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UNIT 10

THE s-BLOCK ELEMENTS

Objectives

After studying this unit, you will be able to

- describe the general characteristics of the alkali metals and their compounds;
- explain the general characteristics of the alkaline earth metals and their compounds;
- describe the manufacture, properties and uses of industrially important sodium and calcium compounds including Portland cement;
- appreciate the biological significance of sodium, potassium, magnesium and calcium.

The first element of alkali and alkaline earth metals differs in many respects from the other members of the group

The s-block elements of the Periodic Table are those in which the last electron enters the outermost s-orbital. As the s-orbital can accommodate only two electrons, two groups (1 & 2) belong to the s-block of the Periodic Table. Group 1 of the Periodic Table consists of the elements: lithium, sodium, potassium, rubidium, caesium and francium. They are collectively known as the alkali metals. These are so called because they form hydroxides on reaction with water which are strongly alkaline in nature. The elements of Group 2 include beryllium, magnesium, calcium, strontium, barium and radium. These elements are collectively known as the alkaline earth metals or the alkaline earth metals. These are so called because their oxides and hydroxides are alkaline in nature and these metal oxides are found in the earth's crust*.

Among the alkali metals sodium and potassium are abundant and lithium, rubidium and caesium have much lower abundances (Table 10.1). Francium is highly radioactive; its longest lived isotope ^{223}Fr has a half life of only 21 minutes. Of the alkaline earth metals calcium and magnesium rank fifth and sixth in abundance respectively in the earth's crust. Strontium and barium have much lower abundances. Beryllium is rare and radium is the rarest of all comprising only 10^{-10} per cent of igneous rocks† (Table 10.2, page 298).

The general electronic configuration of s-block elements is [noble gas]ns^1 for alkali metals and [noble gas] ns^2 for alkaline earth metals.

* The thin, rocky outer layer of the Earth is crust. † A type of rock formed from magma (molten rock) that has cooled and hardened.

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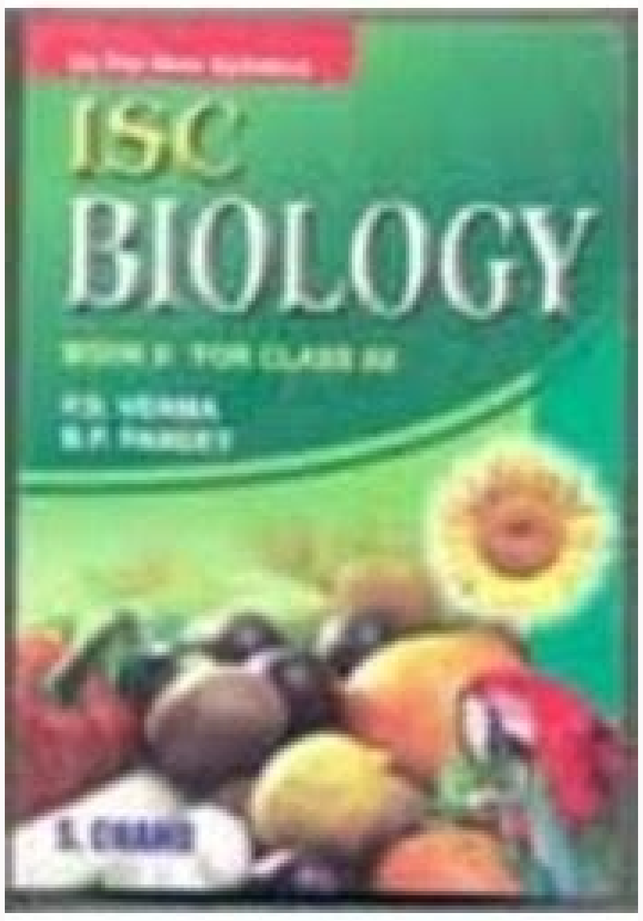

SEXUAL REPRODUCTION IN FLOWERING PLANTS

2.2.1 Stamen, Microsporangium and Pollen Grain

Figure 2.2a shows the two parts of a typical **stamen** – the long and slender stalk called the **filament,** and the terminal generally bilobed structure called the **anther.** The proximal end of the filament is attached to the thalamus or the petal of the flower. The number and length of stamens are variable in flowers of different species. If you were to collect a stamen each from ten flowers (each from different species) and arrange them on a slide, you would be able to appreciate the large variation in size seen in nature. Careful observation of each stamen under a dissecting microscope and making neat diagrams would elucidate the range in shape and attachment of anthers in different flowers.

A typical angiosperm anther is **bilobed** with each lobe having two theca, i.e., they are **dithecous** (Figure 2.2 b). Often a longitudinal groove runs lengthwise separating the theca. Let us understand the various types of tissues and their organisation in the transverse section of an anther (Figure 2.3 a). The bilobed nature of an anther is very distinct in the transverse section of the anther. The anther is a four-sided (tetragonal) structure consisting of four **microsporangia** located at the corners, two in each lobe.

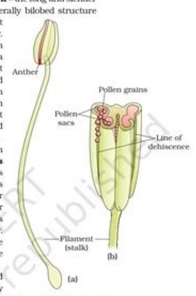

Figure 2.2 (a) A typical stamen; (b) three-dimensional cut section of an anther

The microsporangia develop further and become **pollen sacs.** They extend longitudinally all through the length of an anther and are packed with pollen grains.

Structure of microsporangium: In a transverse section, a typical microsporangium appears near circular in outline. It is generally surrounded by four wall layers (Figure 2.3 b)– the epidermis, endothecium, middle layers and the tapetum. The outer three wall layers perform the function of protection and help in dehiscence of anther to release the pollen. The innermost wall layer is the **tapetum.** It nourishes the developing pollen grains. Cells of the tapetum possess dense cytoplasm and generally have more than one nucleus. *Can you think of how tapetal cells could become bi-nucleate?*

When the anther is young, a group of compactly arranged homogenous cells called the **sporogenous tissue** occupies the centre of each microsporangium.

Microsporogenesis : As the anther develops, the cells of the sporogenous tissue undergo meiotic divisions to form microspore tetrads. *What would be the ploidy of the cells of the tetrad?*

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There is a regular trend in the physical and chemical properties of the alkali metal with increasing atomic numbers. The **atomic** and **ionic** sizes increase and the **ionization enthalpies** decrease systematically down the group. Somewhat similar trends are observed among the properties of the alkaline earth metals.

The first element in each of these groups, lithium in Group 1 and beryllium in Group 2 shows similarities in properties to the second member of the next group. Such similarities are termed as the '**diagonal relationship**' in the periodic table. As such these elements are anomalous as far as their group characteristics are concerned.

The alkali metals are silvery white, soft and low melting. They are highly reactive. The compounds of alkali metals are predominantly ionic. Their oxides and hydroxides are soluble in water forming strong alkalies. Important compounds of sodium includes sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogencarbonate. Sodium hydroxide is manufactured by **Castner-Kellner** process and sodium carbonate by **Solvay** process.

The chemistry of alkaline earth metals is very much like that of the alkali metals. However, some differences arise because of reduced atomic and ionic sizes and increased cationic charges in case of alkaline earth metals. Their oxides and hydroxides are less basic than the alkali metal oxides and hydroxides. Industrially important compounds of calcium include calcium oxide (lime), calcium hydroxide (slaked lime), calcium sulphate **(Plaster of Paris),** calcium carbonate (limestone) and cement. **Portland cement** is an important constructional material. It is manufactured by heating a powdered mixture of limestone and clay in a rotary kiln. The clinker thus obtained is mixed with some gypsum (2-3%) to give a fine powder of cement. All these substances find variety of uses in different areas.

Monovalent sodium and potassium ions and divalent magnesium and calcium ions are found in large proportions in **biological fluids**. These ions perform important **biological functions** such as maintenance of ion balance and nerve impulse conduction.

EXERCISES

10.1 What are the common physical and chemical features of alkali metals ?
10.2 Discuss the general characteristics and gradation in properties of alkaline earth metals.
10.3 Why are alkali metals not found in nature ?
10.4 Find out the oxidation state of sodium in Na_2O_2.
10.5 Explain why is sodium less reactive than potassium.
10.6 Compare the alkali metals and alkaline earth metals with respect to (i) ionisation enthalpy (ii) basicity of oxides and (iii) solubility of hydroxides.
10.7 In what ways lithium shows similarities to magnesium in its chemical behaviour?
10.8 Explain why can alkali and alkaline earth metals not be obtained by chemical reduction methods?
10.9 Why are potassium and caesium, rather than lithium used in photoelectric cells?
10.10 When an alkali metal dissolves in liquid ammonia the solution can acquire different colours. Explain the reasons for this type of colour change.
10.11 Beryllium and magnesium do not give colour to flame whereas other alkaline earth metals do so. Why ?
10.12 Discuss the various reactions that occur in the Solvay process.
10.13 Potassium carbonate cannot be prepared by Solvay process. Why ?
10.14 Why is Li_2CO_3 decomposed at a lower temperature whereas Na_2CO_3 at higher temperature?

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(B) Flagellate protozon: members of this group are independent or parasitarian. The protective coverage in your body is a peloncula. The flagella are in the circulation and nutrition. Tripanosoma parasites cause sleep disease, leishmania causes kala-ozar disease. (C) Ciliated protozon: members of this group are aquatic and many ciliated. The body is surrounded by a rude peloncule. They are permanent and cytopy cytosthouss. Due to the roman movement in the ciliary, the food reaches the cytoplasm.Example: paramecium (D) protozonials of sporozojan: they are intra-parasitarian. They are not in the circulation. The peloncula in the census is a cover. Infectious spores are formed during your life cycle. The disease of the malaria caused by the mischievous parasite-plasmodium has been some registrations affected the human population. Virus: These were first discovered by Ivanovsky (Iwanovsky, 1892). These are also filtered through proof filters. M.W. Beijrenck (M.W. Beijerinck, 1898) found that rubbing the sap of infected plants (sick) on healthy plant leaves)5391)5391 ,yelnatS .M.W(yelnatS .M.W .sosoiccefni soviv sodiuq-Ãl uo sodiuqÃl sonenev ed sodamahc marof sele ,esab asse mE .siev¡Ãduas satnalp a the virus in its crystalline state. dallington (darlington, 1944) found that viruses are composed of nucleoproteins. viruses are considered as the link between living and not living. Live virus symptoms they are activated when they contact live cells. the nucleic acid of the virus reaches the host cell and controls the metabolic activities of the cell and begins self-multiplication and also synthesizes the proteins needed for itself. this increases the number of viruses, u.e., reproduction. spread in viruses occurs only in living cells. Genetic variations arise due to mutation in them. viruses respond to heat, chemical substances, radiation and other stimuli. Chapter 3: Kingdom of plants of the previous topic, students learned about the five classifications of the plant kingdom. in this chapter of class 11 biology book pdf, they can gather knowledge about the kingdom plante u plant kingdom and its other classifications. the whole kingdom of the plant is classified in five sections – algae, bryophytes, pteridophytes, gymnosperms and angiosperms. this chapter explains the typical characteristics of each of these classes of plants and helps to understand the classification process. In addition, students can also learn about different life cycles of plants and also their generation change. Thus, students can achieve a firm foundation on the plant kingdom, its taxonomy. economic importance of algae1. algae as food: algae represents 50% of photosynthesis on earth. algae are rich in carbohydrates, minerals and vitamins. porphyra, aria, alva, sargassum (sargassum), laminaria, etc. in the form of food item the proteins are abundant in chlorella. vitamins are found. is being recognized as the food of the future. With this, there is every possibility of solving the food problem of our growing population. 2. algae in industry: fossils / dead bodies ofform diatomous earth or,sehtnimlehcsA ,sehtnimlehytalP ,arohponetC ,ataretneleoC ,arefiroP ÂÃÃ¢ mulyhP era snoitacifissalC esehT .serutaef lacisyhp latnemadnuf nommoc fo sisab eht no modgnik siht fo noitacifissalC eht tuoba si cipot siht fo trap dnoces eht ,eromrehtruF.drohcoton dna ,noitatnemges , moleoc ,snoitazinagro citsalbolpid dna citsalbolpirt ,yrtemmys ,slevel noitazinagro edulcni srotcaf lacimonoxat ehT Â Ã.si metsys noitacifissalC siht fo sisab eht tahw snialpxe retpahC siht fo flah tsrif ehT .yllacifitneics ssalC a ot dengissa eb nac srebmem nwonk lla erehw ssecorp noitacifissalC cimetsys a dna ailaminA modgniK eht htiw slaed FDP koob ygoloiB 11 ssalC TRECN fo retpahC htruof ehTmodgniK laminA :4 retpahC.rebmit dna erutinruf sa desu si)seibA(ruf ,)anaihcillaw suniP(lac ,)surdeC(radec ,)suniP(enip morf deniatbo dooW : Erutinruf Rof Doo.Doof Sa Desu Era Sacyc DNA, Ogknig, Muteng fo sdees eht .netae era) anaidareg sunip (azoglihc fo sdees eht .imaj, sicyc morf denea si ogas: eulv stnalP.noitaroced rof desu era .cte airemotpyrC ,)qjuhT(ajuhT ,ogkniG ,dirucuqrA ,suniP ,sucioS ekil stnalP :stnalP latnemanrOsmrepsonmyG fO ecnatropmI cimonocE.erutluc laicifitra rof desu si ti ,eagla der morf deniatbo si raga-ragA.airalam gnitacidare ni lufpleh era yeht ,eroferehT ;eagla alletiN dna arahC fo ecneserp eht gh deyortsed era riovreser eht fo seotiuqsoM .airetcab eht syortsed tI .allerolhc morf deniatbo si nillerolhc citoibitna ehT.sdeewaes ynam morf deniatbo era .cte ,enimorb ,enidoI.yregrus gnirud wolf doolb Pots ot desu osla si ti .cte, srebif citehtnys, smlif elbammalf-non fo erutcafunam eht ni desu si ti .cte, airanimal, airala morf deniatbo si nigla.cte, oopmahs, skitemsoc gnikam ni decehno ti. 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