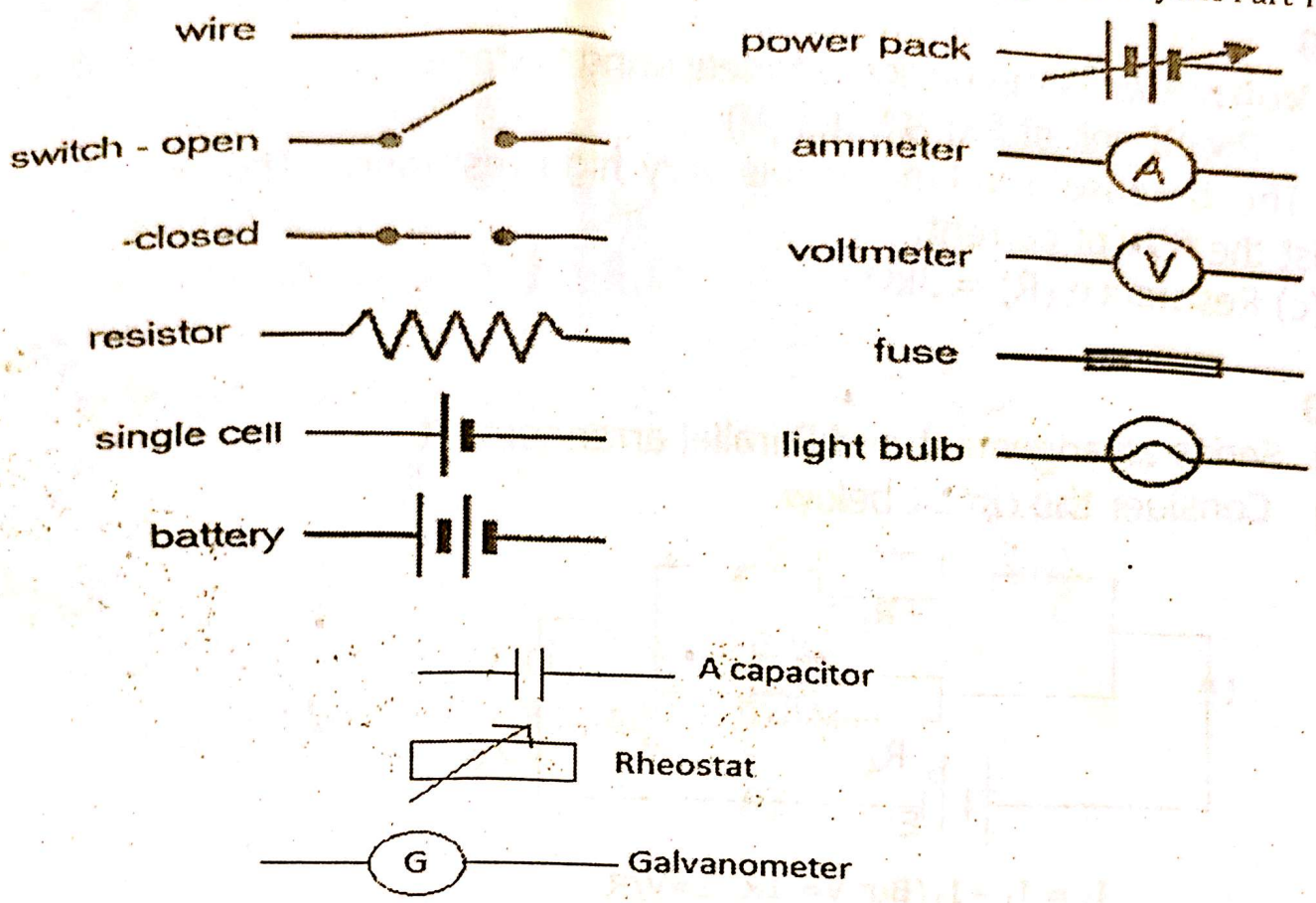
$$R_T = \frac{R_1 R_2}{R_1 + R_2}$$

c) Bulbs at home are connected in parallel and not in series becau of the following reasons.

- All bulbs will glow with the same brightness
- The equivalent resistance across all bulbs is very low
- Burning of one bulb will not affect others

341 (a)

Series arrangement	



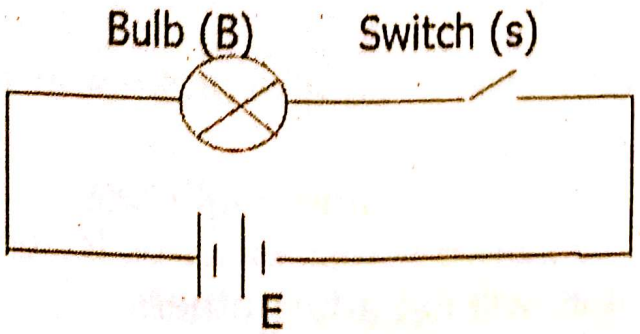
337

a) Car battery/Accumulators, D.C or A.C generator and Solar panel
b) SI unit of current is Ampere (A) SI unit of Resistance is Ohm (Ω)
c) Electric charge (Q) = 7.2C

338.

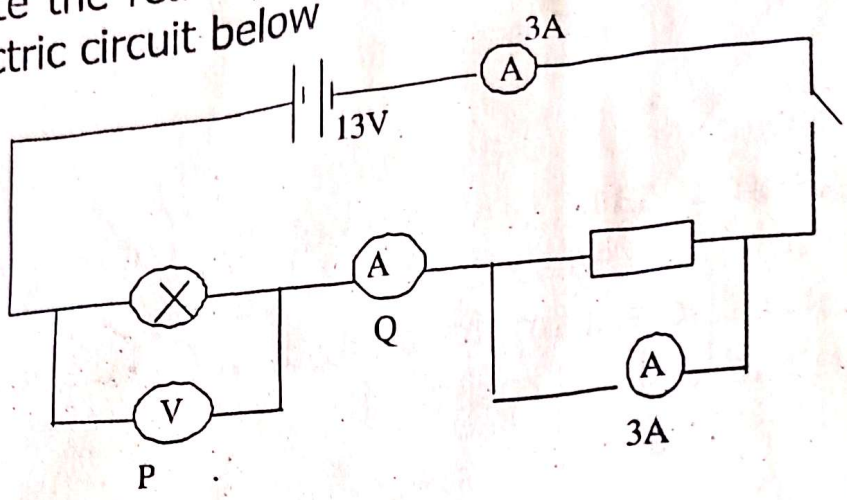
a) **Ohm's law states that** "The voltage across the conductor is directly proportional to the electric current flowing through it provided that temperature and other physical conditions of a conductor are kept constant"
b) Length of a conductor, Cross sectional area and Temperature

(c)



350.

(a) Calculate the readings of the Voltmeter P and the ammeter Q in the electric circuit below



(b) A resistor has a resistance of 2Ω. How could this be measured experimentally?

ANSWER (QN: 334-350)

334.

a) **Current electricity** is the branch of electricity that deals with the study of electric charges in motion

b) **Coulomb** is the quantity of charge that flows in a circuit in second when a steady current of 1A is flowing

c) **Electric circuit** is the complete path of electricity

d) **Electric current** is the flow of electric charge per second

335.

a) **Ammeter** is a device for measuring electric current WHILE **Voltmeter** is a device for measuring voltage

b) **Electromotive force** is the potential difference of a cell/battery in an open circuit. WHILE **Potential difference** is the voltage drop across resistors in a closed circuit.

c) **Rheostat** is the device that controls the amount of current in a circuit WHILE **Resistance** is the opposition to the flow of current in a circuit.

(iii) Sketch the circuit to show how the Voltmeter could be connected to the circuit in fig. 2

(iv) From the argument you have given in (i) and (ii), Why parallel arrangement is mostly preferred than series arrangement?

346.

a) Differentiate between P.d and current

b) Show diagrammatically how ammeter is connected to measure current through the resistor R

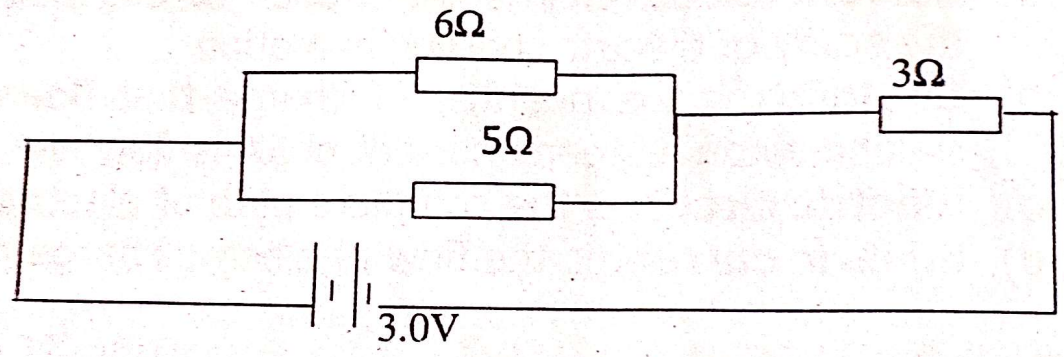
c) Draw the circuit diagram to show how a Voltmeter is used to measure the P.d of load resistor R

347.

a) Explain the advantage of parallel arrangement of bulbs over series arrangement during electric installation at home

b) The current passing through the filament of a lamp is 2A. How many electrons pass through the filament in one second?

348



ing the figure above,

a) Calculate the P.d across the 5Ω resistor

b) What is the value current through the 3Ω resistor?

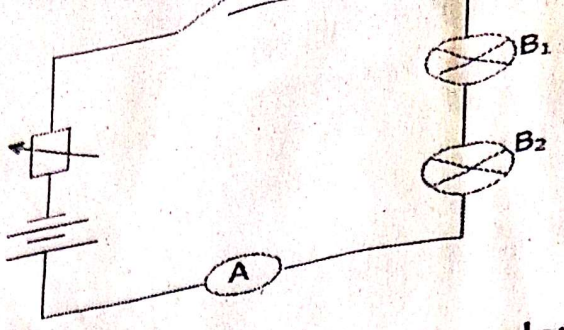
c) Re-draw the circuit above and show how the Voltmeter is connected to a 3Ω resistor

a) What do you understand by the term Ohmic conductors?

b) If a P.d 6.0V is measured across the ends of a wire of resistance 12Ω

(i) What current flows through it?

(ii) What P.d is required to make a current of 1.5A pass through it?



a) If the switch 'S' is closed, the bulbs glows. Will the brightness of the two bulbs be the same? If Yes or No explain?

b) What happen to the brightness of the bulb if current is increased?

c) If another bulb is added to bulb B_1 and B_2 in series, will the brightness of the three bulbs remain the same as initially? Explain

d) Suppose the bulbs (B_1 and B_2) are connected in parallel. How would you comment on the brightness of the two bulbs if switch is closed?

e) Draw the schematic diagram for the connection of the two bulbs in parallel if other components remained the same.

345. (a) Convert these currents into compare
(i) 500μA (ii) 250μA

(b)Consider the following circuit and answer the questions that follow

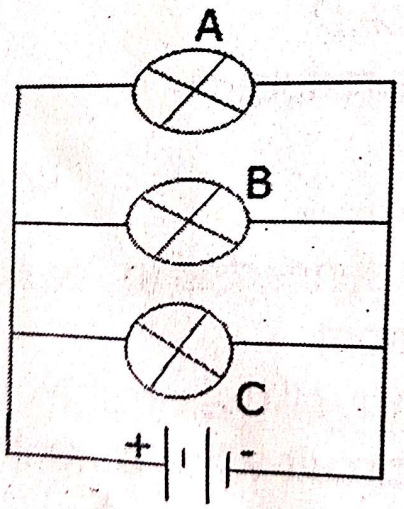
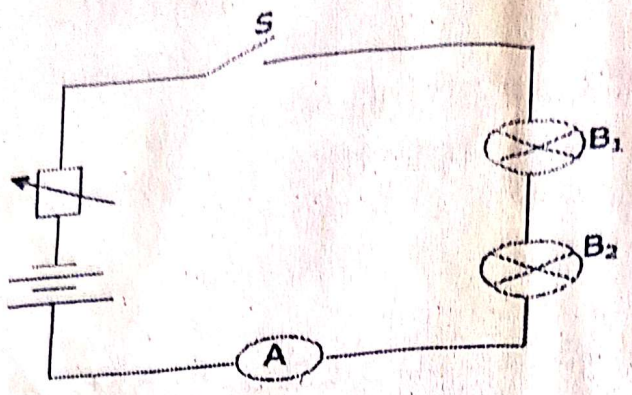


Fig 2

(i) If lamp A is burnt out, would lamps B and C light up? Explain your answer

(ii) If the same lamps (A, B and C) where connected in series and lamp A is burnt out, would lamp B and C grow up? Explain



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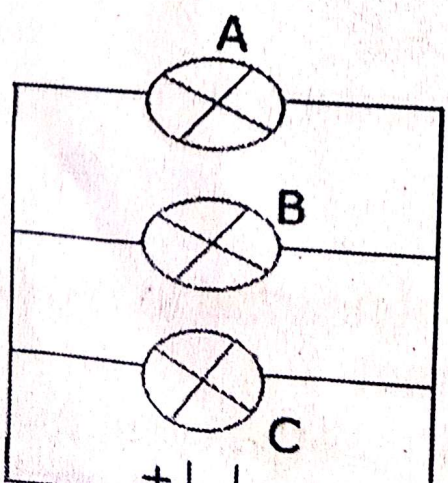

Fig 2