

SCIENCE & TECHNOLOGY

Curriculum goals at middle level

- Develop good human beings capable of rational thought and action possessing compassion and empathy, courage and resilience, a scientific tempo and creative imagination.
- Develop a scientific attitude and temper and understand scientific concepts, principles and laws.
- Acquire the knowledge of scientific terms, facts, definitions and processes.
- Develop experimental skills, rational thinking ability to analyse and sharpen their sense of enquiry and creativity.
- Develop basic process skills in science like (measurement skills, observational skills and inferences) and to encourage the use of locally available resources.
- Recognize the relationship of science, technology, environment and society.
- Appreciate the contribution of science towards development.
- Create awareness and concern for a healthy environment and preservation of ecosystem.

General Instructions :

Examination will be held at the end of the year. It will be for the entire Syllabus.

Duration of Written exam will be 3 hrs

Internal Assessment will be of 20 Marks

(a) Unit wise detail of chapter along with learning outcomes

Chapter-1: The cell- Its structure and functions (5 Marks)

- Discovery of the cell
- The cell- variation in cell number, shape and size in living Organisms
- Parts of cell
- Levels of Organisation in an Organism
- Comparison between Plant and Animal Cells

Learning Outcomes: The learner:

1. Comprehends the basic unit of life.
2. Differentiates between unicellular and multicellular organisms.
3. Classifies the cell on the basis of shape, size and number.

4. Identifies the major cell structure.
5. Relates the functions of various cell organelles.
6. Draws flowchart related to levels of organisations
7. Compares between plant cell and animal cell.
8. Draws Plant cell and animal cell.

Chapter-2: Microorganisms: Friends or Foes (6 marks)

- Types of Microorganisms
- Viruses are Unique
- Where do Microorganisms live?
- Role of Microorganisms in our life
- Microorganisms as our friends
- Microorganisms – The Foes
- Food Poisoning
- Food Preservation

Learning Outcomes: The learner:

1. Identifies the different types of microorganisms on the basis of their cell structure.
2. Appreciates uniqueness of viruses
3. Relates the habitat of microorganisms.
4. Understands and appreciates the role of microbes as our friends.
5. Relates that microbes are major cause of disease in plants and animals.
6. Understands food poisoning, its causes and ways to prevent.
7. Understands and appreciates various methods of food preservation.

Chapter-3: Metals and Non-metals (8 Marks)

- Classifications of elements
- Occurrence of elements
- Minerals and Ores
- Physical Properties

- Chemical Properties
- Reactivity of metals
- Displacement Reactions
- Noble Metals
- Uses of Metals and Non-metals
- Alloys- Composition and Uses of Alloys

Learning Outcomes: The learner:

1. Classifies elements on the basis of their physical and chemical properties
2. Relates the concept of minerals and ores.
3. Compares physical properties of metals with non-metals.
4. Understands the chemical reaction of metals and non-metals with air, water and acid
5. Analyses the reactivity of various metals in reactivity series.
6. Comprehend displacement reactions.
7. Relates the importance of noble metals, metals, non-metals and alloys.

Chapter-4: Force and Pressure

(5 Marks)

- Force
- Effects of force
- Factors associated with magnitude of Force needed
- Balanced and unbalanced Forces
- Types of Forces- Contact and non contact Forces
- Pressure
- Application of the concept of Pressure in daily life
- Liquid pressure
- Properties of Liquid Pressure
- Atmospheric Pressure
- Variation in Air Pressure
- Importance of atmospheric pressure
- Force and Pressure- Concept Map

Learning Outcomes: The learner:

1. Defines the term- force and its types.
2. Realises the effects of force.

3. Analyses factors associated with the magnitude of force needed.
4. Interprets balanced and unbalanced forces with examples from daily life.
5. Identifies different types of forces.
6. Explains the relationship of pressure, area and force.
7. Demonstrates activities based on liquid pressure and atmospheric pressure.
8. Draws concept map of force and pressure.
9. Applies the knowledge of pressure and atmospheric pressure in day to day life.

Chapter-5: Friction

(5 Marks)

- Concept of Friction
- Cause of Friction
- Factors affecting Friction
- Types of Friction
- Friction- A necessary evil (a necessity and an evil both)
- Methods of Increasing/ Reducing Friction
- Fluid Friction

Learning Outcomes: The learner:

1. Defines and classifies the different types of friction.
2. States the cause of friction and factors affecting it.
3. Describes friction as a necessity and as an evil.
4. Explains methods of increasing and decreasing friction.

Chapter- 6: Sources of Energy

(6 Marks)

- Classification of sources of energy
- Fossil Fuels
- Wood as a fuel
- Coal (occurrence, formation and types)
- Destructive distillation of coal and its products
- Petroleum (Occurrence, refining and petroleum products)
- Natural Gas and its uses
- Cleaner Fuels

Learning Outcomes: The learner:

1. Classifies, identifies and differentiates sources of energy on the basis of their occurrence, physical state and availability.
2. Defines fuel, fossil fuel, destructive distillation of coal, refining of petroleum.
3. Describes the occurrence, formation and types of coal.
4. Explains the occurrence and refining of petroleum.
5. State the products and their uses, obtained during refining of petroleum.
6. Realises the importance of switching on to cleaner fuels like CNG,LPG, biomass etc.

Chapter-7:Combustion**(7 Marks)**

- Combustion
- Conditions required for combustion
- Types of Combustion
- Fire Control
- Incomplete Combustion
- Flame
- Fuel and Calorific Value
- Characteristics of a good fuel
- Harmful effects of Fuels

Learning Outcomes: The learner:

1. Defines combustion, combustible substances, ignition / kindling temperature, calorific value of fuels and global warming.
2. States the conditions required for combustion.
3. Applies the knowledge of ignition temperature in practical situations.
4. Identifies and describes different types of combustion.
5. Recalls the characteristics of a good fuel and learns the methods of fire control.
6. Draws the structure of candle flame and explains its different zones.
7. Explains harmful effects of fuels.

Chapter-8: Conservation of plants and animals

(*For internal assessment only)

- Domestic consequences of Deforestation
- Global consequences of Deforestation
- Conservation of Forest and wild life
- Biosphere Reserves (Map of biodiversity hotspots not to be evaluated)
- National Parks
- Wild life Sanctuaries
- Flora and Fauna
- Endemic species
- Red Data book
- Migration
- Reforestation
- Recycling of Paper

Learning Outcomes: The learner:

1. Recalls the domestic and global consequences of deforestation.
2. Realises and appreciates the importance of conservation of forest and wildlife.
3. Defines and differentiates between biosphere, national parks and wildlife sanctuaries.
4. Learns about flora, fauna and red data book.
5. Distinguishes and identifies between extinct ,endangered, vulnerable and endemic species.
6. States the cause of extinction of endemic species.
7. Defines and realises the importance of migration, reforestation ,afforestation and recycling of paper.

Chapter- 9 : Crop Production and its Management

(*For internal assessment only)

- Food from plants

- Agricultural practices
- Preparation of soil
- Sowing
- Soil replenishment
- Irrigation
- Traditional System of irrigation
- Modern system of irrigation
- Crop Protection
- Harvesting
- Storage
- Crop Improvement

Learning Outcomes: The learner:

1. Describes the various agricultural practices.
2. Compares traditional and modern system of irrigation.
3. Identifies agricultural tools .
4. Differentiates crops based on the season in which they grow.
5. Appreciates and analyses the methods of crop improvement and their protection.

Chapter-10: refraction and Dispersion of Light (7 Marks)

- Refraction of Light
- Refraction- its causes
- Refractive Index, Optical density
- Rules of Refraction
- Refraction of light by a glass slab
- Dispersion of white light by a glass prism
- Rainbow
- Lenses-spherical lenses
- Basic terms related to lenses
- Three special rays for lenses
- Image formation by convex and concave lenses
- Application of lenses

Learning Outcomes: The learner:

1. Understands the concept of refraction, optical density and various terms related to refraction.
2. Relates and quotes the examples of refraction from daily life.

3. Draws ray diagrams for refraction through a glass slab, dispersion through a prism and different types of lenses .
4. Identifies and differentiates lenses on the basis of images formed by them.
5. Understands the various terms related to lenses.
6. Appreciate the importance of lenses in daily life.

Chapter-11: The Human Eye

(4 Marks)

- Structure of human eye
- Function of various parts of the human eye
- The blind spot
- How do we see colours?
- Working of the human eye
- Range of Vision
- Defects of Vision
- Care of the Eyes
- Visually Challenged Persons
- Help for Visually Challenged Person
- Braille System

Learning Outcomes: The learner:

1. Appreciates the functions of various parts of the human eye.
2. Draws diagram of human eye.
3. Defines blind spot, range of vision, power of accommodation and near point.
4. Understands the various defects of vision, their causes and corrective measures
5. Classifies the sources available for visually challenged persons .
6. Appreciates the precautions suggested to ensure the health and proper functioning of eyes
7. learns to exhibit sensitivity towards visually challenged persons.

Chapter-12: Sound

(4 Marks)

- Sound and vibrations
- Sound produced by humans

- Sound produced by animals
- Propagation of sound
- Light propagates faster than sound
- Amplitude, Time Period and frequency of a Vibration
- Loudness and Pitch of a sound
- Audible and inaudible sounds
- Noise and Music
- Noise Pollution: sources and effects
- Measures to limit Noise Pollution
- Hearing Impairment

Learning Outcomes: The learner:

1. Defines the terms sound, vibration, amplitude, frequency, time period, audible and inaudible sounds, music, noise and noise pollution.
2. Understands the cause of production of sounds.
3. Describes the production of sound in humans and animals.
4. Explains the propagation of sound in different media.
5. Differentiates between the propagation of sound and light in air.
6. Relates frequency with time period amplitude with loudness and pitch
7. Applies interdependency of amplitude with loudness and pitch with frequency.
8. Identifies the sources of noise pollution.
9. Knows the measures to limit noise pollution and hearing impairment.

Chapter-13: Synthetic Fibres and Plastics (5 Marks)

- Natural Fibres and Synthetic Fibres
- Different Synthetic Fibres
- Advantages and Disadvantages of Synthetic fibres
- Plastics
- Characteristics of Synthetic plastics
- Types of Synthetic Plastics
- Thermosetting Plastics
- Thermoplastics
- Plastics and the environment

- Damage caused by Plastic Waste
- Measures to control the damage caused by Plastic waste

Learning Outcomes: The learner:

1. Defines monomers, polymers , synthetic fibres and polymerisation.
2. Classifies the fibres into natural and synthetic fibres.
3. Identifies the types of synthetic fibres .
4. Recalls the uses of various synthetic fibres.
5. Understands the advantages and disadvantages of synthetic fibres
6. Classifies and differentiates plastics as thermoplastics and thermosetting plastics.
7. States the characteristics of synthetic plastics.
8. Distinguishes between biodegradable and non-biodegradable materials.
9. Realises the damage caused by plastic waste on environment.
10. Knows the measures to control the damage caused by plastic waste.

Chapter-14: Reproduction in animals

(7 Marks)

- Asexual Reproduction
- Sexual Reproduction
- Reproductive Patterns
- Reproductive Systems
- Fertilisation, Development of the embryo
- How do hens lay eggs?
- Viviparous and oviparous animals
- Journey from young ones to adults(Frog)

Learning Outcomes: The learner:

1. Recalls the concept of reproduction and its types
2. Explains the different methods of asexual reproduction
3. Classifies an organism as Oviparous or viviparous .
4. Draws diagram of sperm and female reproductive system.
5. Relates metamorphosis and understand the changes in life-cycle of frog.
6. Differentiates between direct and indirect development.

Chapter-15: Reaching the age of adolescence

- Adolescence and Puberty (7 Marks)
- Changes at Puberty
- Sexual development
- Determination of sex of the child
- The Endocrine system
- Role of hormones in completing the life cycle of insects and frogs
- Reproductive health

Learning Outcomes: The learner:

1. Defines adolescence and puberty
2. Understands emotional and physiological changes taking place during adolescence
3. concludes the factors responsible for determination of sex of a child
4. Realises the importance of hormones in human body for its proper functioning
5. Incorporates the various health measures in lifestyle for maintaining good reproductive health

Chapter-16: Electric current and its chemical effects

- Conductors and insulators (5 Marks)
- Conduction through liquids
- Cause of conductivity of liquids
- Electrolytes
- Conversion of chemical energy into electrical energy
- Chemical effects of electric currents, their applications
- Faraday's Discovery
- Electromagnetic Induction

Learning Outcomes: The learner:

1. Recalls and identifies conductors and insulators.
2. Defines electrolyte, electrorefining, electroplating, electrolysis and electromagnetic induction.
3. Understands the cause of conductivity of liquids.

4. Differentiates and identifies strong and weak electrolytes.
5. Describes the conversion of chemical energy into electrical energy in a voltaic cell.
6. Explains the chemical effects of current and its application.
7. States the factors on which a chemical reaction taking place in a solution depends and its effect within a solution.
8. Quotes examples of application of electroplating from our daily life.
9. Elaborates the process of electromagnetic induction, its observations and its application.

Chapter-17: Stars and Solar System

(*For internal assessment only)

- Galaxy-Milky way galaxy
- Stars
- Constellations
- The Moon
- Phases of the moon
- The moon's surface
- The solar system
- Minor bodies in the solar system
- Artificial satellites and their applications

Learning Outcomes: The learner:

1. Understands various heavenly bodies like stars , planets etc. and their characteristics.
2. Identifies various constellations.
3. Defines planets, galaxy, celestial bodies, constellations, asteroids, meteors, meteorites, comets.
4. Explains the different phases of moon.
5. Differentiates between natural and artificial satellite.

Chapter-18: Earthquake

(*For internal assessment only)

- Earthquakes and their effects

- Cause of an earthquake
- The focus
- Predicting an earthquake
- Measuring an earthquake
- Protection against earthquake, safety precautions.

Expected Learning Outcomes: The learner:

1. Understands earthquake, its causes and effects.
2. Differentiates between focus and epicentre.
3. Knows the methods to predict and measure the intensity of an earthquake.
4. Acquires the skills of disaster management.

Chapter-19: Pollution of air

(*For internal assessment only)

- Pollution
- Air Pollution; Causes of air pollution
- Harmful effects of Carbon monoxide, Nitrogen dioxide, Smog, Chlorofluorocarbons(CFCs)
- Acid rain and its harmful effects
- Green house effects and Global warming
- Causes of increase in concentration of Green house gases
- Consequences of green house effects
- Global warming and its consequences
- Measures to check global warming
- Methods to control air pollution

Learning Outcomes: The learner:

1. Defines the terms air pollution and air pollutants.
2. Relates various air pollutants with their harmful effects.
3. Explains the concept of green house effect and its consequences.
4. Applies scientific concepts in checking global warming and controlling air pollution.

Chapter-20: Pollution of water

(*For internal assessment only)

- Water Pollution
- Causes of water pollution
- Potable water
- Purification of drinking water
- Methods to make water safe for drinking
- Treatment of major sources of water pollution
- Treatment of sewage

- Treatment of Industrial waste
- Conservation of water

Learning Outcomes: The learner:

1. Defines the term water pollution.
2. Explains causes of water pollution.
3. Suggests parameters need to be followed before water is supplied for drinking purposes.
4. Applies methods used to make water safe for drinking.
5. Shows concern about water conservations.

Detailed Syllabus Marks and Time Distribution

S.No.	Unit/Section	Chapter/ content	No. of Periods	Marks Allotted
1	Ch-1	The cell-It's structure and functions	8	5
2	Ch-2	Microorganisms: friends or foes	9	6
3	Ch-3	Metals and non-metals	12	8
4	Ch-4	Force and pressure	8	5
5	Ch-5	Friction	10	5
6	Ch-6	Sources of energy	6	5
7	Ch-7	Combustion	8	7
8	Ch-8	Conservation of plants and animals	6	For Internal assessment
9	Ch-9	Crop production and its management	6	For Internal assessment
10	Ch-10	Refraction and dispersion of light	14	7
11	Ch-11	The human eye	7	4
12	Ch-12	Sound	6	4
13	Ch-13	Synthetic fibres and plastics	6	5
14	Ch-14	Reproduction in Animals	10	7
15	Ch-15	Reaching the age of of adolescence	10	7
16	Ch-16	Electric current and its chemical effects	10	5
17	Ch-17	Stars and solar system	6	For Internal assessment
18	Ch-18	Earthquakes	6	For Internal assessment
19	Ch-19	Pollution of Air	4	For Internal assessment
20	Ch-20	Pollution of Water	3	For Internal assessment

Weightage as per typology of question

S.No.	Typology	No. of questions	Marks allotted to each question	Total Marks
1	MCQ	16	1	16
2	A/R	4	1	4
3	SAI	6	2	12
4	SAll	7	3	21
5	Long Answer	3	5	15
6	Case Based	3	4	12
Total		39		80

Details of Internal Assessment

S. No.	Tools of Internal Assessment	Weightage
1.	<p><u>Periodic Tests</u> Three periodic tests (pen and paper test) will be conducted at school level, as per their own schedule, and the average of the best two scores will be reduced to 5 marks.</p>	5
2.	<p><u>Subject Enrichment Activity</u> 1st Activity : Art Integration Activity : Students will be given an activity/ interdisciplinary project in which they will use any form of Art to express/ explain the scientific idea. 2nd Activity : Mobile Lab Kit Making : Students will prepare under teacher's guidance their own mobile lab kit and demonstrate/carry out a sample science activity using it.</p>	5
3.	<p><u>Multiple Assessment Activity</u> Students will be assessed using multiple tools of observation such as interdisciplinary project, Role play, Group discussion, Debate, Quiz, Oral test, Field work, Bulletin board making, Puzzles etc.</p>	5

- Give an Art Integration Activity or Interdisciplinary Project on topics from these chapters.
 - Carry out Multiple Assessment based on these chapters.
- (b) The diagrams listed below are meant for understanding. Therefore, drawing of these diagrams will not be included for assessment in annual examination. However, questions based on these diagrams can be used for evaluation.

S.NO.	Page No.	Diagram
1	8	Euglena and Paramecium
2	256	Male Reproductive System

- (c) Refractive Index, Refractive Index and optical density given on Page no. 171 will not be assessed in annual examination.
- (d) Some suggested Art integration activities, Mobile Lab activities and interdisciplinary projects are given below.

List of Suggested Activities for

Subject Enrichment and Multiple Assessment

(Minimum three activities are to be carried out)

Note : The list given here is only suggestive in nature. The teachers/students, can take up other projects/ activities in place of those suggested here. This list is not prescriptive and exhaustive.

- (a) Prepare a Jigsaw Puzzle on plant cell/ Animal cell.
 - (b) Prepare a temporary mount of onion peel and cheek cells.
 - (c) Make a model of plant cell/animal cell using ecofriendly materials.
- (a) Collect the labels from the bottles of Jams and jellies. Enlist the preservatives mentioned on labels.
 - (b) Spotting of different microorganisms—Amoeba, Spirogyra, Paramecium, Yeast (either slides photographs).
 - (c) Include a photocopy of your “Vaccination chart” in PORTFOLIO. Prepare a “Survey report” on diseases for which vaccination is done in India.
- (a) Design a piece of jewellery by using Aluminium foil.
 - (b) Laboratory Demonstration by teacher on different physical and chemical properties of metals and non-metals.

4. (a) Tug of war is a sport where two teams test their strength using a rope. Play this game with your friends and mention the type of force coming into action.
- (b) Use pictures/science toons to show different types of forces.
- (c) Lab activities to show relation of-
 - (i) force and pressure
 - (ii) pressure and area
- (d) demonstration showing properties of liquid pressure.
5. (a) Imagine that friction was to suddenly vanish. Write a short story on how would our lives be affected in its absence.
- (b) Collection of interesting facts or situations to create Power Point Presentation on-
 - (i) Methods to increase or decrease friction in day to day life.
 - (ii) Advantages or disadvantages of friction.
- (c) Demonstration of an activity to show that force of friction increases with increase in the weight of the body.
6. (a) In the outline map of India mark any three places where coal mines are located.
- (b) Graphical representation on Increase in cost of Petrol / Diesel in last ten years.
- (c) Survey - Visit a nearby petrol station and collect data for one month about number of vehicles that have undergone pollution check on each day of that month.
7. (a) Activity showing different conditions required for combustion.
- (b) Prepare working model of CO_2 type fire extinguisher by using household materials.
- (c) Collect information on different types of fire extinguishers and write about them in a scrap file with pictures of fire extinguishers.
- (d) Activities showing presence of wax vapours in the innermost zone of candle flame and unburnt particles of carbon in the luminous zone of the candle flame and to show that the non-luminous zone is the hottest part of the candle flame.

8. (a) Prepare a poster on conservation of animals.
(b) Take Out a Rally to create awareness about "Importance of Trees".
(c) Prepare recycled paper using scrap paper.
(d) Make a Picture Gallery on different types of species of plants and animals.
(e) Design a Brochure on National Park/Bio-diversity Park/ Wildlife Sanctuary.
9. (a) Compose a song/poem or jingle to promote organic farming or green manuring.
(b) Design different agricultural implements using clay/ dough.
10. (a) Draw ray diagrams to show image formation by a convex lens/ concave lens by using match stick/ Broom sticks/ woollen thread.
(b) Demonstration/Activity on refraction of light through a glass slab, glass prism and spherical lenses.
11. (a) Prepare a flip book to explain persistence of vision.
(b) Model of Human Eye using waste materials.
(c) Survey on "Defects of vision".
12. (a) In a scrap file, paste pictures of different musical instruments and give information about their special characteristics (through a visit to the music room).
(b) Power Point Presentation on "Cause and Effects of Noise Pollution" and "Measures to be taken to minimise ill effects of Noise Pollution".
13. (a) Organise a debate on the topic " My fabric is superior".
(b) Make a doll using waste plastic materials (bottle, caps, straws, etc.) and adorn it using different types of synthetic fibers/fabrics. [click its photograph and place it in the portfolio]
(c) Draw posters and write slogans (self created) on "Say No To Plastics".
(d) Make an "Eco brick" using used plastic bottles and plastic wrappers.
(e) Make a planter by using a PET bottle/used tyre.
(f) Devise an activity to show that organic waste is biodegradable while plastic is not.

14. (a) Prepare a 3D model of human sperms/asexual reproduction / female reproductive system.
 - (b) Write up on “Challenges faced by countries with over population”.
 - (c) Model on “Life cycle of a frog”.
15. (a) Design a book cover based on “ Adolescents are Unique.”
 - (b) Poster making on “Say no to drugs”.
 - (c) Short film / Skit / Street play/video on ‘Gender sensitization’ and ‘drug menace’.
16. (a) To prepare a model to show the conversion of magnetic energy into electrical energy.
 - (b) To prepare a continuity tester to check conduction through liquids.
 - (c) Demonstration of electrolysis of water.
17. (a) To show different phases of moon using Oreo biscuit/ disposable glass etc.
 - (b) Visit or collect information about any of the ancient astronomical observatory built by Maharaja Jai Singh and instruments / technique used by astronomers of those times.
 - (c) To make a collage on “Achievements of ISRO” till date.[Sources - newspaper, Science magazine, newsletters, journals, internet etc.]
18. (a) Make a model of seismometer.
 - (b) Role play an “Do’s & Dont’s during an earthquake.”
 - (c) Gather information about specific earthquake location and prepare a collage based on information.
19. (a) write a rhyme in context to air pollution.
 - (b) Report on ‘Smoke Towers’.
 - (c) Comparative Study of steps taken by the Government against pollution of three polluted cities of the world.
20. (a) Street play “Jal hi Jeevan Hai”.
 - (b) Case study on Conservation of water bodies.

Prescribed Book-

The living world (A book of Science and Technology)