CBSE Board
Class X Science
Sample Paper - 3
Term 2 – 2021-22

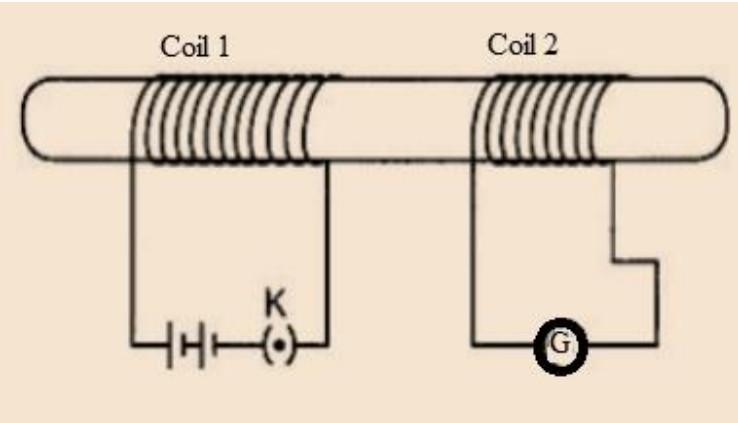
Time: 2 hours **Total Marks: 40**

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 the arrangement shown in figure there are two coils wound on a non-conducting cylindrical rod.
a) Initially the key is not inserted in the circuit.
b) Later the key is inserted and then removed shortly after.



What are the two observations that can be noted from the galvanometer reading? [2]

2. Draw the magnetic field lines around a straight current carrying conductor. [2]

3. How can we help in reducing the problem of waste disposal? List any two ways. [2]

4. What causes joining up of stock and scion in grafting technique of vegetative propagation in plants? Name one positive trait which each of the plants contributing to stock and scion should have. [2]

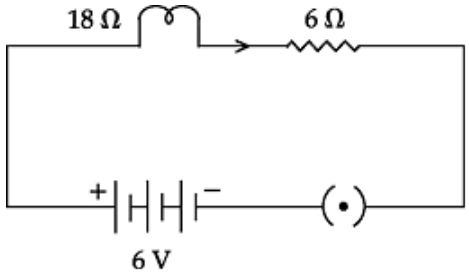
5. Describe the mechanism that determines the sex of a child. [2]

OR

i) In a cross between a white flowered plant and pink flowered plant, the F_1 generation was found to be pink. On this basis, which are the dominant and the recessive traits?

ii) What is the ratio of the plants in F_2 generation?

6.



In the given circuit, calculate

(a) Total resistance of the circuit

(b) Current flowing through the circuit [2]

OR

Two resistors each of 10 Ω are connected in i) series ii) and then in parallel to a battery of 6 V. Calculate the ratio of power consumed in the combination of resistor in two case.

7. A black mouse mates with a brown mouse, and all the offsprings are black. [2]

(a) Why are no brown offspring produced?

(b) If two of the black offspring mate with each other what kind of offspring would you expect and in what proportions? Give reason for your answer.

OR

Draw a flow chart to determine the characteristics of the progeny of a cross between tall pea plants with short pea plants showing

(i) F_1 Generation

(ii) F_2 Generation

SECTION - B

8. Draw a circuit diagram to show how 3 bulbs can be lit from a battery so that 2 bulbs are controlled by the same switch while the third bulb has its own switch. [3]

9. An electric appliance of 1.5 kW power rating operates on a 220V main supply and has a current rating of 5 A. Is this fuse suitable for this electrical appliance? Explain. [3]

OR

If three resistors of 6 Ω, 7 Ω and 10 Ω are connected in series. Calculate the equivalent resistance in the circuit.

(i) What is the potential difference across the three resistorsR_1, R_2 and R_3 in a series combination if the potential across the circuit is V?

(ii) What is the current along each of the resistors in a series combination if the current flowing in the circuit is I?

10. [3]

Group Nos.							
IA	IIA	IIIA	IVA	VA	VIA	VIIA	0
1	2	13	14	15	16	17	18
Li		D			O	J	Ne
A	Mg	E	Si		H	K	
B	C		F	G			L

Select from the table:

(i) Which is the most electronegative?

(ii) How many valence electrons are present in G?

(iii) Write the formula of the compound between B and H.

11. Explain: [3]

(i) Larger the atomic size, more metallic is the element.

(ii) Size of the atom changes when it loses or gains electrons.

(iii) K is more reactive than Li.

12. A potato is cut into a number of small pieces. These potato pieces are placed on wet cotton kept in a tray. After a few days, green shoots and roots appear only from some potatoes and not from all potato pieces. Why? [3]

OR

Justify that parthenogenesis is not the same as asexual reproduction.

13. Mrs. Kumar is pregnant for the last three months and she goes for regular check-up to her doctor. During her last visit, the doctor asked Mrs. Kumar to get an ultrasound done. Both Mr. and Mrs. Kumar went to a radiologist and got the ultrasound done. Once the ultrasound is over, Mr. Kumar asked the doctor whether the baby in the womb is a boy or a girl. [3]

(a) What should the doctor reply to the couple?

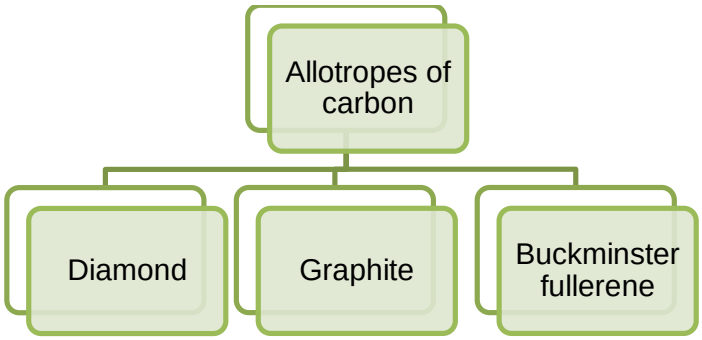
(b) Is it ethical to determine the sex of a child?

(c) What should government do to discourage sex determination?

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.

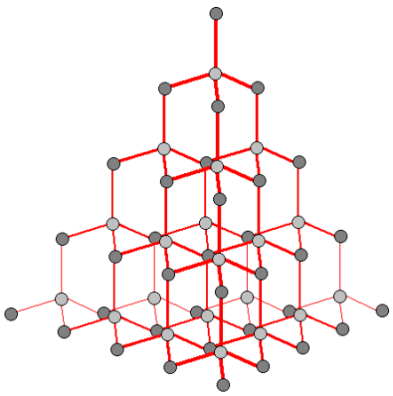
14. The various physical forms in which an element can exist are called the allotropes of the element. Three allotropes of carbon are:



In diamond, each carbon atom is bonded to four other carbon atoms, forming a three dimensional. It is a non-conductor of electricity since there are no free electrons in a diamond crystal. In graphite, each carbon atom is bonded to three other carbon atoms in the same plane, giving a hexagonal array. It is a very good conductor of electricity due to the presence of free electrons. Fullerene is an allotrope of carbon containing clusters of 60 carbon atoms joined together to form spherical molecules. There are 60 carbon atoms in a molecule of buckminsterfullerene, so its formula is C60. The allotrope was named buckminsterfullerene after the American architect Buckminster Fuller.

a) Which allotrope of carbon has a 2D hexagonal layered structure? [1]

b) What structure is shown in the diagram? [1]

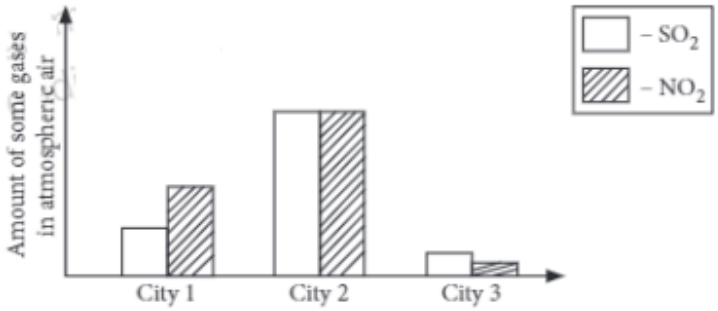


c) Write number of C-C covalent bonds in allotropes of C. [2]

OR

Which allotrope of carbon is good conductor of electricity and why?

15. All living things need air to breathe. Contamination of air with particles, gases and chemicals that have the potential to adversely affect the health of humans and animals, vegetation and human assets is called air pollution. Major air pollutants are SO_2, nitrogen oxides, CO, CFCs, etc. Refer to the given graph showing air quality of three cities.



a) What can be inferred from the given graph? [1]

b) What will be the effect of high concentration of SO_2 and NO_2 in atmospheric air of city 2? [1]

c) What are the harmful effects of acid rain? (Any two) [2]

OR

What measures can be taken to curb air pollution? (Any two)

Solution

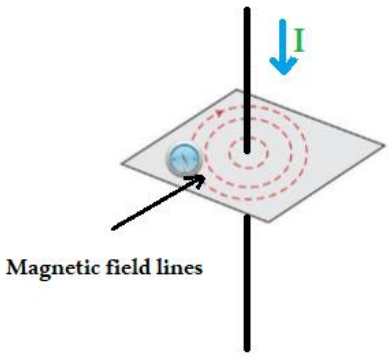
SECTION-A

1.

a) When key is inserted, small monetary deflections are observed which returns to zero in a while.

b) When key is removed the deflections are seen in opposite direction.

2. For straight current carrying conductor, the magnetic field lines are concentric circles.



3. We can help in reducing the problem of waste disposal by the following ways:

(a) By segregating biodegradable and non - biodegradable wastes.

(b) By reusing and recycling the non - biodegradable waste.

4. The stock and scion unite due to cambial activity. The plant contributing to scion should have large sized fruits and plant contributing to stock should have deep root system.

5. In humans, the females have XX sex chromosome while the males have XY chromosome. When the X chromosome of female unites with X chromosome of male, a girl will be born and when X chromosome of females unites with Y chromosome of male, a boy will be born. Thus, the Y chromosome of male (father) determines the sex of child.

OR

i) The pink colour of flowers is the dominant trait whereas the recessive trait is white colour.

ii) 3:1 (pink:white)

6.

(a) Total resistance R = R1 + R2 = $18\,\Omega + 6\,\Omega = 24\,\Omega$

(b) Current flowing through the circuit, I = V/R = 6/24 = 0.25 A

OR

Total resistance in series,

$R_s = 20\,\Omega$

and

$$\text{Power}, P_s = \frac{V^2}{R_s} = 1.8\ \text{W}$$

In parallel, total resistance

$R_P = 5\,\Omega$

$$\text{Power, } P_P = \frac{V^2}{R_P} = 7.2\text{W}$$

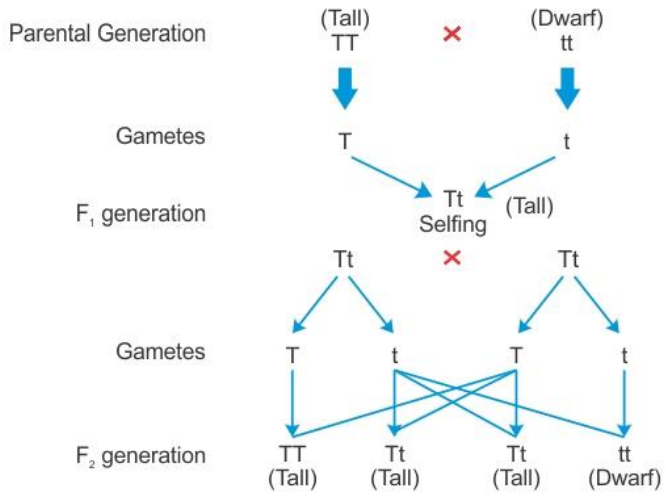
$$\frac{P_s}{P_P} = \frac{1}{4}$$

7.

(a) Because black colour genes are dominant over brown colour genes.

(b) Three black mice and one brown mouse will be obtained in F_2 generation. It is a monohybrid cross.

OR

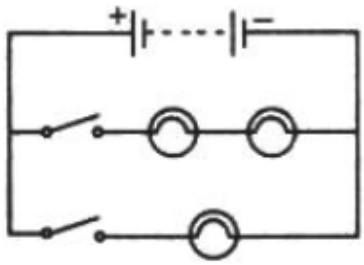


(i) All tall plants in F_1 generation

(ii) 75% Tall and 25% short plants in F_2 generation

SECTION – B

8. Circuit Diagram:



9. Power, P = 1.5 kW = 1500 W

V = 220 V

Current drawn, P = V × I

$I = P/V$

$I = \frac{1500}{220}$

I = 6.81 A

Current drawn, I ≈ 7 A

The current drawn by the electrical appliance is 7 A which is beyond the fuse rating capacity in the circuit. Hence, when a very high current of 7 A flows through the 5 A fuse, it will melt and break the circuit. Hence, the fuse wire of 5 A rating would not be suitable for this electrical appliance.

OR

Equivalent resistance when the resistors are connected in series is

$\rightarrow R_s = R_1 + R_2 + R_3$

$\rightarrow R_s = 6 + 7 + 10 = 23$ ohm

(i) The potential difference across each resistor will be different in a series combination.

Across resistor R_1, PD will be V_1; for R_2, PD will be V_2 and for R_3, PD will be V_3.

(ii) The current across the three resistors in a series combination will be the same, i.e. 'I'.

10.

(i) The most electronegative is J.

(ii) Valence electrons present in G are 5.

(iii) B contains 1 valence electron and H contains 6 valence electrons. So, the valency of B is +1 and the valency of H is -2.

11.

(i) Larger the atomic size, farther is the valence electron from the nucleus and lesser is the pull exerted on it. As a result, the electron can be easily removed from the valence shell, and hence, more metallic is the element.

(ii) When an atom loses or gains an electron to form an ion, the number of electrons present in the outermost shell also changes. Corresponding to that, the effective nuclear charge on the changed number of electrons changes which further changes the size of an atom as there is an inverse relation between the effective nuclear charge and the size of the atom.

(iii) K and Li belong to Group 1, i.e. metals. For metals, chemical reactivity of elements increases down the group, because chemical reactivity increases as the electropositive or metallic character increases.

12. The pieces of potato that bear nodes only can give rise to new plants by producing shoots and roots. But the pieces not bearing nodes cannot produce new plants. Thus from a whole potato only some pieces that bear nodes give rise to roots and shoots. This is an example of vegetative propagation which is an asexual mode of reproduction in plants.

OR

Asexual reproduction does not involve fusion of gametes and new individuals arise from a single parent. Example budding, fusion and fragmentation are different methods of asexual reproduction. Parthenogenesis is a process of development of an organism from an unfertilised egg. For example honey, bees, aphids etc. develop by parthenogenesis

13.

(a) The doctor should not tell the sex of the foetus.

(b) No, it is not ethical to determine the sex of a child.

(c) The government should ban the process of sex determination and should punish or fine whosoever does so.

SECTION – C

14.

a) Graphite has a 2D hexagonal layered structure.

b) Diamond has each carbon atom is bonded to four other carbon atoms, forming a three dimensional structure.

c) The number of C-C covalent bonds in Diamond are 4, Graphite are 3 and fullerene are 3.

OR

Graphite is good conductor of electricity because one valence electron of each carbon atom remains free. Due to the free electrons in its framework, graphite can perform electricity. Therefore, graphite is said to be a good conductor of electricity.

15.

a) Air of city 2 is most polluted as maximum amount of oxides of sulphur and nitrogen are present in its atmospheric air.

b) When the rainwater contains large quantities of acids like nitric acid and sulphuric acid formed by dissolution of oxides of nitrogen and sulphur in water it is called acid rain.

c) Acid rain damages the foliage thereby decreasing the growth and yield of plants. Soil microbes get killed due to low pH of the soil and results in disturbing the terrestrial ecosystem. Buildings and monuments get corroded and damaged.

OR

<u>Measures to curb air pollution:</u>

- The practice of biofuels should be promoted. The biofuels do not discharge dangerous fumes like leaded fuels.
- There should be separate ranges for the factories and the domestic residences. The factories should be placed away from towns. This will decrease the respiratory and other infections in mammals due to manufacturing gases.