

**SAMPLE PAPER TEST 04 FOR TERM-2 EXAM (2021-22)**  
**(ANSWERS)**

**SUBJECT: SCIENCE (086)**

**CLASS : X**

**MAX. MARKS : 40**

**DURATION: 2 HRS**

**General Instructions:**

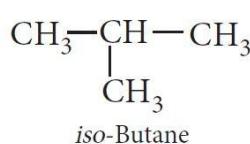
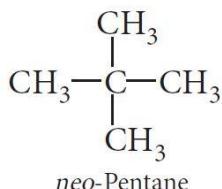
1. All questions are compulsory.
2. The question paper has three sections and 15 questions. All questions are compulsory.
3. **Section-A** has 7 questions of 2 marks each; **Section-B** has 6 questions of 3 marks each; and **Section-C** has 2 case based questions of 4 marks each.
4. Internal choices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

**SECTION – A**

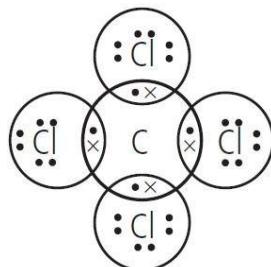
**Questions 1 to 7 carry 2 marks each.**

1. (a) Write the condensed formulae for neo-pentane and iso-butane.  
(b) Give the electron dot structure for  $\text{CCl}_4$ .

**Ans:** (a)



1. (b) Carbon has 4 valence electrons and chlorine has 7 valence electrons. The electron dot structure of  $\text{CCl}_4$  is drawn as follows:



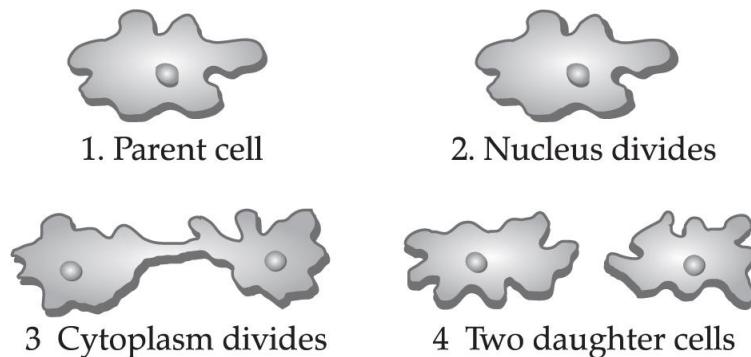
2. X, Y and Z are the three elements, each one belongs to any one of the groups IA, IIIA and VA. The oxide of X is amphoteric, the oxide of Y is highly acidic, and the oxide of Z is highly basic. Identify the groups to which these elements X, Y and Z belong?  
**Ans:** Oxides of metals are basic while the oxides of non-metals are acidic. As we move from left to right in a period, basic character of oxides decreases while the acidic character of oxides increases. Thus, element X belongs to IIIA, Y belongs to VA and Z belongs to IA.

3. What are the benefits of using mechanical barriers during sexual act?

**Ans:** Mechanical barriers like condoms have the following advantages :

- (i) They prevent the sperms from reaching the egg.
- (ii) They also prevent the transmission of infections during sexual act.

4. Reproduction is one of the biological processes that are commonly carried out by an organism. In fact, the ability to reproduce is one of the major characteristics of a living organism. There are two major modes of reproduction : sexual and asexual. The given diagram represents a mode of reproduction, wherein a cell divides to produce two identical cells.



- (a) Name the organism that divides by the above process. State the type of reproduction.  
 (b) How the above process is different from multiple fission?

**Ans:** (a) Binary fission: Amoeba

Type of reproduction is asexual reproduction.

(b) Binary fission: Two daughter cells are produced.

Multiple fission: Many daughter cells are formed simultaneously.

5. In an experiment, Mendel obtained 1014 plants out of which 787 were having round seeds and 227 had wrinkled seeds in F<sub>2</sub> generation.  
 (a) What is the approximate ratio obtained in F<sub>2</sub>-generation? Under which law of Mendel do you find this ratio?  
 (b) Why is this law so called?

**Ans:** (a) 3 : 1

Law of segregation or principle of purity of gametes.

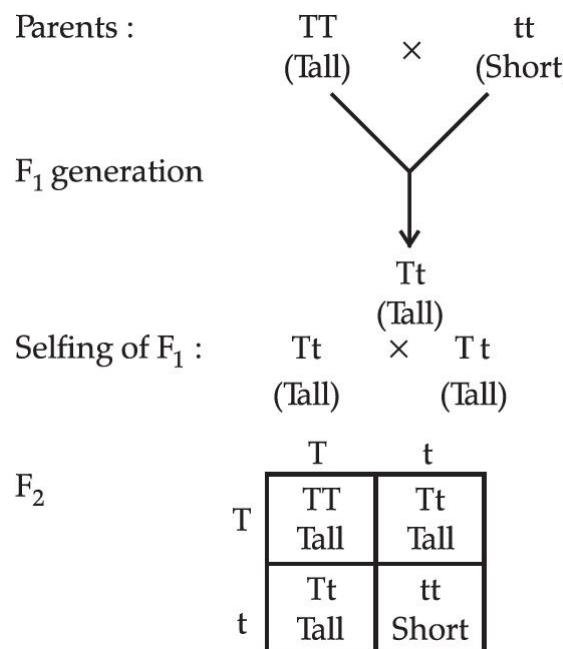
(b) Law of segregation is known so because the two factors or alleles of a character separate and pass to different gametes at the time of gametogenesis. As a result a gamete contains only one factor of a character.

### OR

Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F<sub>1</sub> and F<sub>2</sub> generations when he crossed the tall and short plants? Write the ratio he obtained in F<sub>2</sub> generation plants.

**Ans:** Mendel used Pisum sativum (Pea plant) for his experiment.

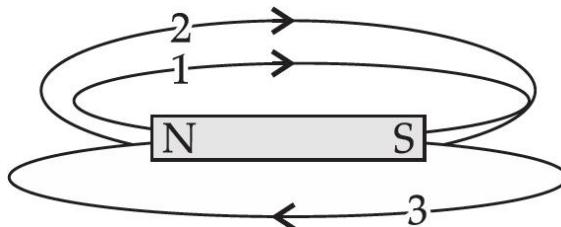
Mendel took a tall pea (TT) plant and a short pea (tt) plant. When he crossed both, the first filial generation (F<sub>1</sub>) obtained were tall. When F<sub>1</sub> progeny was self-pollinated, all plants obtained in F<sub>2</sub> generation were not tall. Instead, three tall pea plants and one short pea plant was obtained.



Phenotypic ratio 3 Tall: 1 short

Genotypic ratio 1 Pure Tall (TT): 2 Hybrid (Tt): Pure short (tt)

6. A student drew three magnetic field lines 1, 2 and 3 of a bar magnet with the help of a compass needle as shown in the figure.



(a) Is this configuration possible? If not, then what is wrong in the given figure and why?

(b) List any two characteristics of these magnetic field lines.

**Ans:** (a) No, this type of configuration is not possible as:

(i) Two field lines cannot intersect each other

(ii) Direction of field line as it emerged from south pole and merged at north pole. '3' is wrong as, it emerged from south pole and merged at north pole.

(b) Characteristics of Magnetic field lines are:

(i) Emerge at north pole and merge at south pole. Inside the magnet, the direction of field lines is from south pole of magnet to its north pole and are closed curves.

(ii) At the points where the magnetic field is stronger, field lines are crowded and vice-versa.

(iii) No two magnetic field lines can intersect each other. (Any two)

**OR**

A magnetic field that varies in magnitude from point to point but has a constant direction (east to west) is set up in a chamber. A charged particle enters the chamber and travels undeflected along a straight path with constant speed. What can you say about the initial velocity of the particle?

**Ans:** If a charged particle moves parallel or antiparallel to the magnetic field, no magnetic force will act on it and it is undeflected. So, in the given condition either the charged particle enters east to west or west to east.

7. Explain briefly about CFCs. Name two gases which have replaced CFCs.

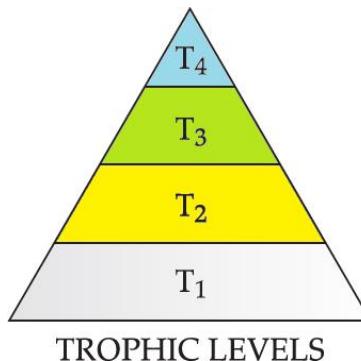
**Ans:** CFCs (Chlorofluorocarbons) are synthetic, gaseous compounds of carbon and halogen which are odourless, non-toxic, non-inflammable, chemically inert propellants used in refrigerators and air conditioners, in aerosol sprayers, etc. Once released in the air, these harmful chemicals produce active chlorine which destroy the ozone by converting it into oxygen. CFCs are being replaced by Hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs).

**OR**

Observe the figure and answer the below questions.

(a) Which trophic level has maximum number of organisms? Why?

(b) In which trophic level chemicals like DDT are accumulated in highest concentration? Why?



**Ans:** (a) Trophic level 1 has maximum number of organisms because it includes producers.

(b) DDT is accumulated at trophic level 4. It occupies the topmost place in the given food chain.

## **SECTION – B**

**Questions 8 to 13 carry 3 marks each.**

8. (a) Explain law of octaves with example.

(b) What was the position of isotopes in Mendeleev's periodic table?

**Ans:** (a) When the elements are arranged in the order of increasing atomic mass, the properties of eighth element (starting from a given element) are the repetition of the properties of first element. e.g., if we start from lithium (Li), then the eighth element is sodium (Na) and further eighth element is potassium (K). The above elements have similar chemical and physical properties. Similarly, Be and Mg, B and Al, C and Si, etc., have similar chemical and physical properties.

Li, Be, B, C, N, O

Na, Mg, Al, Si, P, S

(b) Mendeleev's original periodic table does not explain the position of isotopes. Isotopes are the atoms of the same element having different atomic masses. Therefore, according to Mendeleev's classification these should be placed at different places depending upon their atomic masses. For example, hydrogen isotopes with atomic masses 1, 2 and 3 should be placed at three places. However, isotopes have not been given separate places in the periodic table because of their similar properties.

9. Mendel was first to explain the mechanism of transmission of characters from one generation to other. Write the basic features of mechanism of inheritance.

**Ans:** The basic features of mechanism of inheritance are as follows:

- Characters are controlled by genes and each gene controls one character.
- Chromosomes are gene carrier and genes are basic unit of heredity.
- One form of gene may be dominant on other, i.e., genes are allelic in nature.
- The two forms of alleles separate at the time of gamete formation, i.e., they do not mix with each other.
- Two allelic forms of a gene are brought together in a zygote.

10. A homologous series is a series of organic compounds which belong to the same family (i.e., possess same functional group) and show similar chemical properties. The members of this series are called homologous and differ from each other by the number of  $-\text{CH}_2$  units in the main carbon chain.

(a) What is the difference between two consecutive members in a homologous series in alkanes in terms of: (i) Molecular mass (ii) Number of atoms of elements.

(b) Write the name and formula of the 2nd member of homologous series having general formula  $\text{C}_n\text{H}_{2n}$ .

(c) The molecular formula of 'A' is  $\text{C}_{10}\text{H}_{18}$  and 'B' is  $\text{C}_{18}\text{H}_{36}$ . Name the homologous series to which they belong.

**Ans:** (a) Difference is:

- Molecular mass = 14 a.m.u.
- Number of atoms of elements =  $\text{CH}_2$ .

(b) Name: Propene

Formula:  $3\text{H}_6$

(c) 'A' belongs to alkyne as general formula of alkyne is  $\text{C}_n\text{H}_{2n-2}$ .

'B' belongs to alkene as general formula of alkene is  $\text{C}_n\text{H}_{2n}$ .

**OR**

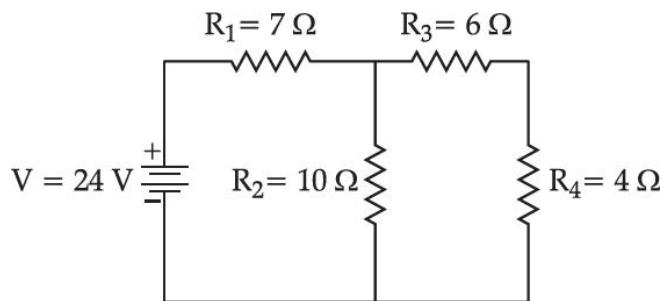
What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

**Ans:** The two important properties of carbon that lead to huge number of carbon compounds are as follows :

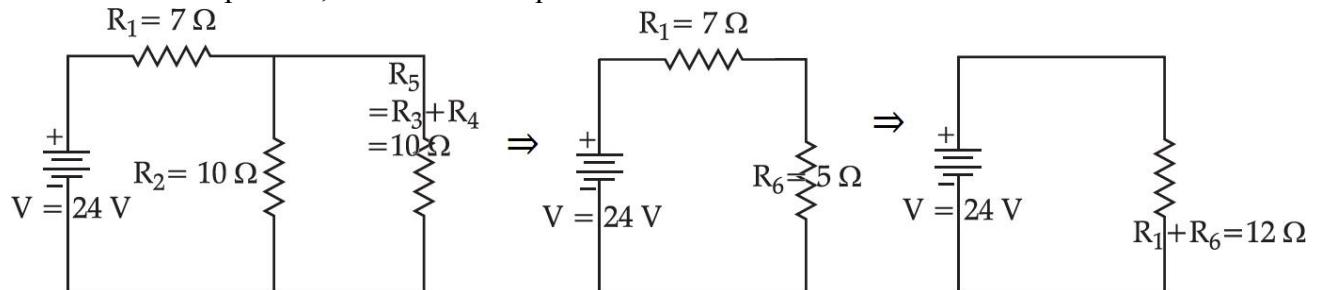
(i) Catenation : Carbon has the unique property of self linking which is known as catenation. In fact, any number of carbon atoms can be linked to one another by covalent bonds. This is on account of the stability of  $\text{C} - \text{C}$  bonds since the size of the carbon atom is quite small.

(ii) Linking of carbon with other atoms : Carbon is tetravalent in nature and can readily unite with atoms like hydrogen, oxygen, nitrogen, sulphur, etc. by electron sharing.

**11.** Calculate the total resistance of the circuit and find the total current in the circuit.



**Ans:**  $R_3$  and  $R_4$  are in series, hence the equivalent resistance of those two =  $R_5 = R_3 + R_4 = 10\Omega$ .  $R_5$  and  $R_2$  are in parallel, Let  $R_6$  be the equivalent resistance for them.



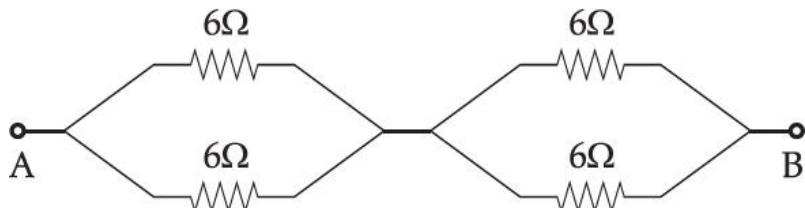
$$\text{Hence, } R_6 = (R_5 R_2) / (R_5 + R_2) = 100/20 = 5\Omega$$

Now  $R_1$  and  $R_6$  are in series and hence the final equivalent resistance of the entire circuit is  $R = R_1 + R_6 = 12 \Omega$ .

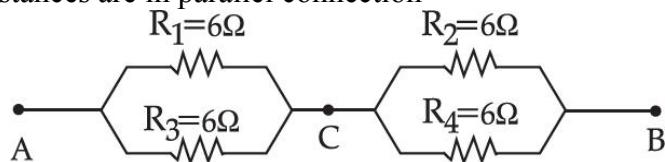
By Ohm's Law, we know that  $V = IR$ , hence  $I = V/R$ .

Hence the current in the circuit is  $24/12 \text{ A} = 2\text{A}$

**12.** Calculate the equivalent resistance between the points A and B in the circuit shown below:



**Ans:** In loop AC, resistances are in parallel connection



$$R_{p1} = \frac{R_1 R_3}{R_1 + R_3} = \frac{6 \times 6}{6 + 6} = 3\Omega$$

In loop CB, resistances are in parallel connection,

$$R_{p2} = \frac{R_2 R_4}{R_2 + R_4} = \frac{6 \times 6}{6 + 6} = 3\Omega$$

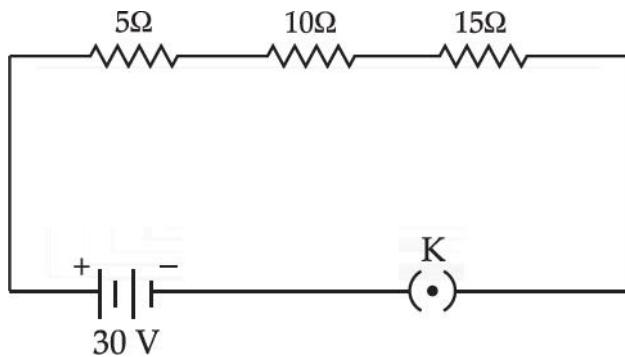
Now, in ACB,  $R_{p1}$ , and  $R_{p2}$  are in series connection,

$$R_{eq} = R_{p1} + R_{p2} = 3\Omega + 3\Omega = 6\Omega$$

So, the resistance between A and B is  $6\Omega$ .

## OR

Consider the given electric circuit and find potential difference across each resistor.



**Ans:** Total resistance of the circuit,  $R_{eq} = R_1 + R_2 + R_3 = 5 + 10 + 15 = 30\Omega$

Current in the circuit,

Potential difference across  $15\Omega$  Resistor,

$$V_{15} = IR_{15} = 1A \times 15\Omega = 15V$$

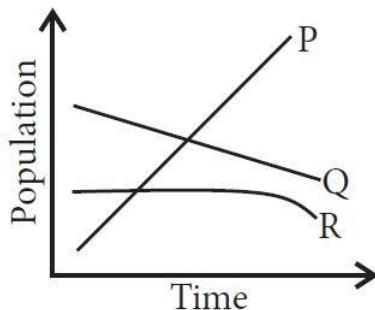
Potential difference across  $5\Omega$  resistor,

$$V_5 = IR_5 = 1A \times 5\Omega = 5V$$

Potential difference across  $10\Omega$  resistor,

$$V_{10} = IR_{10} = 1A \times 10\Omega = 10V$$

13. In a cage with plenty of plants, three animals P, Q and R were kept together. The changes in their population over time have been plotted in the given graph.



(a) Identify the carnivore and herbivore animal among these.

(b) The population of R remains stable for a longer time as compared to P and Q. What is the most likely reason for this?

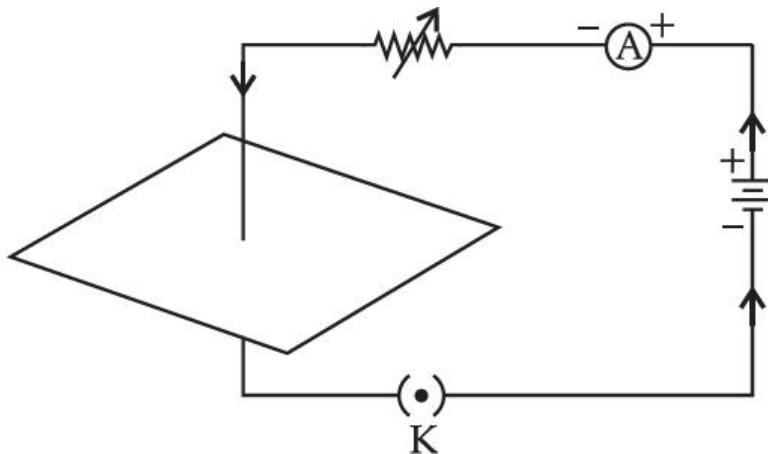
**Ans:** (a) According to the given graph, P could be carnivore and Q and R are herbivores.

(b) The population of R remains stable for a longer time compared to P and Q, because R is a herbivore which is not eaten by P.

## 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. Study the figure of a current carrying straight conductor passing perpendicularly through a horizontal cardboard. Answer the following questions:



- (a) Why does a compass needle show deflection when brought near a current carrying conductor?  
 (b) State right-hand thumb rule to mark the direction of the field lines.  
 (c) How will the strength of the magnetic field change when the point where magnetic field is to be determined is moved away from the straight conductor? Give reason to justify your answer.

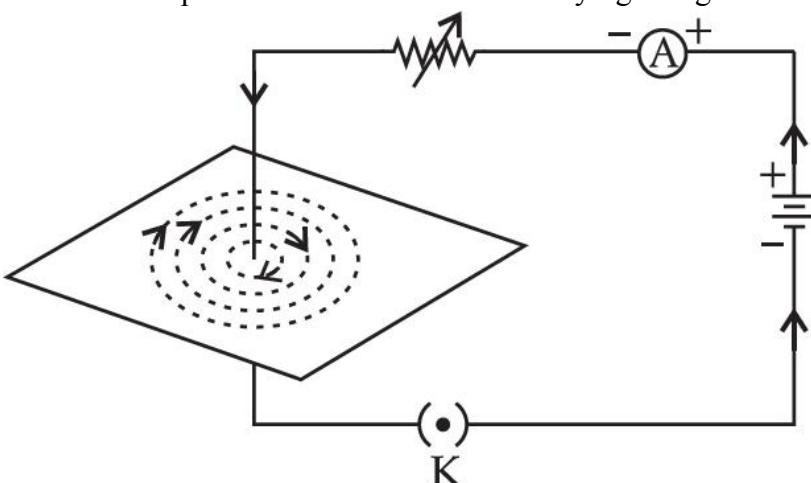
**OR**

Draw the pattern of magnetic field lines produced around a current carrying straight conductor passing perpendicularly through a horizontal cardboard as shown in figure.

- Ans:** (a) Due to production of magnetic field around the current carrying conductor.  
 (b) Right-hand thumb rule: If we are holding a current carrying straight conductor in right hand such that the thumb points towards the direction of current, then, the fingers wrap around the conductor shows the direction of the field lines of the magnetic field.  
 (c) As the compass is placed farther, deflection in the needle decreases. Thus, the magnetic field produced by given current decreases as the distance from its increases. The concentric circles around the wire become larger as we move away from it.

**OR**

Pattern of magnetic field lines produced around a current carrying straight conductor.



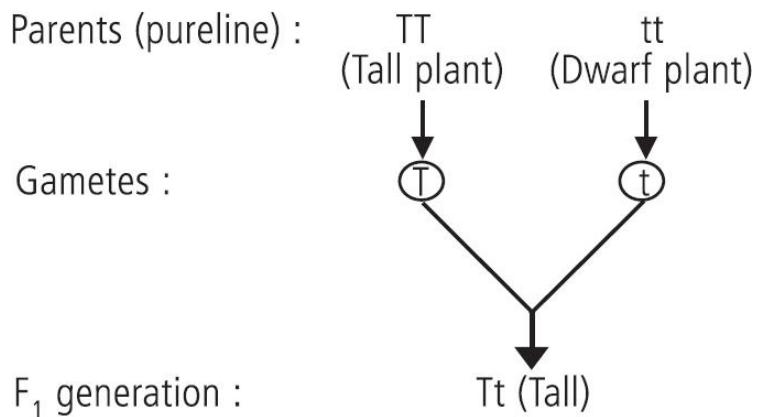
15. The Australian monk Gregor Johannes Mendel worked on a plant due to its unique features like shorter life cycle, well defined contrasting characters over other plants.  
 (a) Name the plant Mendel used for his experiment.  
 (b) What type of progeny was obtained by Mendel in F<sub>1</sub> generation when he crossed the tall and short plants?  
 (c) Write the phenotypic and genotypic ratio he obtained in F<sub>2</sub> generation plants.

**OR**

Write the dominant characters studied by Mendel in his experiments.

- Ans:** (a) Mendel selected garden pea (*Pisum sativum*) for his series of hybridisation experiments.  
 (b) He first selected two pureline plants (tall plant having gene TT and short plant having gene tt) and then crossed such plants having contrasting characters. In the F<sub>1</sub> generation, he observed that

only one of the two contrasting characters appeared, he called this character as dominant and the one which does not get expressed in F1 was called recessive.



- (c) The plants of F<sub>1</sub> generation will be all tall plants and after selfing the ratio of tall and dwarf plants that Mendel obtained in F<sub>2</sub> generation plants is 3 (Tall) : 1 (Dwarf). Genotypic ratio of F<sub>2</sub> generation is 1 (TT) : 2 (Tt) : 1 (tt).

**OR**

Dominant characters studied by Mendel were:

- (i) Plant height – Tall (T)
  - (ii) Flower position – Axillary (A)
  - (iii) Pod colour – Green (G)
  - (iv) Pod shape – Full or inflated (I)
  - (v) Flower colour – Violet (V)
  - (vi) Seed shape – Round (R)
  - (vii) Seed colour – Yellow (Y)
-