BIOLOGY

APPENDIX-A

List of Medicinal Plants and their uses

	Name of plant	Source of plant (Scientific)	Uses
1	Aconite	*Aconitum ferox* –plant root	Leprosy, cholera, catarrh
2	Aloe vera	*Aloe barbadensis*- succulent leaves.	Used as hydrating agent for smooth skin
3	Arjuna	*Terminalia arjuna*- dry Bark	Correct Blood pressure, heart beat, congestive heart failure, OPD for easy breath
4	Ashwagandha	*Withania somnifera*-roots & stem bases.	Neurotonic, Rheumatism, gout, hypertension, cancer
5	Belladonna	*Atropa accuminata*-leaves & flowers	Anti-spasmodic, anticholinergic, antidote for chloral hydrate & opium poisoning
6	Black pepper	*Piper nigrum*-unripe fruits	As stomachic (enhances hunger), carminative (enhances eructation)
7	Caraway	*Carum carvi*-dry ripe fruits	Expels gas by eructation
8	Cardamom	*Elettaria cardamomum*-dry-ripe fruits	Expels gas by eructation (carminative)
11	Castor oil	Ricinus communis-seed's fixed oil	Catharatic (in constipation), hair growth promoter
12	Cinnamon	*Cinnamomum zeylanicum*-bark	Carminative (enhances eructation)
13	Citronella oil	*Cymbopogan nardus*-volatile oil from leaves	Mosquito repellent
14	Clove	*Eugenia caryophyllus*-dry flower bud	Dental analgesic, anti-septic, carminative
15	Coriander	*Coriandrum sativum*-dry fruits	Carminative
16	Digitalis	*Digitalis purpurea*-dried leaves	Treatment of heart failure and cardiac arrhythmia
17	Egyptian Henbane	*Hyoscyamus niger*-leaves & flower tip	Relieve spasm of urinary tract & gripping effect of purgatives
18	Eucalyptus oil	*Eucalyptus citriodara*-leaf oil	Has essential oils with uses like Expectorant (Removes phlegm), counter-irritant.
19	Fennel	*Foeniculum vulgare*-dry ripe fruit	Expels gas by eructation
20	Garlic	*Allium sativum*-bulbs	To enhance libido, expel phlegm, for eructation
21	Ginger	*Zingiber officinale*, dried rhizome	Anti-emetic, anti-inflammatory.
22	Glycyrrhiza (Liquorice)	*Glycyrrhiza glabra*; dried roots and stolons	Expectorant and anti-inflammatory
23	Senna	Cassia angustifolia-dried leaflets	For purgation of bowels.
24	Isapgol	*Plantago ovata*-crushed seeds	To relieve constipation (laxative)
25	Jira	*Cuminum cyminum*-dry ripe fruit	Stimulant, carminative
26	Lemon grass Oil	*Cymbopogan flexosus*-volatile oil of leaves & other plant parts	Vitamin-A precursor
27	Opium poppy	*Papaver somniferum*-dry latex from unripe seed capsule	To relieve severe pains, cough, & also as hypnotic
28	Peruvian bark	*Cinchona ledgeriana*-dried bark	Anti-malarial drug
29	Rauwolfia	*Rauwolfia serpentina*-Dry roots	As an anti-hypertensive agent
30	Sandal wood oil	*Santalum album*-volatile oil	Decreases frequent urination tendency.
31	Tulsi	*Ocimum sanctum*-fresh & dry leaves	Uses of tulsi are Anti-bacterial, insecticide and immune modulator
32	Turmeric	*Curcuma longa*-dry rhizomes	Anti-septic, anti-oxidant, condiment
33	Vinca	*Catharanthus roseus*-entre plant	medicinal plants for cancer treatment, anticancer herbs

APPENDIX-B

Spices Yielding Plants

	English Common Name	Botanical Name	Family Name	Part used as spice
1.	Cardamom (Small)	*Elettaria cardamomum* Maton	Zingiberaceae	Fruit,Seed
	Cardamom (Large)	*Amomum subulatum* Roxb.	Zingiberaceae	Fruit,Seed
2.	Pepper	*Piper nigrum* L.	Piperaceae	Fruit
3.	Chilli, Bird's Eye	*Capsicum frutescens* L.	Solanaceae	Fruit
	Capsicum	*Capsicum annuum* L.	Solanaceae	Fruit
4.	Ginger	*Zingiber officinale* Rosc.	Zingiberaceae	Rhizome
5.	Turmeric	*Curcuma longa* L.	Zingiberaceae	Rhizome
6.	Coriander	*Coriandrum sativum* L.	Apiaceae	Leaf & Fruit
7.	Cumin	*Cuminum cyminum* L.	Apiaceae	Fruit
8.	Fennel	*Foeniculum vulgare* Mill.	Apiaceae	Fruit
9.	Fenugreek	*Trigonella foenum-graecum* L.	Fabaceae	Seed
10.	Celery	*Apium graveolens* L.	Apiaceae	Leaf, Fruit & Stem
11.	Aniseed	*Pimpinella anisum* L.	Apiaceae	Fruit
12.	Ajowan	Trachyspermum ammi L.	Apiaceae	Fruit
13.	Caraway	*Carum carvi* L.	Apiaceae	Fruit
14.	Cinnamon	*Cinnamomum zeylanicum*	Lauraceae	Bark
15.	*Garlic*	*Allium sativum* L.	Alliaceae	Bulb
16.	Curry leaf	*Murraya koenigii*(L) Sprengel	Rutaceae	Leaf
17.	Mint	*Mentha piperita* L.	Lamiaceae	Leaf
18.	Saffron	*Crocus sativus* L.	Iridaceae	Stigma
19.	Tejpat	*Cinnamomum tamala* (Buch Ham)	Lauraceae	Bark & Leaf
20.	Pepper Long	*Piper longum* L.	Piperaceae	Fruit
21.	Star Anise	*Illicium verum* Hook.	Illiciaceae	Fruit
22.	Clove	*Syzygium aromaticum*(L)	Myrtaceae	Unopened Flower bud
23.	Asafoetida	*Ferula asafoetida* L.	Apiaceae	resin from rhizome,root
24.	Nutmeg	*Myristica fragrans* Houtt.	Myristicaceae	Seed
25.	Mace	*Myristica fragrans* Houtt.	Myristicaceae	Aril

APPENDIX-C

Difference between Scanning Electron Microscopy and Transmission Electron Microscopy

Properties	Scanning Electron Microscopy (SEM)	Transmission Electron Microscopy (TEM)
Light Source	SEM is based on scattered electrons, i.e., electrons emitted from the surface of a specimen.	Electrons are used as "light source". TEM uses transmitted electrons (electrons which are passing through the sample) to create an image.
Purpose	SEM provides detailed images of the surfaces of cells so SEM shows only the morphology of samples.	TEM is used to view thin specimens (tissue sections, molecules, etc). TEM can show many characteristics of the sample, such as internal composition, morphology, crystallization etc.
Sample Preparation	Sample is coated with a thin layer of a heavy metal such as gold or palladium.	The sample in TEM has to be cut thinner (70-90 nm) because electrons cannot penetrate very far into materials.
Resolution	SEM can resolve objects as close as 20 nm.	TEM has much higher resolution than SEM and can resolve objects as close as 1 nm.
Magnification	The magnifying power of SEM is up to 50,000X.	The magnifying power of TEM is up to 2 million times.
Processing of sample (s)	SEM allows for large amount of sample to be analyzed at a time	With TEM only small amount of sample can be analysed at a time.
3D picture	SEM provides a 3-dimensional image	TEM provides a 2-dimensional picture.
Applications	To study the topography and atomic composition of specimens, process control and also, for example, the surface distribution of immuno-labels	To image the interior of cells (in thin sections), the structure of protein molecule, the organization of molecules in viruses and cytoskeletal filaments.

APPENDIX-D

The Nobel Prize in Physiology or Medicine awarded between 1901 and 2019

(2019) William G. Kaelin Jr, Sir Peter J. Ratcliffe and Gregg L. Semenza "for their discoveries of how cells sense and adapt to oxygen availability"

(2018) James P. Allison and Tasuku Honjo "for their discovery of cancer therapy by inhibition of negative immune regulation"

By stimulating the inherent ability of our immune system to attack tumor cells they established an entirely new principle for cancer therapy.

(2017) Jeffrey C. Hall, Michael Rosbash and Michael W. Young "for their discoveries of molecular mechanisms controlling the circadian rhythm"

(2016) Yoshinori Ohsumi "for his discoveries of mechanisms for autophagy"

Ohsumi's discoveries led to the understanding of how the cell recycles its content. His discoveries opened the path to understanding the fundamental importance of autophagy in many physiological processes, such as in the adaptation to starvation or response to infection. Mutations in autophagy genes can cause disease, and the autophagic process is involved in several conditions including cancer and neurological disease.

(2015) William C. Campbell and Satoshi Ōmura "for their discoveries concerning a novel therapy against infections caused by roundworm parasites"

Tu Youyou "for her discoveries concerning a novel therapy against Malaria"

(2011) Bruce A. Beutler and Jules A. Hoffmann "for their discoveries concerning the activation of innate immunity"

Ralph M. Steinman "for his discovery of the dendritic cell and its role in adaptive immunity"

(2010) Robert G. Edwards "for the development of *in vitro* fertilization"

(2009) Elizabeth H. Blackburn, Carol W. Greider and Jack W. Szostak "for the discovery of how chromosomes are protected by telomeres and the enzyme telomerase"

The long, thread-like DNA molecules that carry our genes are packed into chromosomes, the telomeres being the caps on their ends. Elizabeth Blackburn and Jack Szostak discovered that a unique DNA sequence in the telomeres protects the chromosomes from degradation. Carol Greider and Elizabeth Blackburn identified telomerase, the enzyme that makes telomere DNA. These discoveries explained how the ends of the chromosomes are protected by the telomeres and that they are built by telomerase.

(2008) Harald zur Hausen"for his discovery of human papilloma viruses causing cervical cancer", the second most common cancer among women.

Françoise Barré-Sinoussi and Luc Montagnier "for their discovery of human immunodeficiency virus"

(2006) Andrew Z. Fire and Craig C. Mello "for their discovery of RNA interference – gene silencing by double-stranded RNA"

(2005) Barry J. Marshall and J. Robin Warren "for their discovery of the bacterium *Helicobacter pylori* and its role in gastritis and peptic ulcer disease"

(2001) Leland H. Hartwell, Tim Hunt and Sir Paul M. Nurse "for their discoveries of key regulators of the cell cycle"

(1997) Stanley B. Prusiner "for his discovery of Prions – a new biological principle of infection"

(1993) Richard J. Roberts and Phillip A. Sharp "for their discoveries of split genes"

(1986) Stanley Cohen and Rita Levi-Montalcini "for their discoveries of growth factors"

(1983) Barbara McClintock "for her discovery of mobile genetic elements"

(1978) Werner Arber, Daniel Nathans and Hamilton O. Smith "for the discovery of restriction enzymes and their application to problems of molecular genetics"

(1975) David Baltimore, Renato Dulbecco and Howard Martin Temin"for their discoveries concerning the interaction between tumour viruses and the genetic material of the cell"

(1972) Gerald M. Edelman and Rodney R. Porter "for their discoveries concerning the chemical structure of antibodies"

(1971) Earl W. Sutherland, Jr. "for his discoveries concerning the mechanisms of the action of hormones"

(1969) Max Delbrück, Alfred D. Hershey and Salvador E. Luria "for their discoveries concerning the replication mechanism and the genetic structure of viruses"

(1968) Robert W. Holley, Har Gobind Khorana and Marshall W. Nirenberg "for their interpretation of the genetic code and its function in protein synthesis"

(1966) Peyton Rous "for his discovery of tumour-inducing viruses"

Charles Brenton Huggins "for his discoveries concerning hormonal treatment of prostatic cancer"

(1965) François Jacob, André Lwoff and Jacques Monod "for their discoveries concerning genetic control of enzyme and virus synthesis"

(1962) Francis Harry Compton Crick, James Dewey Watson and Maurice Hugh Frederick Wilkins "for their discoveries concerning the molecular structure of nucleic acids and its significance for information transfer in living material"

(1959) Severo Ochoa and Arthur Kornberg "for their discovery of the mechanisms in the biological synthesis of ribonucleic acid and deoxyribonucleic acid"

(1958) George Wells Beadle and Edward Lawrie Tatum "for their discovery that genes act by regulating definite chemical events"

Joshua Lederberg "for his discoveries concerning genetic recombination and the organization of the genetic material of bacteria"

(1953) Hans Adolf Krebs "for his discovery of the citric acid cycle"

Fritz Albert Lipmann "for his discovery of co-enzyme A and its importance for intermediary metabolism"

(1952) Selman Abraham Waksman "for his discovery of streptomycin, the first antibiotic effective against tuberculosis"

(1946) Hermann Joseph Muller "for the discovery of the production of mutations by means of X-ray irradiation"

(1945) Sir Alexander Fleming, Ernst Boris Chain and Sir Howard Walter Florey "for the discovery of penicillin and its curative effect in various infectious diseases"

(1936) Sir Henry Hallett Dale and Otto Loewi "for their discoveries relating to chemical transmission of nerve impulses"

(1933) Thomas Hunt Morgan "for his discoveries concerning the role played by the chromosome in heredity"

(1932) Sir Charles Scott Sherrington and Edgar Douglas Adrian "for their discoveries regarding the functions of neurons"

(1930) Karl Landsteiner "for his discovery of human blood groups"

(1924) Willem Einthoven "for his discovery of the mechanism of the electrocardiogram"

(1923) Frederick Grant Banting and John James Rickard Macleod "for the discovery of insulin"

(1922) Archibald Vivian Hill "for his discovery relating to the production of heat in the muscle"

Otto Fritz Meyerhof "for his discovery of the fixed relationship between the consumption of oxygen and the metabolism of lactic acid in the muscle"

(1905) Robert Koch "for his investigations and discoveries in relation to tuberculosis"

(1904) Ivan Petrovich Pavlov "in recognition of his work on the physiology of digestion, through which knowledge on vital aspects of the subject has been transformed and enlarged"

(1902) Ronald Ross "for his work on malaria, by which he has shown how it enters the organism and thereby has laid the foundation for successful research on this disease and methods of combating it"

There are basically three kinds of microscopy: light microscopy, transmission electron microscopy (TEM), and scanning electron microscopy (SEM).

Light microscopes use normal light; it can magnify transparent things 1,000 times.

Transmission electron microscopes give a more detailed view of the internal organization of cells and organelles. They use an electronic beam, which kills objects as it passes through.

In addition, for examination under a TEM, objects are often stained with heavy metals like osmium, and for SEM with gold which is highly reflective for electronic rays.

A TEM can magnify things 10,000,000 times. Scanning electron microscopes show an image of the surface of cells and organisms using reflected electronic beam. It can magnify things 1,000,000 times.