CBSE Board
Class X Science
Sample Paper - 4
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. List the factors on which the resistance of a conductor depends. [2]

2. What are the three factors which cause a change in magnetic flux of the coil? [2]

3. Protozoans reproduce by binary fission as well as multiple fission. Which process is better and why? Give your opinion. [2]

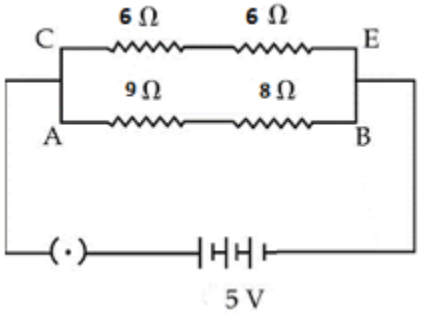
4. Compare the vegetative propagation in *Bryophyllum* and money plant. [2]

5. Sujata's parents received a proposal for her marriage from a boy living in London. Before everything could get finalised, Sujata asked her parents to ask the boy to get his blood test report. [2]
(a) Do you think it was right on the part of Sujata to do so?
(b) Name two STD's along with their causative organism.

OR

Explain how, offspring and parents of organisms reproducing sexually have the same number of chromosomes.

6. Study the circuit and find the



(i) Total resistance in arm CE
(ii) Current in arm AB [2]

OR

Draw a schematic labelled diagram of a closed circuit which connects all the given components in series and connected across a 12-V battery:
(i) 20 W lamp
(ii) An ammeter
(iii) A switch
(iv) 10 Ω/100 W resistor

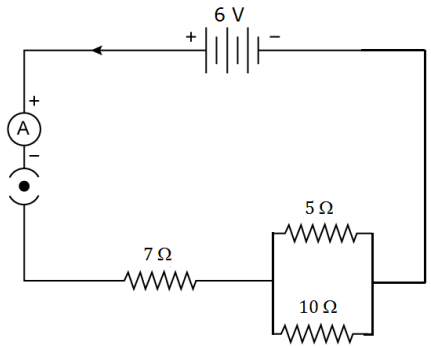
7. Why there has been a large hue and cry against the use of CFCs? [2]

OR

In a certain study conducted on the occurrence of DDT along food chains in an ecosystem, the concentration of DDT in grass was found to be 0-5 ppm. In sheep, it was 2 ppm and in man it was 10 ppm. Why was the concentration of DDT maximum in case of man?

SECTION - B

8. Consider the following electric circuit:



Calculate:
(i) Resultant resistance
(ii) Total current
(iii) Voltage across 7Ω resistor [3]

9.

(a) What are the patterns formed by the circular loop carrying current?

(b) Which rule is used to find the direction of the magnetic field produced due to the electric current in a circular loop?

(c) On which factors does the strength of a magnetic field depend? [3]

OR

(a) Distinguish between a bar magnet and an electromagnet. (Any 2 points)

(b) State Fleming's left-hand rule. [3]

10. Which element has [3]

a) Two shells, both of which are completely filled with electrons

b) The electronic configuration 2, 8, 2

c) A total of three shells with four electrons in the valence shell

11. [3]

(a) How does the metallic character of elements change along a period of the periodic table from the left to the right and why?

(b) In the modern periodic table, the element calcium (atomic number = 20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these elements have physical and chemical properties resembling those of calcium and why?

12. State the importance of chromosomal difference between sperms and eggs of humans. [3]

OR

Genotype of a plant bearing purple flowers is PP and one with white flowers is pp. When these are crossed:

(a) What colour of the flowers would you find in F_1 progeny?

(b) Give the percentage of white flowers if F_1 plants are self-pollinated.

(c) In what ratio would you find PP and Pp in F_2 progeny? Draw flow chart in support of your answer.

13. A high concentration of harmful chemical is highly injurious, even fatal, to higher trophic level organisms. Mention the basis of classifying substances as biodegradable and non-biodegradable. Give two examples of each. [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. Buckminsterfullerene is a spherical molecule in which 60 carbon atoms are arranged in interlocking hexagonal and pentagonal rings of carbon atoms..

(a) How many hexagons of carbon atoms are present in one molecule of buckminsterfullerene? [1]

(b) How many pentagons of carbon atoms are present in one molecule of buckminsterfullerene? [1]

(c) State the other allotropes of carbon and their uses. [2]

OR

How is Buckminsterfullerene related to other allotropes?

15. G. J. Mendel (1822-1884), the father of genetics, was an Austrian monk. He was the 1st scientist who made a systematic study of patterns of inheritance of characters from parents to progeny. He carried out breeding experiments on garden pea plants (*Pisum sativum*) and formulated basic laws of heredity. Mendel crossed a pure tall garden pea plant and a pure dwarf pea plant, the resulting offspring were called F_1 generation. Mendel continued his experiments further and allowed self-pollination in F_1 hybrids. The resultant offspring were called F_2 generation.

(a) What does law of segregation state? [1]

(b) What is the scientific name of the garden pea plat used by Mendel for his experiments? [1]

(c) Why did Mendel select pea plants for his experiments? [2]

OR

Among the seven pairs of contrasting traits in pea plant as studied by Mendel –

(a) How many traits were related to flower, pod and seed respectively?

(b) How many traits were colour based contrasting traits?

Solution

SECTION-A

1. Resistance of a conductor depends on
(i) its length
(i) its area of cross-section
(ii) on the nature of its material

2. Changes in the magnetic flux of a coil occur due to
(i) Relative motion between a coil and a magnet placed near it.
(ii) Relative motion between a coil and a current-carrying conductor placed near it.
(iii) Change of current in the conductor placed near the coil.

3. Multiple fission is better than binary fission because it produces several daughter cells inside a protective structure called cyst. This ensures their survival under adverse conditions.

4. *Bryophyllum* reproduces by the adventitious buds present on the margins of its leaves. Money plant reproduces by stem cutting which can produce the whole plant when placed in moist soil.

5. (a) Yes, it was right on Sujata's part to do so because blood reports would indicate whether the person has any disease, any sexually transmitted disease or is free of them.
(b) Two sexually transmitted diseases are:

- AIDS caused by HIV
- Gonorrhoea caused by *Neisseria gonorrhoea*

OR

The process of cell division called meiosis halves the number of chromosomes present in the cell of an organism. The gametes produced as a result of meiosis, fuse during sexual reproduction and restore the number of chromosomes in the offspring of the individual.

6.

(i) Total resistance in arm CE

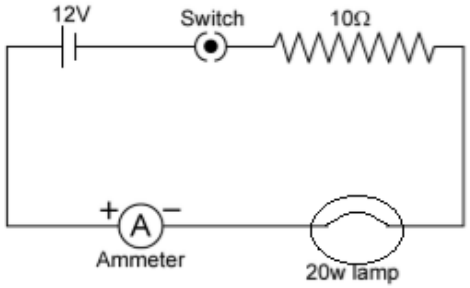
(ii) $R_s = 6 + 6 = 12\ \Omega$

(iii) Current in arm AB

$$I = \frac{5\ V}{17\ \Omega} = 0.29\ A$$

OR

Circuit diagram:



7. CFCs or chlorofluorocarbons pass on to the upper layers of atmosphere, i.e., the stratosphere, where ozone layer is based. CFCs cause depletion of the ozone layer. This allows harmful UV radiations to reach the surface of the earth causing skin cancers and defective eye sight.

OR

DDT is a non-biodegradable chemical which not only accumulates at each trophic level but also undergoes biomagnification with the rise in trophic level. DDT concentration is maximum in man as man occupies the highest trophic level in a food chain comprising of grass, sheep and man.

SECTION - B

8. For the given circuit,

(i) The resultant resistance is

$$R_{eq} = 7 + \left(\frac{1}{5} + \frac{1}{10}\right)$$

$$\therefore R_{eq} = 7 + \frac{10 \times 5}{10 + 5} = 7 + \frac{50}{15}$$

$$\therefore R_{eq} = \frac{105 + 50}{15} = \frac{155}{15} = 10.33\ \Omega$$

(ii) The total current is

$$I = \frac{V}{R_{eq}}$$

$$\therefore I = \frac{6}{10.33} = 0.58\ A$$

(iii) Voltage across the 7Ω resistor is

$$V_7 = IR_7 = 0.58 \times 7 = 4.06\ V$$

9.

(a) The circular loops carrying current forms concentric circular patterns of the magnetic field due to electric current.

(b) The direction of the magnetic field of the loop carrying current can be determined by the clock face rule.

(c) The strength of the magnetic field due to current depends on the

(i) number of turns of wire in the coil

(ii) radius of the coil

(iii) current flowing in the coil

OR

(a)

Bar magnet	**Electromagnet**
1. A bar magnet is a permanent magnet.	1. An electromagnet is a temporary magnet.
2. A permanent magnet produces a comparatively weak force of attraction.	2. An electromagnet can produce a very strong magnetic force.
3. The strength of a permanent magnet cannot be changed.	3. The strength of an electromagnet can be changed by changing the number of turns in the coil or changing the current passing through it.
4. The polarity of a permanent magnet is fixed and cannot be changed.	4. The polarity of an electromagnet can be changed by changing the direction of current.

(b) According to Fleming's left-hand rule, hold the forefinger, the middle finger and the thumb of your left hand at right angles to one another. Adjust your hand in such a way that the forefinger points in the direction of the magnetic field and the middle finger points in the direction of current. The direction in which the thumb points gives the direction of force acting on the conductor.

10.

(a) Elements with comparatively filled shells are noble gas elements and they belong to Group 18. Since the element has two shells, it must be present in neon (Ne) with electronic configuration 2, 8.

(b) The electronic configuration suggests that this element belongs to the third period and second group, i.e. magnesium (Mg).

(c) The element with three shells is present in the third period and has four valence electrons. It must belong to Group 14. So, it is silicon with electronic configuration 2, 8, 4.

11.

(a) The metallic character decreases from left to right along a period of the periodic table because on moving from left to right, the size of the atoms decreases and the nuclear charge increases. Hence, the tendency to release electrons decreases. Thus, the electropositive character decreases.

(b) Ca: Electronic configuration: 2, 8, 8, 2

The physical and chemical properties of elements with atomic number 12 and 38 will resemble those of calcium.

This is because they all belong to the second group and all of them have two electrons in the valence shell.

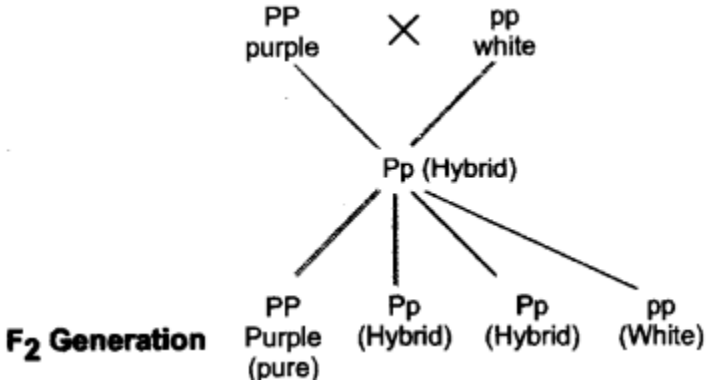
12. Human eggs are of one type with a chromosomal complement of 22 + X. Human sperms are of two types with chromosomal complements of 22 + X and 22 + Y. Sex of the child will be determined by which sperm type fuses with the egg. Sex of the child will be male if 22 + Y sperm fuses with the egg (22 + Y, 22 + X). It will be a female if 22 + X sperm fuses with the egg (22 + X, 22 + X).

OR

(a) Purple

(b) 25%

(c) 1:2



13. Substances are classified into biodegradable and non-biodegradable on the basis of their disposability or non-disposability by saprophytic organisms.

Biodegradable substances: Used tea leaves, waste paper.

Non-biodegradable substances: DDT, silver/aluminium foil.

SECTION – C

14.

(a) 20 hexagons

(b) 12 pentagons

(c) Diamond and Graphite. Diamond is used for making cutting tools whereas graphite is used for making dry cell electrodes.

OR

Buckminsterfullerene burns on heating to form carbon dioxide and nothing is left behind. This shows that it is made of carbon only like diamond and graphite.

15.

(a) The law of segregation states that, during the formation of gametes, the paired factors or traits separate, or segregate randomly so that each gamete receives one or the other with equal likelihood. If an individual contains a pair of like factors, then all its gametes receive one of those same kinds of factor.

(b) The scientific name of the garden pea plat used by Mendel for his experiments *Pisum sativum*.

(c) Mendel selected pea plants for his experiments because they had distinct, easily detectable contrasting characters. They reproduce well and grow to maturity in a single season with less generation time. They are self-pollinating in nature because pea flower is bisexual.

OR

(a) Mendel studied 2 traits related to flower i.e. flower colour and flower position, 2 traits related to pod i.e, pod shape and pod colour and 2 traits related to seed i.e., seed shape and seed colour.

(b) There were 3 colour based contrasting traits studied by Mendel in pea plant namely flower colour, seed colour and pod colour.