CBSE Board
Class X Science
Sample Paper - 1
Term 2 – 2021-22

Time: 2 hours **Total Marks: 40**

General Instructions:

i. All questions are compulsory.

*ii. The question paper has three sections **and 15 questions**. All questions are compulsory.*

iii. 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.

iv. Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

SECTION-A

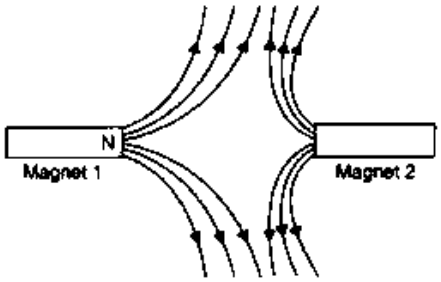
1. In humans, the gene for black hair colour is B and gene for brown hair colour is b. What will be the hair colour of person having the genetic constitution? [2]
(a) bb
(b) Bb

2. In a bisexual flower inspite of the young stamens being removed artificially, the flower produces fruit. How is it possible? [2]

3. A horticulturist took stems of two different plants, plant X with roots and plant Y without roots. He fixed the cut stem X in soil and fitted and bound tightly the other cut stem Y over the surface of X. He fastened the joint properly with the help of polythene. The cut soon healed and the two plant stems (X and Y) grew together as one plant. [2]
(a) What are stems X and Y respectively known as?
(b) Why the area where two stems are joined is covered with polythene?

4. 'Different species use different strategies to determine the sex of a newborn individual. It can be environmental cues or genetically determined'. Explain the statement by giving example for each strategy. [2]

5. The figure given below shows the magnetic field between two magnets: [2]



(i) Copy the diagram and label the other poles of the magnets.
(ii) Which is the weaker magnet?

OR

What is a magnetic field? How can the direction of magnetic field lines at a place be determined?

6. Basis the understanding of size of the organism and chromosome number, answer the following questions: [2]
(i) Do larger organisms have more number of chromosomes/cells?
(ii) More the number of chromosomes/cells greater in the DNA content. Justify.

OR

A married woman used a device made of common metal for preventing pregnancy. This device was put into her uterus by some trained medical professional. Unfortunately she got pregnant after two months of insertion of device. She was in shock to learn that her birth control device has failed.
(i) How does device X prevent pregnancy?
(ii) Why do you think the woman got pregnant even after using device X?

7. What will happen if we kill all the organisms in one trophic level? [2]

OR

In the following food chain, plants provide 500 J of energy to rats. How much energy will be available to hawks from snakes?
Plants → Rats → Snakes → Hawks

SECTION - B

8. "It is possible that a trait is inherited but may not be expressed." Give a suitable example to justify this statement. [3]

9. An electric heater of resistance 10 Ω and resistance wire of 8 Ω are connected in series with a 6V battery. Find
(i) Current through the circuit
(ii) Potential difference across the electric heater
(iii) Potential difference across electric wire [3]

OR

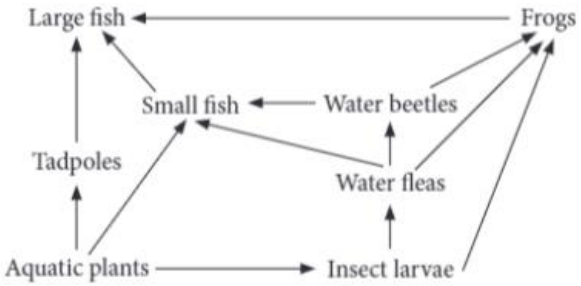
A heater connected to a 230V power source draws 5.5 A current. Calculate

(i) Electric power of the heater

(ii) Resistance of the heater

(iii) Cost of operating this heater for 20 hours if commercial electricity unit cost is Rs. 4 [3]

10. Refer to the given food web. [3]



(a) What will be the effect on food web if population of water fleas gets eliminated?

(b) In the given food web, which organism operates at both primary and tertiary consumer level?

11. (a) Which gas is filled in an electric bulb and why?

(b) State Ohm's law. [3]

12. An element X belongs to Group 17 and the third period of the periodic table. [3]

(a) Write the electronic configuration of the element. What is its valency?

(b) Predict its nature, whether it is a metal or a non-metal.

(c) Give the formula of the compound formed when it combines with an element Y having a valency three.

OR

The following table shows the position of six elements A, B, C, D, E and F in the periodic table. [3]

Group / Period	1	2	3 to 12	13	14	15	16	17	18
2	A					B			C
3		D			E				F

Using the above table, answer the following questions:

(a) Which element will form only covalent compounds?

(b) Write the common name for the family of elements C and F.

(c) Which element is a metal with valency 2 and a non-metal with valency 3?

13. A non-metal X exist in two forms Y and Z. Y is a good conductor and Z is a bad conductor of electricity. Identify X, Y and distinguish between you and Z in terms if their physical properties. [3]

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. The homologous series is a group of organic compounds having a similar structure and similar chemical properties in which the successive compounds differ by a $-CH_2$ group. There are some characteristics of a Homologous series such as each member of the series differs from the preceding one by the addition of a $-CH_2$ group and by 14 a.m.u.

All members of a homologous series share the general formula. For example, the general formula for alkane is C_nH_{2n+2} and alkene is C_nH_{2n}. The physical properties of the members show a gradation in properties as the molecular mass increases. The chemical properties also show a gradient similarity.

(a) Give homologous series of alkanes with an example.

(b) State two characteristics of a homologous series.

(c) Select the hydrocarbons which belong to the same homologous series. Give the name of each series.

CH_4, C_2H_2, C_2H_4, C_2H_6, C_4H_{10}, C_3H_4, C_3H_6

OR

What is meant by 'heteroatom'? Give examples. Write the names and formulae of two organic compounds containing different heteroatoms. [4]

15. The magnetic field at any point is the combined effect of the magnetic field due to the current in the wire and the magnetic field of the Earth. Iron filings when placed near the wire carrying current are arranged in circles due to the magnetic field produced by the current flowing through the wire. However, at the point far away from the wire, the magnetic field due to the earth is predominant as compared to the magnetic field due to current due to which the iron filings are arranged in straight lines. The point where the two fields are equal and opposite is called the neutral point. At the neutral point, the net magnetic field is zero and the compass needle at this point rests in any direction.

(a) How are the magnetic field lines at the point near the straight current-carrying conductor? [1]

(b) To what parameter is the magnitude of the magnetic field produced by the straight conductor directly proportional? [1]

(c) Which rule is used to find the direction of the magnetic field produced by the straight current-carrying conductor? [2]

OR

What according to the rule will be the direction of the current when lines of the magnetic field are in the anti-clockwise direction?

Solution

SECTION-A

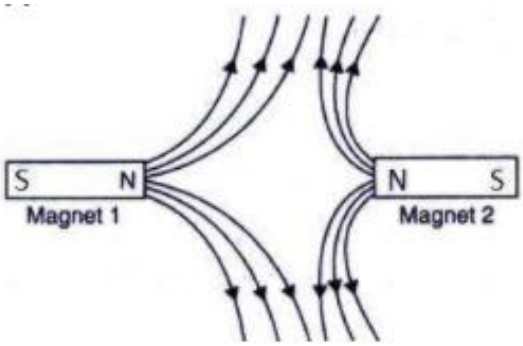
1. Black hair colour is dominant over brown hair colour.
(a) bb – brown hair
(b) Bb – black hair

2. When the stamen or the male part of the flower is removed, it will have no effect on flower-producing capability of the plant because the pistil or the female reproductive part is still intact. So, by the process of cross-fertilization, the stamen from other plant might fertilize the pistil of this flower, thereby producing a fruit.

3.
(a) The cut stem of a plant having roots (X) and is fixed in soil is called stock. The cut stem of another plant (without roots) (Y) is called scion.
(b) The area where two stems are joined is covered with polythene to prevent the loss of water and cell sap from the cut and joined ends of the stems. It also helps to prevent harmful infection by bacteria or fungi.

4. Environmental cue: In some animals, the temperature at which fertilised eggs are incubated determines whether the developing animal in egg is a male or a female. In some animals like snail, individuals can change sex.
Genetic cue: A child who inherits an X chromosome from the father will be a girl and the one who inherits a Y chromosome from the father will be a boy.

5.
i)



ii) Magnet 2 is weaker because its field lines are smaller than that of the magnet.

OR

The space surrounding a magnet in which magnetic force is exerted, is called a magnetic field. The direction of magnetic field lines at a place can be determined by using a compass needle.

A compass needle placed near a magnet gets deflected due to the magnetic force exerted by the magnet. The north end of the needle of the compass indicates the direction of magnetic field at the point where it is placed.

6.

(i) No, there is no relationship between size of organism and its chromosome number.

(ii) Yes, since the major component of chromosome is DNA, if there are more chromosomes in a cell, the quantity of DNA will also be more.

OR

(i) Device X (Copper-T) suppresses fertilizing capacity of sperms and thus, prevents pregnancy.

(ii) Intra-uterine devices can be expelled anytime without the knowledge of the woman. Couples continue active sexual life thinking that their birth control device is still in action.

7. Killing all the organisms in one trophic level would decrease the availability of food at the next trophic level. It will also result in excess of organisms at the previous trophic level. This would cause an imbalance in the food chain.

OR

On applying the 10% law to the given food chain-

Plants → Rats → Snakes → Hawks

Energy available to snakes from rats = 10% of 500

= 10/100 × 500 = 50 J

So, energy available to hawks from snakes = 10% of 50 J

= 10/100 × 50 = 5J

SECTION - B

8. Yes, it is possible that a trait is inherited but may not be expressed. For example, when pure tall pea plants are crossed with pure dwarf pea plants, only tall pea plants are obtained in F_1 generation. The trait for dwarfness was present but could not express itself in the presence of the dominant trait for tallness.

On selfing the tall plants of F_1 generation, both tall and dwarf plants are obtained in F_2 generation in the ratio 3 : 1. Reappearance of the dwarf character, a recessive trait in F_2 generation shows that the dwarf trait was present in individuals of F_1, but it did not express. It got suppressed in the presence of the dominant trait.

9.

i) $V = IR$

$6 == I \times (8 + 10)$

$I = 6 / 18 = \frac{1}{3} = 0.33A$

ii) $V_{\text{electric heater}} = \frac{1}{3} \times 10 = \frac{10}{3} V = 3.33\ V$

iii) $V_{\text{electric wire}} = \frac{1}{3} \times 8 = \frac{8}{3} V = 2.67\ V$

OR

Power is

$P = VI = 230 \times 5.5 = 1265\ W$

= 1.265 kW

Resistance of the heater

$R = \frac{V}{I} = \frac{230}{5.5} = 41.82\ \Omega$

Running cost or cost of consumption for 20 hours

$Cost = 1.265 \times 20 \times 4 = Rs.101.20$

10.

(a) In the given food web, water fleas feed on insect larvae and are in turn fed by water beetles. So, if water fleas get eliminated, then population of insect larvae will increase and that of water beetles will decrease. As small fish are dependent on water beetles for food, a decrease in population of water fleas will cause a decrease in their population as well. Population of frogs remain unaffected as frog also depend on insect larvae for food.

(b) Small fish operates at both primary and tertiary consumer level in the gven food web.

Aquatic plant → Small fish → Large fish

Aquatic plant → Insect larvae → Water fleas → Small fish → Large fish

11. (a) Argon or neon gas is filled in electric bulbs.

These gases are used because they are inactive or inert. This prolongs the life of the filament.

(b) **Ohm's law**: At a constant temperature, the current flowing through a conductor is directly proportional to the potential difference across its ends.

12.

(a) Electronic configuration of the element is 2, 8, 7 and its valency is 1.

(b) Non-metal

(c) The formula of the compound formed when element X combines with an element Y is YX_3.

OR

(a) Element E will form only covalent compounds.
(b) Noble gases
(c) Element D is a metal with valency 2 and Element B is a non-metal with valency 3.

13.

(a) A non-metal X is a carbon. The two forms Y and Z are graphite and diamond.
(b) Graphite is a good conductor of electricity while diamond is a bad conductor.
(c) Difference between the properties of diamond and graphite:
  (i) Diamond is a very hard while graphite is soft.
  (ii) Diamond is a bad conductor of electricity and graphite is a good conductor of electricity.

SECTION – C

14.

(a) Homologous series of alkanes: Methane, CH_4; Ethane, C_2H_6; Propane, C_3H_8; Butane, C_4H_{10}; Pentane, C_5H_{12}
(b) (i) All the members of the homologous series can be represented by the same general formula.
  (ii) Any two adjacent homologues differ by 1 carbon atom and 2 hydrogen atoms in their molecular formulae.
(c) Alkanes: CH_4, C_2H_6, C_4H_{10}
  Alkenes: C_2H_4, C_3H_6
  Alkynes: C_2H_2, C_3H_4

OR

In an organic compound, any atom other than carbon and hydrogen is called a heteroatom. Examples: Chlorine (Cl), Bromine (Br), Oxygen (O). In chloromethane (CH_3Cl), chlorine is the heteroatom. In methanol (CH_3OH), oxygen is the heteroatom.

15.

(a) The magnetic field lines around the straight conductor carrying current are concentric circles whose centre lies on the wire.
(b) The magnitude of the magnetic field is directly proportional to the current passing in the wire.
(c) Maxwell's right-hand thumb rule is used to find the direction of magnetic field produced by the straight current-carrying conductor.

OR

According to Maxwell's right-hand rule, the current will be flowing in the upward direction when the direction of the magnetic field is in the anti-clockwise direction.