

SAMPLE PAPER TEST 05 FOR TERM-2 EXAM (2021-22)
(ANSWERS)

SUBJECT: SCIENCE (086)
CLASS : X

MAX. MARKS : 40
DURATION: 2 HRS

General Instructions:

- All questions are compulsory.
- The question paper has three sections and 15 questions. All questions are compulsory.
- Section–A** has 7 questions of 2 marks each; **Section–B** has 6 questions of 3 marks each; and **Section–C** has 2 case based questions of 4 marks each.
- Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

SECTION – A

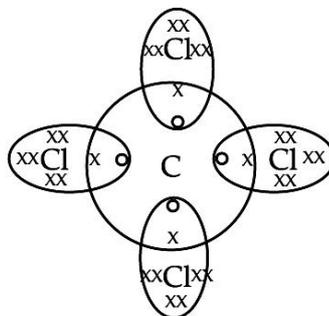
Questions 1 to 7 carry 2 marks each.

- Choose from the following: ${}_{20}\text{Ca}$, ${}_{3}\text{Li}$, ${}_{11}\text{Na}$, ${}_{10}\text{Ne}$
 - An element having two shells completely filled with electrons.
 - Two elements belonging to the same group of the periodic table.
- Carbon is a Group 14 element in the Periodic Table. It is known to form compounds with many elements. Write an example of a compound formed with:
 - Chlorine, which is a group 17 element of a Periodic Table.
 - Oxygen, which is a group 16 element of a Periodic Table.

Ans:

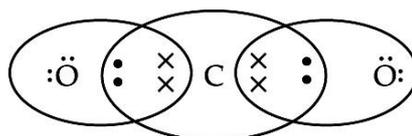
Element :	C	Cl	O
Valence electron:	4	7	6
Valency	4	1	2

- Thus, carbon can share its four electrons with four chlorine atoms



Carbon tetrachloride (CCl_4)

- Carbon dioxide (CO_2)



Carbon dioxide (CO_2)

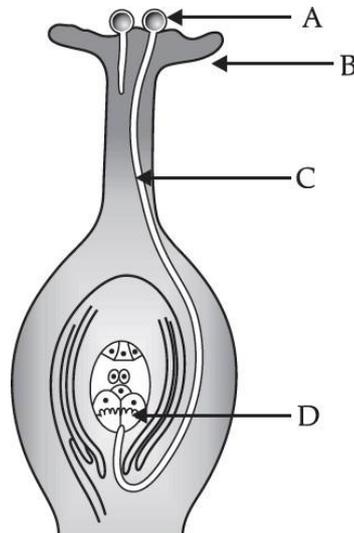
Thus, carbon can share its four electrons with two oxygen atoms.

- What is the pathway of sperm during ejaculation?
 - Name the organs producing sperms and ova respectively in humans.

Ans: (a) Sperms come out from testis into the vas deferens and pass through the urethra before ejaculation. The secretions of seminal vesicle and prostate glands provide nutrition to the sperms and also facilitate their transport.

(b) Testis: Sperms, Ovary: Ova.

4. In biology class, a teacher shows here students, the process of germination of pollen on stigma. Also, she told that the germination of pollen grain in stigma occurs in 'in vivo' conditions. It is called as fertilisation. Pollen grains are the male gametes and stigma is the female floral part. Ovule contains the egg cell. Based on the information and diagram given below, answer the questions given below:



(a) Identify 'A' and explain how it reaches part 'B'.

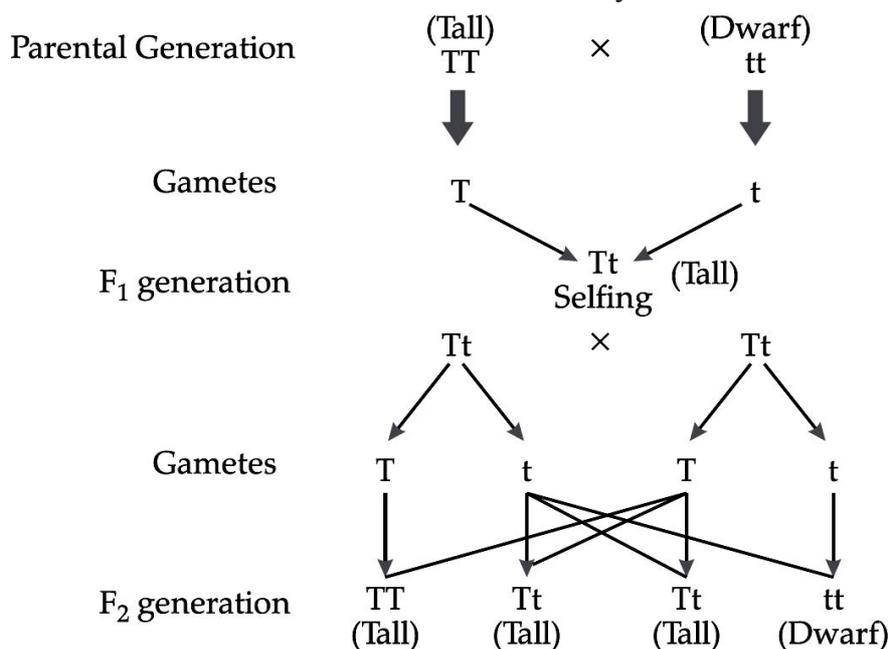
(b) What happens to the part marked 'D' after fertilisation is over?

Ans: (a) 'A' is pollen grain. Pollen grain reaches part B i.e., stigma by the process of pollination.

(b) Part D is female gamete i.e. egg cell that forms zygote after fertilisation.

5. Nazia performed a monohybrid cross between homozygous tall pea plants denoted by TT and homozygous short pea plants denoted by tt. She obtained only tall plants denoted by Tt in the F₁ generation. However, in F₂ generation she obtained both tall and short pea plants. Does the given information, explains the law of dominance? If yes, explain.

Ans: The cross shown below demonstrates that the traits may be dominant or recessive.



Law of dominance of traits: It states that "When parents having pure contrasting characters are crossed, then only one character expresses itself in F1 generation. This character is the dominant character and the character which cannot express itself is called recessive character".

OR

Mr. Naresh and his wife have attached earlobes (recessive trait) and are professional dancers. They told their colleagues that their offspring would also have attached earlobes and will be a good dancer. Is their notion right? Support your answer with suitable reasons.

Ans: Attached earlobe or free earlobe is an inherited trait. Also, both parents have attached earlobe which is a recessive trait, so the progeny produced will have attached earlobe. But, the ability to dance or being a good dancer is an acquired trait which an individual acquires during its lifetime. So, there is no certainty that the offspring produced will be a good dancer or not. Therefore, the notion they perceive is not right.

6. Varun divided a magnet into three parts A, B, and C.



- (a) Name the parts where the strength of the magnetic field is: (i) maximum (ii) minimum
 (b) The density of magnetic field lines differ at these parts. Explain.

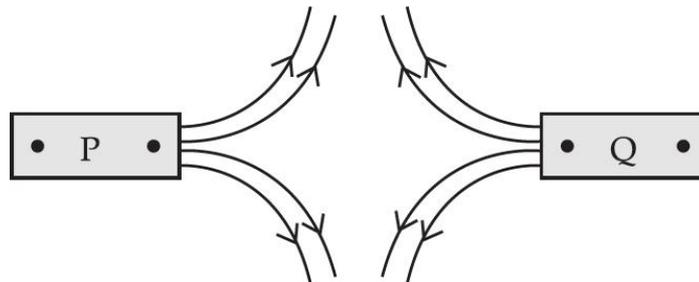
Ans: (a) (i) Maximum strength – At A and C

(ii) Minimum strength – At B

(b) At poles A and C, magnetic field lines are crowded that diverges from poles, so magnetic density is high at the poles. While at B, they are parallel to the centre and hence magnetic effect is minimum.

OR

Two students were playing with two magnets. They observed the magnets were sometimes attracting and sometimes repelling from their ends. They asked about magnets from their physics faculty. He demonstrated an activity with magnet's ends and draw a diagram. Study the diagram given below.



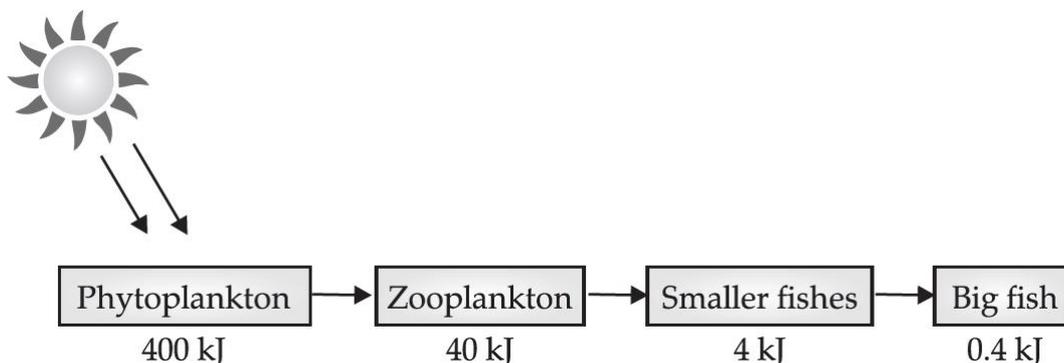
- (a) Identify the poles marked P and Q as North Pole or South Pole. Give reason in support of your answer.

(b) What is the direction of magnetic field lines inside a bar magnet ?

Ans: (a) Both P and Q are North poles because. magnetic field lines emerge from North Pole.

(b) From South Pole to the North pole.

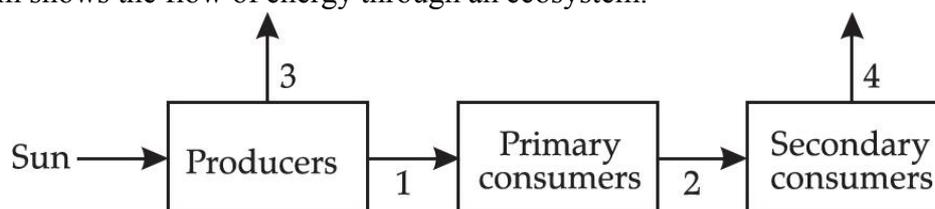
7. Shilpa studied the flow of energy at different trophic levels. Based on her studies she draw a flow chart. What does this flowchart depict? Why a food chain cannot have more than four trophic levels?



Ans: It is a food chain that is depicting 10% law of energy. The loss of energy at each step is so great that very little usable energy remains after four trophic levels.

OR

The diagram shows the flow of energy through an ecosystem.



The smallest amount of energy transferred between organisms and the largest amount of energy lost to the ecosystem is represented by which arrows?

Ans: The smallest amount of energy transferred between organisms is shown by arrow number 4. It is because as we go above in a food chain the amount of energy transferred is reduced by 10%.

The largest amount of energy lost to the ecosystem is in the form of heat. It is shown by arrow number 3. This is because producers (plants) take energy from sunlight. Only 1% of it is used to prepare food; the rest other is lost in the form of heat.

SECTION – B

Questions 8 to 13 carry 3 marks each.

8. The position of three elements A, B and C in the Periodic Table is shown below:

Period → Group ↓	1	2	3	4
Group 16				B
Group 17		A		C

Giving reasons, explain the following:

- (a) Element A is non-metal.
- (b) Atom of element B has a larger size than atom of element C.
- (c) Element C has a valency of 1.

Ans: (a) 'A' is non-metal because it can gain one electron easily as it has 7 valence electrons in its outermost shell. It requires one electron to attain stable noble gas configuration. Thus, it forms negative ion with stable electronic configuration.

(b) It is because 'B' has lesser atomic number, less nuclear charge, less force of attraction between valence electrons and nucleus therefore, B has larger atomic size than C.

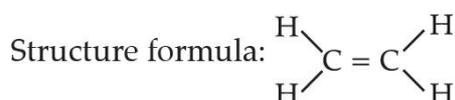
(c) Element 'C' has 7 valence electrons. It can gain one electron to attain stable noble gas configuration. So, its valency is equal to one.

9. The general formula for the molecule of alkene family is C_nH_{2n} .

- (a) What is the molecular formula of the alkene if there are six H-atoms in it?
- (b) What is the molecular formula and structural formula of the first member of the alkene family?
- (c) Write the molecular formulae of lower and higher homologues of an alkene which contains four carbons.

Ans: (a) C_3H_6

(b) Molecular formula: C_2H_4



(c) Lower homologue — C_3H_6 , Higher homologue — C_5H_{10}

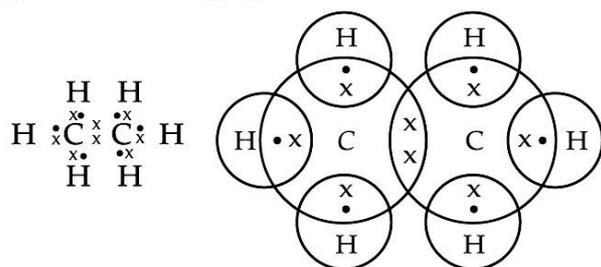
OR

Write the molecular formula of the following compounds and draw their electron-dot structures:

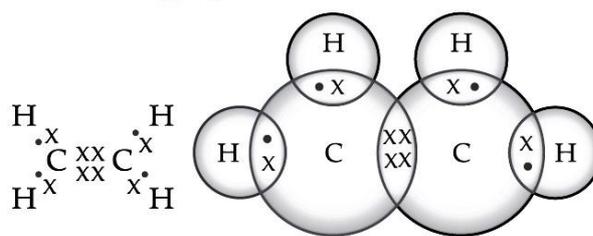
(a) Ethane (b) Ethene (c) Ethyne

Ans:

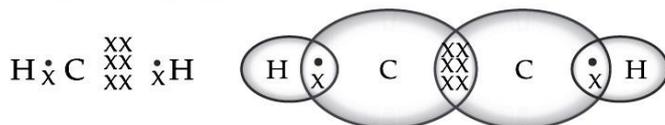
(a) Ethane : C_2H_6



(b) Ethene : C_2H_4



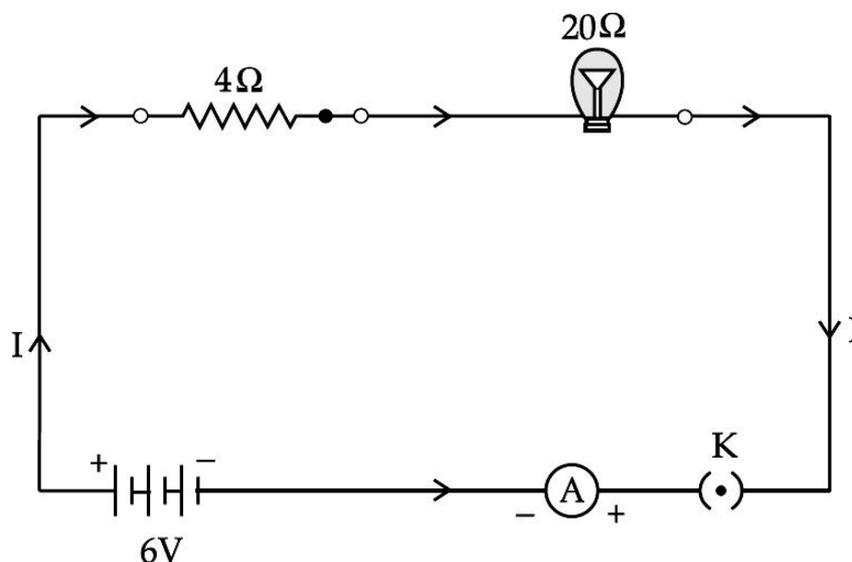
(c) Ethyne : C_2H_2



10. In humans, there is a 50% probability of the birth of a boy and 50% probability that a girl will be born. Justify the statement on the basis of the mechanism of sex-determinants in human beings.

Ans: In humans beings, the genes inherited from the parents decide whether it will be a boy or girl. Women have a perfect pair of sex chromosome (XX). But, men have a mixmatched pair (XY). All children will inherit an X chromosome from their mother regardless of whether they are boys or girls. Thus, the sex of the children will be determined by what they inherit from their father. A child who inherits an X-chromosome from her father will be a girl, and who inherits a Y-chromosome from him will be a boy.

11. An electric lamp whose resistance is 20Ω and a conductor of 4Ω resistances are connected to a 6 V battery as shown in the diagram below. Calculate the total resistance of the circuit, the current through the circuit and the potential difference across the electric lamp and the conductor.



Ans: Since the lamp and conductor are in series, total resistance in the circuit,

$$R_S = R_1 + R_2 = 20 \Omega + 4 \Omega = 24 \Omega$$

$$\text{Current through the circuit, } I = \frac{V}{R_S} = \frac{6}{24} = 0.25 \text{ A}$$

Potential difference across the lamp,

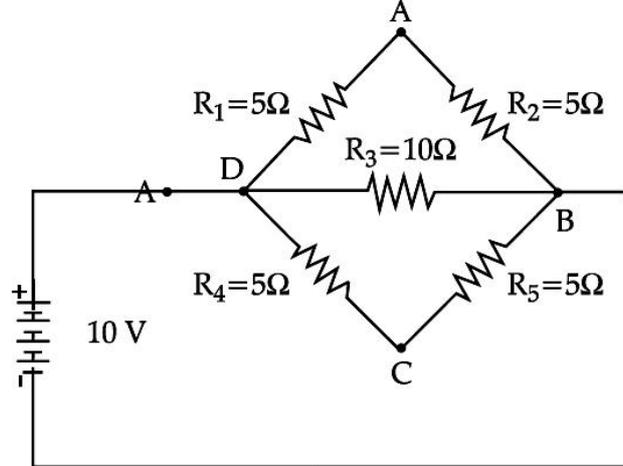
$$V_1 = IR_1 = 0.25 \text{ A} \times 20 \Omega = 5 \text{ V}$$

Potential difference across the conductor,

$$V_2 = IR_2 = 0.25 \text{ A} \times 4 \Omega = 1 \text{ V}$$

OR

- (a) Find the equivalent resistance between the points D and B in the below figure.
(b) Find the current through DAB, DCB and DB path.



Ans: (a) R_1 and R_2 are in series. Hence the equivalent resistance
 $R_{12} = 5 \Omega + 5 \Omega = 10 \Omega$
 R_4 and R_5 are in series. Hence the equivalent resistance
 $R_{45} = 5 \Omega + 5 \Omega = 10 \Omega$
 R_{12} , R_{45} , R_3 are in parallel. Hence the equivalent resistance can be calculated
 $= 1/R_{eq} = 1/R_{12} + 1/R_{45} + 1/R_3$
 $= 3/10$
 $\therefore R_{eq} = 10/3 \Omega$
(b) Total circuit current, $I = V/R_{eq} = 10/(10/3) = 3A$
Since resistance of each path is equal, hence current is equally distributed in each path i.e., 1A through DAB, 1A through DCB and 1A through DB.

12. Vaani connected a hot plate to a 220 V line, which has two resistance coils A and B, each of 22W resistances.

Now she wants to calculate the amount of electric current flowing when these coil are :

- (a) used individually.
(b) connected in series.
(c) connected in parallel.

Ans: (a) By Ohm's law, $V = IR$.

Current flowing in each resistance individually is, $I = \frac{V}{R} = \frac{220}{22} = 10A$

- (b) When two resistances are in series connection,

$$R_{eq} = R_1 + R_2 = 22 + 22 = 44\Omega$$

$$\Rightarrow I = \frac{V}{R} = \frac{220}{44} = 5A$$

- (c) When two resistances are in parallel connection.

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{22} + \frac{1}{22} = \frac{2}{22} \Rightarrow R_p = \frac{22}{2} = 11\Omega$$

$$\Rightarrow I = \frac{V}{R} = \frac{220}{11} = 20A$$

13. You have been selected to talk on 'ozone layer and its protection' in the school assembly on 'Environment Day'.

- (a) Why should ozone layer be protected to save the environment ?
(b) List any two ways that you would focus upon in your talk to bring awareness amongst your fellow friends that would also help in protection of ozone layer as well as the environment.

Ans: (a) Ozone layer helps in shielding the Earth from the harmful UV radiations coming from sun. If ozone layer gets depleted, UV radiations can directly reach the earth's surface and drastically affect the life on earth.

(b) Ozone layer can be protected by:

- (a) Stopping the release of chlorofluorocarbon.
- (b) Removing the pollutant nitrogen monoxide.
- (c) Reduce the usage of air conditioners.

SECTION – C

This section has 02 case-based questions (14 and 15). Each case is followed by 03 sub-questions (a, b and c). Parts a and b are compulsory. However, an internal choice has been provided in part c.

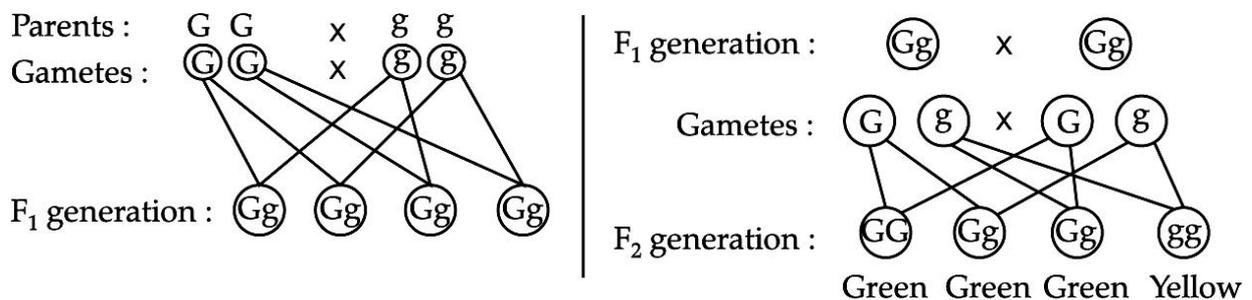
14. Sahil conducted an experiment on pea plants. In which, pure breeding pea plants with green pods were crossed with pure breeding pea plants with yellow pods. He found that all the F₁ generation plants have green pods. Then he interbred the plants from the F₁ generation.

- (a) What colour of pods will be observed in F₂ generation plants? Explain with a cross.
- (b) The genotype for the colour of the pod of a pea plant is Gg. What conclusion may be drawn from this?
- (c) Why Sahil selected garden peas as his experimental material? Give two reasons.

OR

List two contrasting visible characters of garden pea Mendel used for his experiment.

Ans: (a) In pea plants, the gene for green coloured pod (G) is dominant over the gene for yellow coloured pod (g). During a cross between pure breeding pea plants with green pods (GG) and pure breeding pea plants with yellow pods (gg), in F₂ generation, plants with green and yellow coloured pods will be obtained in the ratio of 3:1 respectively.



(b) Genotype is the genetic composition of an organism, i.e., the combination of alleles it possesses. Every character in an organism is controlled by a gene that has at least two alleles that lie on the two homologous chromosomes at the same locus. These alleles may represent the same (homozygous, e.g., GG for green coloured pod) or alternate expressions (heterozygous, e.g., Gg) of the same character. Thus, if genotype for the colour of the pod is Gg, this means there are at least two different alleles for the gene for the colour of pod one is G and the other is g.

(c) Sahil selected pea plants because:

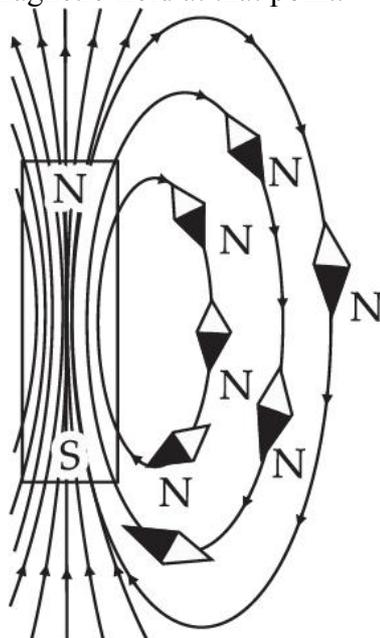
- Peas have many visible characters like tall/dwarf plants, round/ wrinkled seeds, green/yellow pod etc.
- Peas have bisexual flowers and therefore they undergo natural self-pollination. Thus, pea plants produce offspring with same traits generation after generation.
- In pea plants, cross-pollination can be easily achieved by emasculation in which the stamen of the flower is removed without affecting the pistil. (any two)

OR

(d) Contrasting characters:

- Round/wrinkled seeds
- Tall/short plants
- White/purple flowers
- Green/yellow seeds.

15. Sanjana described a magnetic field by drawing the magnetic field lines. She explained that when a small north magnetic pole is placed in the magnetic field created by a magnet, it will experience a force. And if the North Pole is free, it will move under the influence of magnetic field. Since the direction of magnetic field line is the direction of force on a north pole, so the magnetic field lines always begin from the N-pole of a magnet and end on the S-pole of the magnet. Inside the magnet, however the direction of magnetic field lines is from the S-pole of the magnet to the N-pole of the magnet. Thus, the magnetic field lines are closed curves. When a small compass is moved along a magnetic field line, the compass needle always sets itself along the line tangential to it. So, a line drawn from the south pole of the compass needle to its north pole indicates the direction of the magnetic field at that point.



Based on the given passage answer the following questions:

- What is meant by magnetic field lines ?
- What does the degree of closeness of magnetic field lines near the poles signify ?
- Give two uses of a magnetic compass.

OR

What are the characteristics of magnet field lines?

Ans:

- Magnetic field lines are the imaginary path traced by a free north magnetic pole which tends to move under the influence of a magnetic field. The tangent at any point on the magnetic field lines gives the direction of magnetic field at that point.
- Crowding of magnetic field lines indicates that magnetic field in that region is strong.
- Two uses of magnetic compass are:
 - It is used to determine the direction of north and south of the Earth.
 - It is used to draw the magnetic field lines around a bar magnet.

OR

(c) Characteristics of Magnetic field lines are:

- No two magnetic field lines intersect each other.
- At the points of stronger magnetic field, the field lines are crowded and vice-versa.

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