CBSE EXAMINATION PAPER-2022

SCIENCE

(Solved)

Time allowed : 3 hours | Maximum Marks : 27

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **16 questions.** All questions are **compulsory.**

ii. This question paper is divided into **3 sections.**

iii. **Section A** – questions number **1 to 9** are very short answer Each question carries **2 marks.**

iv. **Section B** – questions number **10 to 12** are short answer Each question carries **3 marks.**

v. **Section C** – questions number **13 to 16** are case based questions

vi. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

vii. Use of calculator is NOT allowed.

Section A

Question 1.

"Carbons prefers to share its valence electrons with other atoms of carbon or with atoms of other elements rather than gaining or losing the valence electrons in order to attain noble gas configuration." Give reasons to justify this statement.

[2 Marks]

Answer: Carbon prefers to share its valence electrons rather than gain or lose them because it has four valence electrons and achieving a stable noble gas configuration would require it to gain or lose four electrons, which is energetically unfavorable. By

sharing electrons, carbon can form strong covalent bonds with other atoms, such as hydrogen, leading to stable compounds like methane. This property allows carbon to form a vast array of compounds through catenation.

Question 2.

The atomic number of an element 'X' is 11.

(i) Write the electronic configurations of X and find its valency.

(ii) Write the formula and nature of its oxide.

[2 Marks]

Answer: The electronic configuration of element 'X' (sodium) is 2, 8, 1. Since sodium has one electron in its outermost shell, its valency is 1 as it can easily lose this electron to achieve a stable octet. The oxide formed by sodium is sodium oxide, which has the formula Na2O. This compound is ionic in nature as it consists of sodium ions (Na+) and oxide ions (O2-), resulting from the transfer of electrons.

Question 3.

Give reasons :

(i) Placenta is Extremely essential for foetal development.

(ii) Uterine lining becomes thick and spongy after fertilisation.

[2 Marks]

Answer: The placenta is essential for foetal development because it facilitates the exchange of nutrients, oxygen, and waste products between the mother and the embryo. It serves as a protective and nourishing organ, allowing the embryo to grow optimally in the uterus. Additionally, the uterine lining thickens and becomes spongy after fertilisation to provide a suitable environment for implantation and nourishment of the embryo, crucial for its growth and development into a fetus.

Question 4.

(a) Name the reproductive and non-reproductive parts of bread mould (Rhizopus).

(b) List any two advantages of vegetative propagation.

[2 Marks]

Answer: The reproductive part of the bread mould (Rhizopus) is the sporangium, which produces spores. The non-reproductive parts include the hyphae, which are thread-like structures that form the body of the mould. Two advantages of vegetative propagation are: 1) It allows for quicker reproduction since new plants can grow from parts of the

parent plant without needing seeds. 2) The new plants are genetically identical to the parent, ensuring consistent traits.

Question 5.

Name the reproductive parts of an angiosperm. Where are these parts located ? Explain the structure of its male reproductive part.

[2 Marks]

Answer: The reproductive parts of an angiosperm are stamens and pistils, located in the flower. Stamens are the male reproductive parts, consisting of two main parts: the anther and filament. The anther produces pollen grains, which contain male gametes. The filament supports the anther, positioning it for effective pollen transfer during pollination. The flower may be either unisexual or bisexual, with stamens and pistils involved in sexual reproduction.

Question 6.

What is puberty ? Mention any two changes that are common to both boys and girls in early teenage years.

[2 Marks]

Answer: Puberty is the period of life when the body undergoes changes leading to reproductive maturity. It typically begins around ages 11 to 19 and marks the start of adolescence. During puberty, common changes for both boys and girls include an increase in height due to the growth of long bones as well as the development of body hair in areas such as the armpits and the pubic region.

Question 7.

When is the force experienced by a current - carrying straight conductor placed in a uniform magnetic field.

(i) Maximum;

(ii) Minimum ?

[2 Marks]

Answer: The force on a current-carrying straight conductor in a uniform magnetic field is experienced maximally when the direction of the current is perpendicular (at right angles) to the magnetic field. Conversely, the force is minimal when the conductor is aligned parallel to the magnetic field, meaning the current direction and magnetic field direction are the same or opposite, resulting in zero force.

Question 8.

In the following food chain only 2J of energy was available to the peacocks. How much energy would have been present in Grass ? Justify your answer.

GRASS → GRASS HOPPER → FROG → SNAKE → PEACOCK

[2 Marks]

Answer: Energy transfer in a food chain follows the 10 percent law which means only 10 percent energy is transferred from one trophic level to the next. Given energy at peacock level = 2J.
Energy at snake level = 2J * 10 = 20J.
Energy at frog level = 20J * 10 = 200J.
Energy at grasshopper level = 200J * 10 = 2000J.
Energy at grass (producer) level = 2000J * 10 = 20000J.
Therefore, energy present in grass would be 20000J because at each level energy decreases by 90 percent due to loss in form of heat and other processes.

Question 9.

(a) What is meant by garbage ? List two classes into garbage is classified.

(b) What do we actually mean when we say that the "enzymes are specific in their action"?

[2 Marks]

Answer: Garbage refers to discarded waste material generated from various activities, often polluting the environment. There are two primary classes of garbage: biodegradable waste, which can decompose naturally (like food scraps), and non-biodegradable waste, which does not break down easily (like plastic). Regarding enzymes, saying they are specific in their action means that each enzyme can catalyze only a particular reaction or act on a specific substrate, ensuring accurate biochemical processes in living organisms.

Section B

Question 10.

Consider the following organic compounds:

(a) Name the functional group present in their compounds.

(b) Write the general formula for the compounds of this functional group.

(c) State the relationship between these compounds and draw the structure of any other compound having similar functional group.

[3 Marks]

Answer: (a) The functional group present in these compounds is the **aldehyde** group, which is -CHO. It consists of a carbonyl group (C=O) bonded to a hydrogen atom.
(b) The general formula for compounds containing the aldehyde group is **R-CHO**, where R represents a hydrocarbon group or hydrogen.
(c) The compounds are related as **homologous series**, meaning they differ by a $-CH_2-$ unit.
Another compound with the aldehyde group is **ethanal**. Its structure is CH_3-CHO, which has a methyl group attached to the aldehyde functional group.
Structure of ethanal: $CH_3-C(=O)-H$.

Question 11.

(a) State Ohm's Law. Represent it mathematically.

(b) Define 1 Ohm.

(c) What is the resistance of a conductor through which a current of 0.5 A flows when a potential difference of 2 V is applied across its ends?

[3 Marks]

Answer: (a) **Ohm's Law** states that the current flowing through a conductor is directly proportional to the potential difference across its ends, provided the temperature and other physical conditions remain constant. Mathematically, it is represented as V = I * R, where V is the potential difference in volts, I is the current in amperes, and R is the resistance in ohms.
(b) **1 Ohm** is defined as the resistance of a conductor when a potential difference of 1 volt across its ends produces a current of 1 ampere through it. That is, 1 ohm = 1 volt / 1 ampere.
(c) Given, current I = 0.5 A and potential difference V = 2 V. Using Ohm's Law, resistance R = V / I = 2 V / 0.5 A = 4 ohms. Therefore, the resistance of the conductor is 4 ohms.

Question 12.

(a) What is the meaning of electric power of an electric device ? Write its SI unit.

(b) An electric kettle of 2kW is used for 2h. Calculate the energy consumed in

(i) kilowatt hour and

(ii) joules.

[3 Marks]

Answer: (a) Electric power of an electric device is the rate at which it consumes electrical energy. It is the amount of energy consumed per unit time by the device. The SI unit of electric power is watt (W).

(b) Given power of kettle P = 2 kW, time t = 2 hours
(i) Energy consumed in kilowatt hour = Power * Time = 2 kW * 2 h = 4 kW h
(ii) We know that 1 kW h = 1000 watt * 3600 seconds = 3 600 000 joules
Therefore, energy consumed in joules = 4 kW h = 4 * 3 600 000 J = 14 400 000 joules or 1.44 * 10^7 J

Section C

Question 13.

A student was asked to perform an experiment to study the force on a current carrying conductor in a magnetic field. He took a small aluminum rod AB, a strong horse shoe magnet, some connecting wires, a battery and a switch and connected them as shown. He observed that on passing current, the rod gets displaced. On reversing the direction of current, the direction of displacement also gets reversed. On the basis of your understanding of this phenomenon, answer the following questions:

Question 14.

Draw the patter of magnetic field lines produced around a current carrying straight conductor held vertically on a horizontal cardboard. Indicate the direction of the field lines as well as the direction of current flowing through the conductor.

Question 15.

Draw the pattern of magnetic field lines produced around a current carrying straight conductor held vertically on a horizontal cardboard. Indicate the direction of the field lines as well as the direction of current flowing through the conductor.

Question 16.

Draw the pattern of magnetic field lines produced around a current carrying straight conductor held vertically on a horizontal cardboard. Indicate the direction of the field lines as well as the direction of current flowing through the conductor.