Biology (Class XII)

Learning Outcomes	*Sources/ Resources*	*Suggested Activities (to be guided by teachers)*
The learner – appreciates limited life span of organisms and therefore the need of the reproduction process for sustenance of a species over a long period of time – comprehends and able to explain the processes of reproduction i.e., asexual and sexual in different organisms – comprehends and able to explain various strategies adopted by different organisms for asexual reproduction, e.g., binary fission, budding, sporulation, vegetative propagation, fragmentation etc. – appreciates the similar fundamental pattern of sexual reproduction in all such organisms where it occurs, in which germ cells of two different organism produces male and female gametes and after	**NCERT/State Textbook** **Theme** Reproduction in Organisms Content discussed in the textbook ✓ Concept of life span of an organism and its sustenance by the process of reproduction ✓ Methods of Reproduction: Asexual and Sexual ✓ Asexual Reproduction: Binary Fission, Encystment, Sporulation, Budding, Gemmule formation, Vegetative propagation (in plants), Fragmentation ✓ Similarity in the pattern of sexual reproduction in organisms: Vegetative and Reproductive phase ✓ Events in Reproductive phase: Pre-fertilisation, Fertilisation and Post Fertilisation Events ✓ Pre-fertilisation Events: Gametogenesis i.e., formation of male and female gametes in male and female reproductive parts or organism ✓ Transfer of gamete and Fertilisation	Remember that for any of the activities or exploration learners must not venture out of their home due to the Covid-19 pandemic. All explorations are to be done at home if materials are available, otherwise online exploration should be done. **WEEK 1** ✓ Explore the life span of different organisms from different sources including textbook of Biology for Class XII (Chapter 1) and other online resources ✓ Compare the lifespan of any organism with its sustenance over a long period of time on earth. You will realise that such sustenance of any organism is possible only by leaving progeny after death. ✓ The strategy adopted by an organism to continue by producing its progeny is called reproduction. ✓ Click and open following links to understand different strategies adopted by organisms for reproduction. ✓ Reproduction methods: https://opentextbc.ca/biology/chapter/24-1-reproduction-methods/; https://samagra.kite.kerala.gov.in/uploads/12/botony/916/1716/12_Ch916_12151/main.html Asexual Reproduction https://ciet.nic.in/swayam_biology03_module01.php **Activity 1:** Prepare list of plants and animals which are capable of reproducing— ✓ Only asexually

fertilisation offspring is produced. – comprehends and appreciates the process of gametogenesis to produce gametes in which number of chromosomes are reduced to half (diploid to haploid) – comprehends and appreciates that fertilisation restores the diploid condition in offspring – appreciates the fact that sexual reproduction brings variability among offspring – comprehends and appreciates that the process of fertilisation may be internal or external with its features and significance – understands different mechanisms of early development i.e., embryogenesis in different organisms mainly plants and animals – understands and explains oviparity and viviparity among animals	✓ Post fertilisation events: Zygote formation, Embryogenesis **Resources** ✓ E-Resources developed by NCERT, which are available on NROER and also embedded in QR Code in textbooks of NCERT. ✓ Live telecast of various science concepts at Swayam Prabha Channel https://www.youtube.com/channel/UCT0s92hGjqLX6p7qY9BBrSA ***Links of resources given below*** ✓ About Reproduction methods: https://opentextbc.ca/biology/chapter/24-1-reproduction-methods/; https://samagra.kite.kerala.gov.in/uploads/12/botony/916/1716/12_Ch916_12151/main.html ✓ Asexual Reproduction: https://ciet.nic.in/swayam_biology03_module01.php ✓ Binary fission in prokaryotes: https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Boundless)/6%3A_Culturing_Microorganisms/6.6%3A_Microbi	✓ Only sexually ✓ Both asexually and sexually ✓ (Also compare the life span of asexually and sexually reproducing organisms) **Activity 2**: Identify various events taking place during asexual reproduction (different methods) and sexual reproduction from the book or other online resources. ✓ Click and open the following links to understand different types of asexual reproduction strategies in different types of organisms: ✓ Binary fission in prokaryotes: https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Boundless)/6%3A_Culturing_Microorganisms/6.6%3A_Microbial_Growth/6.6A%3A_Binary_Fission ✓ Sporulation as reproduction process: https://www.microscopemaster.com/sporulation.html **Activity 3**: Students can grow bread mould or may observe developing mould or fungus on bread pieces left for few days at a humid place. They may observe some of these mould or fungus using their magnifying lenses. Think from where these fungi have appeared. ✓ Vegetative propagation in plants: https://www.sciencelearn.org.nz/resources/1662-vegetative-plant-propagation **Activity 4**: Children can observe some of the potatoes available in their home. They may keep two-three old potatoes at a humid place. After a few days they may observe germinating eye buds and if left for few more days they may even observe growth of roots and shoot. ✓ Fragmentation: https://www.biologyonline.com/dictionary/fragmentation ✓ Study about all asexual reproduction strategies adopted by different plants and animals.

	al_Growth/6.6A%3A_Binary_Fission ✓ Sporulation as a reproduction process: https://www.microscopemaster.com/sporulation.html ✓ Vegetative propagation in plants: https://www.sciencelearn.org.nz/resources/1662-vegetative-plant-propagation ✓ Fragmentation: https://www.biologyonline.com/dictionary/fragmentation ✓ Sexual Reproduction: https://www.biologyonline.com/dictionary/sexual-reproduction ✓ Gametogenesis: https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/43%3A_Animal_Reproduction_and_Development/43.3%3A_Human_Reproductive_Anatomy_and_Gametogenesis/43.3C%3A__Gametogenesis_(Spermatogenesis_and_Oogenesis)	Find out whether all such strategies are adopted by all the organisms mentioned in the book or given links or online resources which you could explore. If no, then try to explore the reasons. ✓ Draw neat and labeled diagrams of various asexual reproduction strategies in plants and animals ✓ Communicate with your peers or teacher in case of any query or to share experience and understanding. **WEEK 2** ✓ Study events of sexual reproduction process from your textbook and try to conceptualise the necessity of these events. ✓ Click to open the following links to know more about different gamete formation in unicellular organisms, plants and animals: Sexual Reproduction: https://www.biologyonline.com/dictionary/sexual-reproduction ✓ Now when you have understood the importance of gamete in the process of sexual reproduction, try to explore the part of plants or animals where gametes are produced. **Activity 5**: List names of plants in which flowers are unisexual and bisexual. **Activity 6**: Prepare a list of animals which do not exhibit sexual dimorphism (separate male and female) and explore the process of fertilisation in them. ✓ Correlate the process of gametogenesis and fertilisation with meiotic cell division ✓ Explore the process of embryogenesis and production of offspring in plants and animals. **WEEK 3** ✓ Observe the different parts of any flower available in any plant in
• understands flower as the organ of sexual reproduction and role of its different parts. • explains structure of different parts of androecium and	**Theme** Reproduction in Flowering Plants Content discussed in the textbook ✓ Flower as reproductive structure of angiosperm plants ✓ Structure of stamen,	

gynoecium (male and female parts of the flower) and their functions. • explains different structural variation and arrangement of male and female parts of the flower (androecium and gynoecium) in different flowering plants. • comprehends and appreciates the pre-fertilisation events in male and female parts of the flower. • understands the process of development of microspores (pollen) and megaspores (ovule). • understands and appreciates the process of pollination and appreciate its significance. • appreciates the role of different pollinating agents especially insects. • understands post pollination events, fertilisation, embryogenesis and seed development. • appreciates the role of pre-fertilisation, pollination and	microsporangium and pollen grains ✓ Microsporogenesis ✓ Structure of pollen grain ✓ Structure of pistil, megasporangium and embryo sac ✓ Megasporogenesis ✓ Pollination strategy in flowering plants ✓ Double Fertilization ✓ Endosperm and embryogenesis ✓ Plant seed and fruit ✓ Apomixix and Polyembryony **Resources** ✓ E-Resources developed by NCERT, which are available on NROER and also attached as QR Code in textbooks of NCERT. ✓ Live telecast of various science concepts at *Swayam Prabha* Channel https://www.youtube.com/channel/UCT0s92hGjqLX6p7qY9BBrSA **Online links of resources** ✓ Flower reproductive parts: Fertilisation: https://www.ncbi.nlm.nih.gov/books/NBK26843/ ✓ Reproductive development structure: https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(OpenStax)/6%3A_Plant_Structure_and_Funct	your house, if available. (Please do not venture out of your house premise due to lockdown) ✓ Identify the reproductive parts, i.e., stamen and pistil in the flower ✓ Study about the parts of flowers from different sources including *Textbook of Biology* for Class XII (Chapter 2) and other online resources ✓ Click and open following links to understand the reproductive structure of flower: ✓ Flower reproductive parts—Fertilization: https://www.ncbi.nlm.nih.gov/books/NBK26843/ ✓ Reproductive parts of flower and test items: https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(OpenStax)/6%3A_Plant_Structure_and_Function/32%3A_Plant_Reproduction/32.E%3A_Plant_Reproduction_(Exercises) ✓ Study about the structure of stamen, microsporangium, process of microsporogenesis from Biology Textbook Class XII (Chapter 2) and other resources. **Activity 7**: Draw neat and labeled diagrams of a section of young and mature anther. ✓ Study about the structure of pistil, megasporangium, process of megasporogenesis from the Class XII Biology textbook (Chapter 2) and other resources. **Activity 8:** Draw neat and labelled diagrams of different stages of megaspore and embryo sac. ✓ Online Link: Reproductive development structure: https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(OpenStax)/6%3A_Plant_Structure_and_Function/32%3A_Plant_Reproduction/32.1%3A_Reproductive_Development_and_Stru

post-fertilisation event in artificial hybridisation for crop improvement and parthenocarpy. • understands the structure of fruit and seed. • comprehends and appreciates a few rare methods of reproduction like Apomixis and polyembryony	ion/32%3A_Plant_Reproduction/32.1%3A_Reproductive_Development_and_Structure ✓ Pollination and fertilization: https://courses.lumenlearning.com/biology2xmaster/chapter/pollination-and-fertilization/ ✓ Pollination: https://www.intechopen.com/books/pollination-in-plants/introductory-chapter-pollination ✓ Fertilization, embryogenesis and seed development in plants: http://bio1520.biology.gatech.edu/growth-and-reproduction/plant-reproduction/ ✓ Fertilisation: https://www.ncbi.nlm.nih.gov/books/NBK26843/ ✓ Pollination: https://www.intechopen.com/books/pollination-in-plants/introductory-chapter-pollination ✓ Fertilisation, embryogenesis and seed development in plants: http://bio1520.biology.gatech.edu/growth-and-reproduction/plant-reproduction/	cture ✓ Study the process of pollination in different plants from the Biology textbook and other resources including the following links: ✓ Pollination and fertilisation: https://courses.lumenlearning.com/biology2xmaster/chapter/pollination-and-fertilization/ ✓ Pollination: https://www.intechopen.com/books/pollination-in-plants/introductory-chapter-pollination ✓ Study about different strategies adopted by plants having bisexual flower for cross pollination **Activity 9:** Search different examples of pollination mechanisms and list with example. ✓ List advantages of cross pollination in plants **WEEK 4** ✓ Study about pollen-pistil interaction and post pollination events in flower ✓ Write about the importance of artificial hybridisation for crop improvement and strategy adopted for this ✓ Study about the process of double fertilisation in angiosperm flower in the Biology textbook and other resources including the following link: ✓ Fertilisation, embryogenesis and seed development in plants: http://bio1520.biology.gatech.edu/growth-and-reproduction/plant-reproduction/ ✓ Pollination and fertilisation: https://courses.lumenlearning.com/biology2xmaster/chapter/pollination-and-fertilization/ ✓ Post fertilisation event: ▪ Endosperm development

		▪ Embryogenesis and formation of embryo in dicot and monocot ✓ Study about seed formation and its type from the Biology textbook and other resources ✓ Write about your understanding on fruits and seeds. **Activity 10:** Prepare a list of edible parts of 20 different types of fruits ✓ Parthenocarpic fruit ✓ Study about formation of seeds without fertilisation (apomixis) ✓ Understand about polyembryony with example ✓ Draw labelled diagrams of different types of seed ✓ Test your understanding by solving problems given in the book entitled, "Exemplar Problem in Biology for Class XII" and solve problems given to test your understanding