SUPPORT MATERIAL

CLASS X

SCIENCE

SA-II (English)

LIST OF CONTRIBUTORS FOR PREPARATION/REVIEW OF SUPPORT MATERIAL IN SCIENCE

CLASS X

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QUESTION PAPER DESIGN FOR SCIENCE (CODE NO. 086/090) CLASS-X (2016-17)

Time : 3 Hours

Max. Marks : 90

S. No.	Typology of Questions	Very Short Answer (VSA) 1 Mark	Short Answer-I (SAI) 2 Marks	Short Answer-II (SAII) 3 Marks	Long Answer (LA) 5 Marks	Total Marks	% Wei.
1.	Remembering (Knowl- edge based simple re- call questions, to know specific facts, terms, concepts, principles or theories, identify, define or recite, information)	3	-	1	1	11	15%
2.	Understanding (Com- prehension to be famil- iar with meaning and to understand conceptu- ally, interpret, compare, contrast, explain, para- phrase or interpret in- formation)	-	1	4	1	19	25%
3.	Application (Use ab- stract information in concrete situation, to apply knowledge to new situations, use given content to interpret a situation, provide an ex- ample, or solve a prob- lem)	-	-	4	1	17	23%
4.	High Order Think- ing Skills (Analysis & Synthesis : Classify, compare, contrast or differentiate between different pieces of infor- mation, organize and/or integrate unique pieces of information from a variety of sources)	-	2	-	1	9	12%



5.	Inferential and Evalu- ate (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to pre- dict outcomes based on values)	-	-	2 + 1*	2	19	25%
	Total (Theory Based	$3 \times 1 = 3$	$3 \times 2 = 6$	12 × 3	6 × 5	75 (24)	100
	Questions)			= 36	= 30		%
	Practical Based Ques-	$9 \times 1 = 9$	$3 \times 2 = 6$	-	-	15 (12)	
	tions (PBQs)						
	Total	12 × 1	6 × 2	12 × 3	6 × 5	90 (36)	
		= 12	= 12	= 36	= 30		

One question of 3 marks will be included to assess the values inherent in the texts.



COURSE STRUCTURE CLASS X

Second Term

Marks : 90

Unit No.	Unit	Marks
Ι	Chemical Substances – Nature and Behaviour	23
II	World of Living	30
III	Natural Phenomena	29
V	Natural Resources	08
	Total	90

Theme : Materials

(25 Periods)

Unit I : Chemical Substances – Nature and Behaviour

Carbon compounds : Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series. Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydrocarbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents.

Periodic classification of elements : Need for classification, Modern periodic table, graduation in properties, valency, atomic number, metallic and non-metallic properties.

Theme : The World of the Living

(30 Periods)

Unit II : World of Living

Reproduction : Reproduction in animals and plants (asexual and sexual) reproductive health-need and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Heredity and Evolution : Heredity; Mendel's contribution – Laws for inheritance of traits, Sex determination : Brief introduction; Basic concepts of evolution



Theme : Natural Phenomena

Unit III : Natural Phenomena

Reflection of light by curved surfaces; Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required), magnification.

Refraction; Laws of refraction, refractive index.

Refraction of light by spherical lens; Image formed by spherical lens; Lens formula (Derivation not required); Mangification. Power of lens; Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses.

Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life.

Theme : Natural Resources

(12 Periods)

Unit V : Natural Resources

Conservation of natural resources.

Management of natural resources. Conservation and judicious use of natural resources. Forest and wild life; Coal and Petroleum conservation. Examples of people's participation for conservation of natural resources.

Regional environment : Big dams; advantages and limitations; alternatives, if any. Water harvesting. Sustainability of natural resources.

Our environment : Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.





Practical should be conducted alongside the concepts taught in theory classes

LIST OF EXPERIMENTS

- 1. To study the following properties of acetic acid (ethanoic acid) :
 - (a) odour
 - (b) solubility in water
 - (c) effect on litmus
 - (d) reaction with sodium bicarbonate
- 2. To study saponification reaction for preparation of soap.
- 3. To study the comparative cleaning capacity of a sample of soap in soft and hard water.
- 4. To determine the focal length of :
 - (a) Concave mirror
 - (b) Convex lens

by obtaining the image of a distant object.

- 5. To trace the path of a ray of light passing through a rectangular glass slab for different angles of incidence. Measure the angle of incidence, angle of refraction, angle of emergence and interpret the result.
- 6. To study (a) binary fission in *Amoeba*, and (b) budding in yeast with the help of prepared slides.
- 7. To trace the path of the rays of light through a glass prism.
- 8. To find the image distance for varying object distances in case of a convex lens and draw corresponding ray diagrams to show the nature of image formed.
- 9. To study homology and analogy with the help of models/charts of animals and models/charts/specimens of plants.



10. To identify the different parts of an embryo of a dicot seed (Pea, gram or red kidney bean).

PRESCRIBED BOOKS :

- Science Textbook for Class IX NCERT Publication
- Science Textbook for Class X NCERT Publication
- Assessment of Practical Skills in Science Class IX CBSE Publication
- Assessment of Practical Skills in Science Class X CBSE Publication
- Laboratory Manual Science Class IX, NCERT Publication
- Laboratory Manual Science Class X, NCERT Publication
- Exemplar Problems NCERT Publication





Introduction :

- The element carbon is non-metal. Its symbol is C.
- Carbon is versatile element present in earth crust in form of mineral is 0.02% and atmosphere as CO₂ is 0.03%.
- All the living things, plants and animals are made up of carbon based compounds.

Carbon always form covalent bonds :

The atomic number of carbon is 6.

Electronic configuration :

	Κ	L
C (6)	2	4

How carbon attain noble gas configuration ?

- (i) Carbon is tetravalent, it does not form ionic bond by either losing four electrons (C⁴⁺) or by gaining four electrons (C⁴⁻). It is difficult to hold four extra electron and would require large amount of energy to remove four electrons. So, carbon can form bond by sharing of its electrons with the electrons of other carbon atom or with other element and attain noble gas configuration.
- (ii) The atoms of other elements like hydrogen, oxygen and nitrogen, chlorine also form bonds by sharing of electrons.
- (iii) The bond formed by sharing of electrons between same or different atoms is covalent bond.







$N \equiv N$ triple bond between nitrogen atoms

Molecule of water has single covalent bond between one oxygen and two hydrogen atoms.



Physical Properties of Covalent Compounds

- (a) Covalent compounds have low melting and boiling points as they have weak intermolecular force.
- (b) They are generally poor conductor of electricity as electrons are shared between atoms and no charged particles are formed.

Versatile Nature of Carbon

The two characteristic properties of carbon element which lead to the formation of large number of compounds :

- (i) Catenation : Carbon can link with carbon atoms by means of covalent bonds to form long chains, branched chains and closed ring. Compound Carbon atoms may be linked by single, double or triple bonds.
- (ii) **Tetravalency :** Carbon has 4 valence electrons. Carbon can bond with four carbon atoms, monovalent atoms, oxygen, nitrogen and sulphur.

Saturated and Unsaturated Carbon Compounds

Compounds made up of hydrogen and carbon are called hydrocarbon.



The names, molecular formulae and saturated formulae of saturated hydrocarbons (alkanes) are given below :





Name of Hydrocarbon	Mileculas formula	Structural Formula
1. Methane	CH ₄	H H — C — H H
2. Elhane	C ₂ H ₆	$ \begin{array}{cccc} H & H \\ & \\ H - C - C - H \\ & \\ H & H \end{array} $
3. Propane	C ₃ H ₈	$ \begin{array}{cccccc} H & H & H \\ & & & \\ H - C - C - C - C - H \\ & & & \\ H & H & H \end{array} $
4. Butane	C_4H_{10}	$\begin{array}{ccccccc} H & H & H & H \\ & & & & \\ H - C - C - C - C - C - H \\ & & & \\ H & H & H \end{array}$
5. Pentane	C ₅ H ₁₂	$\begin{array}{cccccccc} H & H & H & H & H \\ & & & & & \\ H - C - C - C - C - C - C - H \\ & & & & \\ H & H & H & H \end{array}$

Electron Dot Structure of Unsaturated Hydrocarbons





Name of Hydrocarbon	Mileculas formula	Structural Formula
Alkenes :		H H
1. Ethene	C ₂ H ₄	H - C = C - H $ $ $H H$ $H H$
2. Propene	C ₃ H ₆	H - C = C - C - H $H - H$ $H - H$
3. Butane	C ₄ H ₈	H - C = C - C - C - H H H H H
Alkynes :		
1. Ethyne	C ₂ H ₂	$H - C \equiv C - H$ H
2. Propyne	C ₃ H ₄	$H - C \equiv C - C - H$ H H H H H
3. Butyne	C ₄ H ₆	$H - C \equiv C - C - C - H$ $ H$ H

Carbon Compounds on the Basis of Structure

(i) Straight (unbranched) chain $-C - C - C - C - C - c - eg C_{3}H_{8}$ H H H H - C - C - C - H H H

Carbon and Its Compounds





These three above compounds has same molecular formula but different structures are called structural isomers and phenomenon is structural isomerism. (iii) Cyclic



Functional Groups

- In hydrocarbon chain, one or more hydrogen atom is replaced by other atoms in accordance with their valancies. These are heteroatom.
- These heteroatom or group of atoms which make carbon compound reactive and decides its properties are called functional groups.

Hetero atom	Functional group	Formula of functional group
Cl/Br	Halo (Chloro/Bromo)	-Cl, -Br, -I
Oxygen	1. Alcohol	— ОН
	2. Aldehyde	
	3. Ketone	— C —
		0
	4. Carboxylic acid	— C — OH
Single bond	1. Alkene group	> C = C <
Double bond	2. Alkyne group	C = C

Homologous Series

It is series of compounds in which the some functional group substitutes for the hydrogen in a carbon chain.

E.g., Alcohols – CH₃OH, C₂H₅OH, C₃H₇OH, C₄H₉OH

- Have same general formula.
- Any two homologues differ by CH₂ group and difference in molecular mass is 14μ.
- Have same chemical properties but show gradual change in physical properties.

Nomenclature of Carbon Compounds

- (i) Identify the number of carbon atoms in compounds.
- (ii) Functional group is indicated by suffix or prefix.





Functional Group	Prefix/Suffix	Example
		ННН
1. Halogen	Prefix – Chloro, Bromo,	H - C - C - C - Cl
	Iodo etc.	H H H
		Chloro Propane
2. Alcohol	Suffix – ol	H - C - C - C - OH
		 H H H
		Propanaol
		НН
3. Aldehyde	Suffix – al	H - C - C - C = 0
		II II II Propagal
4. Ketone	Suffix – one	H - C - C - H
		 H O H
		Propanone
		Н Н О
	a m · · · 1	
5. Carboxylic acid	Suffix – oic acid	H - C - C - C - OH
		Н Н
		Propanoic acid
		Н Н
6 Alleona	Suffix one	
(-C = C -)	Sullix – Clic	
		Н Н
		Propene
8 Science	e Class - 10 (SA - II)	

Science Class - 10 (SA - II)

7. Alkyne Suffix – yne
$$\begin{array}{c} H \\ | \\ H - C - C \equiv C - H \\ | \\ H \\ \end{array}$$
Propyne

Chemical Properties of Carbon Compounds

(a) Combustion

 $CH_4 + 2O_2 \xrightarrow{Combustion} CO_2 + 2H_2O + Heat + Light$

- Carbon and its compounds are used as fuels because they burn in air releasing lot of heat energy.
- Saturated hydrocarbon generally burn in air with blue and non-sooty flame.
- Unsaturated hydrocarbon burns in air with yellow sooty flame because percentage of carbon is higher than saturated hydrocarbon which does not get completely oxidized in air.

(b) Oxidation

Alcohols can be converted to carboxylic acid in presence of oxidizing agent alkaline $KMnO_4$ (potassium permangnate) or acidic potassium dichromate.

$$\begin{array}{c} \text{CH}_{3}\text{CH}_{2}\text{OH} \xrightarrow{\text{Alkaline KMnO}_{4}\text{ Or}} \\ \text{CH}_{3}\text{CH}_{2}\text{OH} \xrightarrow{\text{Alkaline KMnO}_{4}\text{ Or}} \\ \text{Ethanol} \xrightarrow{\text{CH}_{3}\text{COOH}} \\ \text{Ethanoic acid} \end{array}$$

(c) Addition Reaction :

$$R \xrightarrow{R} C = C \xrightarrow{R} R \xrightarrow{Ni \text{ or } Pd} R \xrightarrow{H} H \xrightarrow{H} H$$

$$R \xrightarrow{I} I \xrightarrow{I} R$$

$$R \xrightarrow{R} R$$

Unsaturated hydrocarbon add hydrogen in the presence of catalyst palladium or nickel. Vegetable oils are converted into vegetable ghee using this process. It is also called hydrogenation of vegetable oils.

(d) Substitution Reaction :

 $\mathrm{CH}_4 + \mathrm{Cl}_2 \xrightarrow{\text{Sunlight}} \mathrm{CH}_3\mathrm{Cl} + \mathrm{HCl}$

Important Carbon Compounds : Ethanol and Ethanoic acid

Physical Properties of Ethanol

• Colourless, pleasant smell and burning taste.

Carbon and Its Compounds



- Soluble in water.
- Volatile liquid with low boiling point of 351 K.
- Neutral compound.

Chemical Properties

(i) Reaction with Sodium :

```
2Na + CH_3CH_2OH \rightarrow 2CH_3CH_2O'Na^+ + H_2
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(Sodium ethoxide)
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This reaction is used as a test for ethanol by evolution of H_2 gas (Burn with pop sound).

(ii) Dehydration :

$$CH_{3}CH_{2}OH \xrightarrow{Hot conc.} CH_{2} = CH_{2} + H_{2}O$$

Physical Properties of Ethanoic acid

- Colourless liquid having sour taste and have smell of vinegar.
- Boiling point is 391 K.
- When pure CH₃COOH is freezed, it forms colourless ice like solid. So it is called glacial acetic acid.

Chemical Properties

(i) Esterification :

 $\begin{array}{c} \text{CH}_{3}\text{COOH} + \text{CH}_{3}\text{CH}_{2}\text{OH} \xrightarrow{\text{Acid}} \text{CH}_{3} \text{ CO} \text{ CH}_{2} \text{ CH}_{3} \\ \text{(Ethanoic acid) (Ethanol)} & \parallel \\ \text{O} \end{array}$

Ester

Sweet smelling ester is formed.

CH₃ CO CH₂ CH₃ + NaOH → CH₃COONa + CH₃CH₂OH \parallel O

This is saponification as soap is prepared by this.

(ii) Reaction with base :

 $NaOH + CH_3COOH \rightarrow CH_3COONa + H_2O$

(Sod. acetate)

(iii) Reaction with carbonates and hydrogen carbonates :

$$\begin{array}{c} 2\text{CH}_{3}\text{COOH} + \text{Na}_{2}\text{CO}_{3} \rightarrow 2\text{CH}_{3}\text{COONa} + \text{H}_{2}\text{O} + \text{CO}_{2} \\ \text{CH}_{3}\text{COOH} + \text{Na}\text{HCO}_{3} \rightarrow \text{CH}_{3}\text{COONa} + \text{H}_{2}\text{O} + \text{CO}_{2} \\ \text{(Sod. acetate)} \end{array}$$

Soaps and Detergents

- Soap is sodium or potassium salt of long chain carboxylic acid. *E.g.*, C₁₇H₃₅COO[·]Na⁺
- Soaps are effective only in soft water.
- Detergents are ammonium or sulphonate salt of long chain of carboxylic acid.
- Detergents are effective in both hard and soft water.

Soap molecule has :

- (i) Ionic (hydrophyllic) part
- (ii) Long hydrocarbon chain (hydrophobic) part



Structure of soap molecule

Cleansing Action of Soap

- Most dirt is oily in nature and hydrophobic end attaches itself with dirt and the ionic end is surrounded with molecule of water. This result in formation of a radial structure called micelles.
- Soap micelles helps to dissolve dirt and grease in water and cloth gets cleaned.



- The magnesium and calcium salt present in hard water react with soap molecule to form insoluble product called scum. This scum create difficulty in cleansing action.
- By use of detergent, insoluble scum is not formed with hard water and cloths get cleaned effectively.





QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

- 1. How does carbon attain noble gas configuration ?
- 2. Draw electron dot structure of water molecule.
- 3. Write the name and formula of 2nd member of homologous series having general formula C_nH_{2n} .
- 4. Name the first member of ketones.
- 5. What is glacial acetic acid?
- 6. Why carbon is tetravalent?
- 7. An organic compound burns with blue clear flame. Is it saturated or unsaturated compound ?
- 8. Write the molecular formula of ethanol.
- 9. Which of the following will show addition reaction : C₄H₁₀, C₂H₆, C₂H₄, CH₄, C₃H₈?
- 10. Name the gas evolved when ethanoic acid is added to sodium carbonate ?
- 11. Write balanced chemical equation of dehydration of ethanol by hot conc. H_2SO_4 .
- 12. Name organic acid present in vinegar.
- 13. What is catenation ?
- 14. Why soap is not suitable for washing cloth when water is hard ?
- 15. How many covalent bonds are present in pentane (C_5H_{12}) ?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

- 1. What are hydrocarbons ? Give examples.
- 2. Why does carbon atom forms a large number of compounds ?
- 3. Write down two characteristics of the compounds of an homologous series.
- 4. Covalent compounds generally don't conduct electricity. Why?
- 5. Write down structural formula of :
 - (a) Propanone (b) Hexanal
- 6. Why carbon is unique in nature ?

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- 7. Which is better for health butter or vegetable oil ? Why ?
- 8. Complete the following reactions :
 - (a) $CH_4 + O_2 \rightarrow$ (b) $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}}$
- 9. Identify the functional group in following :
 - (a) HCHO (b) CH₃COOH
 - (c) CH_3CH_2OH (d) CH_3COCH_3
- 10. (a) Why is ethanol used in making of tincture iodine, cough syrup, tonic etc.
 - (b) What is the role of conc. H_2SO_4 in making ethane from ethanol?

SHORT ANSWER TYPE QUESTIONS (3 Marks)

- 1. Differentiate between soap and detergents.
- 2. What is oxidizing agent ? Give two examples.
- 3. What is hydrogenation ? Write its industrial application.
- 4. What is homologous series ? Explain with the help of example.
- 5. Write IUPAC names of :
 - (a) $HC \equiv CH$ (b) $CH_3CH_2CH_2OH$
 - (c) CH₂CHO
- 6. What is structural isomerism ? Draw isomers of pentane (C_5H_{12}) .
- 7. A boy sharpens a pencil at both the ends and connects them to the poles of the battery. Will the current flow through the circuit ? Give reason.
- 8. A neutral organic compound is warmed with some ethanoic acid and a little of conc. H_2SO_4 to form ester, vapours having sweet smell are evolved. Write the chemical equation and what type of functional group is present in this organic compound ?

LONG ANSWER TYPE QUESTIONS (5 Marks)

- 1. Explain the cleansing action of soap with the help of diagram.
- 2. When ethanoic acid reacts with sodium hydrogen carbonate, the salt 'X' is formed and gas 'Y' is evolved.
 - (a) Identify 'X' and 'Y'.
 - (b) Write balanced chemical equation of above reaction.
 - (c) Describe a test to identify the gas 'Y' evolved.





Hints to Long Answer Type Questions

- 1. Page No. 74, Fig. 4.12 (Diagram of formation of micelles) of NCERT.
- 2. $2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$

qq





Periodic Classification **of Elements**

- Matter around us is present in the form of elements, compounds and mixtures.
- Elements are substances containing atoms of only one type. *E.g.*, Na, Mg, Au, etc.
- There are 118 elements known to us. All these have different properties.

Need for Periodic Classification

- To make the study of these elements easy, these elements have been divided into few groups in such a way that elements in the same group have similar properties. Now study of a large number of elements is reduced to a few groups of elements.
- **Dobereiner's Traids :** When elements were arranged in the order of increasing atomic masses, groups of three elements (known as traids), having similar chemical properties are obtained.

The atomic mass of the middle element of the triad was roughly the average of the atomic masses of the other two elements.

E.g.,	Elements	Atomic Mass
	Ca	40.1
	Sr	87.6
	Ba	137.3

Limitations : Only three traids were recognized from the elements known at that time.

Li	Ca	Cl
Na	Sr	Br
Κ	Ba	Ι





• Newland's Law of Octaves :

Newland arranged the then known elements in the order of increasing atomic masses and found that the properties of every 8th element is similar to that of the 1st element.

He compared this to the octaves found in music and called it the 'Law of Octaves'.

For example, the properties of lithium (Li) and sodium (Na) were found to be the same.

Sa	Re	ga	ma	ра	da	ni
Н	Li	Be	В	С	N	0
F	Na	Mg	Al	Si	Р	S
C1	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	-	-

Newland's Octave

Limitations :

- It was applicable upto calcium (for lighter elements only).
- Properties of new discovered elements did not fit into the law of octave.
- To fit elements into his table, Newlands put even two elements together in one slot and that too in the column of unlike elements having very different properties.

Mendeleev's Periodic Table : When elements are arranged in the order of increasing atomic masses, the element with similar properties occur at regular intervals. The properties of elements are a periodic function of their atomic masses.

Mendeleev's periodic table is based on the chemical properties of elements. It contains 7 periods (horizontal rows) and 8 groups (vertical columns).

series :	Second	series :	6 First	series :	Second	series :	5 First	series :	Second	series :	4 First		3		2		1	Х	Periods	Hydride	Oxide	Group
196.97	Au	132.90	Cs	107.87	Ag	85.47	Rb	63.54	Cu	39.102	K	22.99	Na	6.939	Li	1.008	Η		A B	RH	R_2O	Ι
200.59	Hg	137.34	Ba	112.40	Cd	87.62	Sr	65.37	Zn	40.08	Ca	24.31	Mg	9.012	Be				A B	RH ₂	RO	Π
204.37	TI	138.91	La	114.82	In	88.91	Y	69.72	Ga	44.96	Sc	29.98	Al	10.81	В				A B	RH_4	R_2O_3	III
207.19	Рb	178.49	Hf	118.69	Sn	91.22	Zr	72.59	Ge	47.90	Ti	28.09	St	12.011	C				A B	RH_4	RO_3	IV
208.98	Bi	180.95	Та	121.75	Sb	92.91	Nb	74.92	As	50.94	V	30.974	Р	14.007	N				A B	RH ₃	R_2O_5	V
		183.85	W	127.60	Te	95.94	Mo	78.96	Se	50.20	Cr	32.06	S	15.999	0				A B	RH_2	RO_3	VI
				126.90	Ι	66	Tc	79.909	Br	54.94	Mn	35.453	CI	18.998	F				A B	RH	R_2O_7	VII
		190.2 192.2 195.09	Os Ir Pt			101.07 102.91 106.4	Ru Rh Pd			55.85 58.93 58.71	Fe Ce Ni							series	Transition		RO_4	VIII

Table. Mendeleev's Periodic Table



Modern Periodic Table

- Atomic number of an element is a more fundamental property than its atomic mass.
- According to the Modern Periodic law : The properties of elements are a periodic function of their atomic number.
- All the anomalies of Mendeleev's classification disappear.



Modern Periodic Table

Merits of Mendeleev's Periodic Table

- (i) Some gaps were left for the undiscovered elements like gallium (Ga), Scandium (Sc) and Germanium (Ge).
- (ii) Predict properties of elements on the basis of their positions in the periodic table.
- (iii) Accommodate noble gases when they were discovered without disturbing the original arrangement.

Limitations of Mendeleev's Classification

- (i) Position of isotopes could not be explained.
- (ii) No fixed position for hydrogen.
- (iii) Wrong order of atomic masses of some elements could not be explained.

Explanation of the Anomalies :

- (i) Explanation for the position of isotopes (Same atomic number put at one place in the same group).
- (ii) Cobalt with atomic number 27 came first and nickel (28) should come later.
- (iii) Unlike atomic masses, atomic number is always a whole number, so there is no element between hydrogen and helium.
- Atomic Number : It is denoted by Z and equal to the number of protons in the nucleus of an atom.
- Modern Periodic table has 18 vertical columns known as 'groups' and 7 horizontal rows known as 'periods'.
- Elements with same number of valence electrons are placed in the same group. For example,

```
Li: 2, 1 Na: 2, 8, 1 K: 2, 8, 8, 1
```

Outermost or valence shell in all the three contains 1 electron. These elements have been placed in the same group.

- Number of shells increases as we go down the group.
- Elements with same number of occupied shells are placed in same period. For example, Li (2, 1); Be (2, 2); B (2, 3), C (2, 4), N(2, 5). These elements have same number of shells (two).
- Each period marks a new electronic shell getting filled.
- Number of elements placed in a particular period depends upon the fact that how electrons are filled into various shell.
- Maximum number of electrons that can be filled in a shell is given by $2n^2$

Periodic Classification of Elements

where n is shell number.

E.g., K shell n = 1 or $2n^2 = 2(1)^2 = 2$ First period has 2 elements.

L shell n = 2 or $2n^2 = 2(2)^2 = 8$ Second period has 8 elements.

- Position of an element in the periodic table tells us its chemical reactivity.
- Valence electron determine the kind and number of bonds formed by the element.

Trends in the Modern Periodic Table

Valency : No. of valence electrons present in the outermost shell of its atom.

On moving from left to right in each period, the valency of elements increases from 1 to 4 and then decreases to 0.

Third period elements	Na	Mg	Al	Si	Р	S	Cl	Ar
Valency	1	2	3	4	3	2	1	0

Valency remains the same down in a group.

Atomic size : Atomic size refers to the radius of an atom. It may be visualized as the distance between the centre of the nucleus and the outermost shell.

• Atomic size or radius of an atom decreases as we move from left to right in a period because due to large +ve charge on the nucleus, the electrons are pulled in more close to the nucleus and size decreases. *E.g.*,

Third period elements	Na	Mg	Al	Si	Р	S	Cl
Atomic radii (Pm)	186	160	143	118	110	104	99

• Atomic size increases as we move down the group because new shells are being added and this increases the distance between nucleus and outermost electron.

Group I	Lithium	Li	152	Atomic radii (Pm)
	Sodium	Na	186	
	Potassium	K	231	
	Rubidium	Rb	244	
	Casium	Cs	262	r
	Francium	Fr	270	

Metallic Character

- Metallic character means the tendency of an atom to lose electron.
- Metals occupy the left hand side of the periodic table.
- On moving left to right in a period, the metallic character of an element decreases because the effective nuclear charge increases. It means tendency to lose electron decreases.
- Metals are electropositive as they tend to lose electrons while forming bonds.
- Metallic character increases as we go down a group as the effective nuclear charge is decreasing.

Non-metallic Character

- Non-metals are electronegative as they tend to form bonds by gaining electrons.
- Non-metals occupies the right side of the periodic table.
- Non-metallic character increases across a period because due to increase in effective nuclear charge that means tendency to gain electron increase.
- Non-metallic character decreases as we move down a group due to decrease in effective nuclear charge experienced by the valence electron thus the tendency to gain electron decreases.
- In the middle of periodic table we have semi-metals or metalloid because they exhibit some properties of metals and non-metals.
- Oxides of metals are basic in nature while oxides of non-metals are acidic in nature.

	Property	Variation	Reason	Varia-	Reason
		across		tion along	
		Periods		Groups	
1.	Atomic	Decrease	Due to increase	Increases	Due to addition
	size		in nuclear		of new shells,
			charge, or		the distance
			resulting in		between
			stronger force of		outermost
			attraction which		electron
			causes shrinking.		and nucleus
					increases.



2.	Metallic character	Decreases	Due to increase in effective nuclear charge, tendency to lose valence electrons decreases.	Increases	Decrease in effective nuclear charge experienced by valence electrons. Tendency to lose electrons increases.
3.	N o n - metallic character	Increases	Due to increase in effective nuclear charge, tendency to gain electrons increases.	Decreases	Due to decrease in effective nuclear charge e x p e r i e n c e d by valence electrons (due to addition of new shells) tendency to gain electrons decreases.



VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

- 1. Write down three elements that show Dobereiner's triad.
- 2. Write down two drawbacks of Newland's law of octaves.
- 3. What was the need for classification of elements ?
- 4. Which important property did Mendeleev used to classify the elements in his periodic table ?
- 5. What do you mean by valency ?
- 6. How many elements are known till date ?
- 7. State Modern Periodic law.
- 8. Name the elements and its valency having electronic configuration 2, 8, 3.
- 9. How many rows and columns are there in modern periodic table ?
- 10. Why properties of elements are different of same period ?

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SHORT ANSWER TYPE QUESTIONS (2 Marks)

- 1. How does the tendency to lose electrons change in a group and why?
- 2. Why He, Ne and Ar are called inert gases ?
- 3. Write two limitations of Mendeleev's Periodic Table.
- 4. Why is the position assigning to hydrogen in the periodic table considered anomalous ?
- 5. What do you mean by metallic character of an element ? How does it vary as we go down a group ? Give reason for this variation.
- 6. Why metallic oxides are basic in nature whereas non-metallic oxides are acidic in nature ?
- 7. How does the atomic size vary as we go down a group and move left to right in a period ? Write the reason behind it.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

- 1. Four elements P, Q, R and S have atomic number 12, 13, 14 and 15 respectively. Answer the following :
 - (a) What is the valency of Q ?
 - (b) Classify these elements as metals and non-metals.
 - (c) Which of these elements will form the most basic oxide ?
- 2. (a) How do we calculate the valency of an element from its electronic configuration ?
 - (b) How does the valency vary in a period ?
- 3. Study the variation in the atomic radii of elements given below and arrange them in increasing order :

Na Li Rb Cs K 186 152 246 262 231

- (a) Name the element which has the smallest and the largest atomic size.
- (b) How does the atomic size vary as we go down a group ?
- 4. What are metalloids ? Write two examples.

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. Write down five major differences between Mendeleev's periodic table and Modern periodic table.



Periodic Classification of Elements

- 2. Element A has atomic no. 16.
 - (a) Name of the element
 - (b) Physical state
 - (c) Compound with hydrogen
 - (d) Metal or non-metal
 - (e) Nature and formula with oxides

VALUE BASED QUESTION

Ria and Reena are the students of Class X. Ria is very much organized and maintained whereas Reena is an unorganised student and always faces a lot of problems in handling life situations.

- (a) How organization helps in daily life?
- (b) How can you relate the above fact with the chapter 'Classification of Elements'. How classification of elements help us studying them properly ?

Hints to Long Answer Type Questions

(a) Elements have been arranged in increasing order of atomic masses.

Medeleev's Periodic Table

(b) It consist 8 groups.

(c) All the groups from I to VIII are divided into two sub-groups.

2. Element A(16) = 2, 8, 6.

- (a) Sulphur (S)
- (b) Solid

1.

- (c) H_2S
- (d) Non-metal
- (e) Acidic in nature; oxide $-SO_2$

Modern Periodic Table

Elements have been arranged in increasing

order of their atomic number.

It consist 18 groups.

No sub-groups.



How do Organisms **Reproduce**

• Reproduction is the process by which living organisms produce new individuals similar to themselves. It ensures continuity of life on earth.

Chapter - 8

- Nucleus of the cell contains DNA (Deoxyribose Nucleic Acid) which is the heredity material.
- DNA replicates and forms new cells causing variation. So, these new cells will be similar but may not be identical to original cell.
- Variations are useful for the survival of the individual and species over time as well as basis for evolution.

Types of Reproduction

- (a) Asexual Reproduction
 - A single individual give rise to new individual.
 - Gametes are not formed.
 - New individual is identical to parent.
 - It is extremely useful as a means of rapid multiplication.
 - Adopted by lower organisms.

(b) Sexual Reproduction

- Two individuals i.e., one male and one female are needed to give rise to new individual.
- Gametes are formed.
- New individual is genetically similar but not identical to parents.
- It is useful to generate more variations in species.
- Adopted by higher organisms.



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Modes of Asexual Reproduction

- (i) Fission : The parent cell divides into daughter cells.
 - **Binary fission :** 2 cells are formed. *E.g.*, amoeba.
 - Multiple fission : Many cells are formed. *E.g.*, Plasmodium.



Binary fission in Amoeba

(ii) Fragmentation : The organism breaks-up into smaller pieces upon maturation, each piece develops into new individual. *E.g.*, Spirogyra.



Fragmentation in Spirogyra

(iii) **Regeneration :** If organism is somehow cut or broken into many pieces, each piece grows into a complete organism. *E.g.*, Planaria, Hydra.



Regeneration in Planaria and Hydra

(iv) **Budding** : A bud is formed which develops into tiny individual. It detaches from parent body upon maturation and develops into new individual. *E.g.*, Hydra

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Budding in Hydra

- (v) Vegetative Propagation : In many plants, new plants develops from vegetative parts such as :
 - By roots : *E.g.*, dahlias, sweet potato.
 - By stem : *E.g.*, potato, ginger.
 - By leaves : *E.g.*, bryophyllum (leaf notches bear buds which develop into plants).
 - Artificial methods :
- (a) Grafting : *E.g.*, Mango
- (b) Cutting : *E.g.*, Rose
- (c) Layering : *E.g.*, Jasmine

(d) **Tissue culture :** New plants are grown by using growing tip of a plant. These growing cells are kept in a culture medium leads to the formation of callus. Callus is then transferred to hormone medium which causes growth and differentiation. *E.g.*, ornamental plants, orchid.

Benefits of tissue culture :

- We can grow plants like banana, rose, jasmine etc. that have lost the capacity to produce seeds.
- New plants are genetically similar to parents.
- Helps in growing seedless fruits.
- (v) **Spore Formation :** Spores are small bulb like structures which are covered by thick walls. Under favourable conditions, they germinate and produce new organism.







Spore formation in Rhizopus

Sexual Reproduction

When reproduction takes place as a result of the fusion of male and female gametes is called sexual reproduction.

Fusion of gametes is called fertilization which results in variation.

Sexual Reproduction in Plants

- Flowers are the reproductive organs of plants.
- A typical flower consists of four main whorls namely sepals, petals, stamen and pistil.

Types of Flowers

- **Bisexual flower :** Both male and female reproductive parts are present. *E.g.*, Hibiscus, mustard.
- Unisexual flower : Either male or female reproductive part is present. *E.g.*, Papaya, watermelon.

Structure of Flower :


Process of Seed Formation

- Pollen grains, produced in the anther, are transferred to the stigma of same flower (self pollination) or stigma of another flower (cross pollination) through agents like air, water or animals.
- Pollen grains germinate and form pollen tubes which pass through style to reach upto the ovules present in ovary.
- The fusion of male and female gametes is called fertilization. Zygote is produced inside the ovary.
- Zygote divides to form embryo. Ovule develops thick coat and changes into seed gradually.
- Ovary changes into fruit and other parts of flower fall off.





• The seed germinates to form a plant under suitable conditions such as air, moisture etc.

Reproduction in Human Beings

- Humans use sexual mode of reproduction.
- **Sexual maturation :** The period of life when production of germ cells *i.e.*, ova (female) and sperm (male) start in the body. This period of sexual maturation is called puberty.



How do Organisms reproduce



Changes at Puberty

(a) Common in male and female

- Thick hair growth in armpits and genital area.
- Skin becomes oily, may result in pimples.
- (b) In girls
 - Breast size begin to increase.
 - Girls begin to menstruate.
- (c) In boys
 - Thick hair growth on face.
 - Voice begin to crack.

These changes signals that sexual maturity is taking place.

Male Reproductive System

(a) Testes : A pair of testes are located inside scrotum which is present outside the abdominal cavity. Scrotum has a relatively lower temperature needed for the production of sperms.

- Male germ cell *i.e.*, sperms are formed here.
- Testes release male sex hormone (testosterone). Its function is : (i) Regulate production of sperms.

(ii) Bring changes at puberty.

(b) Vas deferens : It passes sperms from testes upto urethera.

(c) Urethera : It is a common passage for both sperms and urine. Its outer covering is called penis.

(d) Associated glands : Seminal vesicles and prostate gland add their secretion to the sperms. This fluid provide nourishment to sperms and make their transport easy.

Sperm alongwith secretion of glands form semen.



Human – male reproductive system

Female Reproductive System

- (a) Ovary : A pair of ovary is located in both sides of abdomen.
 - Female germ cells *i.e.*, eggs are produced here.
 - At the time of birth of a girl, thousands of immature eggs are present in the ovary.
 - At the onset of puberty, some of these eggs start maturing.
 - One egg is produced every month by one of the ovaries.

(b) Oviduct or Fallopian tube

- Receives the egg produced by the ovary and transfer it to the uterus.
- Fertilisation *i.e.*, fusion of gametes takes place here.

(c) Uterus : It is a bag-like structure where development of the baby takes place.

• Uterus opens into vagina through cervix.



Fig. Human – female reproductive system

When egg is fertilised :

- The fertilized egg called zygote is planted in uterus and develops into an embryo.
- The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. It provides a large surface area for the exchange of glucose, oxygen and waste material.
- The time period from fertilization upto the birth of the baby is called gestation period. It is about 9 months.



How do Organisms reproduce



When egg is not fertilised :

- The uterus prepares itself every month to receive fertilized egg.
- The lining of the uterus becomes thick and spongy, required to support the embryo.
- When fertilisation had not taken place, this lining is not needed any longer.
- This lining breaks and comes out through vagina as blood and mucus. This cycle takes around 28 days every month and called menstruation.

Reproductive Health

Reproductive health means a total well-being in all aspects of reproduction *i.e.*, physical, emotional, social and behavioural.

Sexually Transmitted Diseases (STDs)

• Many diseases can be sexually transmitted such as :

Bacterial : Gonorrhoea and syphilis

Viral : Warts and HIV-AIDS

• Use of condom prevents these infections to some extent.

Contraception

It is the avoidance of pregnancy, can be achieved by preventing the fertilisation of ova.

Methods of contraception

- (a) Physical barrier
 - To prevent union of egg and sperm.
 - Use of condoms, cervical caps and diaphragm.

(b) Chemical methods

- Use of oral pills
- These change hormonal balance of body so that eggs are not released.
- May have side effects.

(c) Intrauterine contraceptive device (IUCD)

• Copper-T or loop is placed in uterus to prevent pregnancy.

(d) Surgical methods

- In males the vas deferens is blocked to prevent sperm transfer called vasectomy.
- In females, the fallopian tube is blocked to prevent egg transfer called tubectomy.

Female Foeticide

- The practice of killing a female child inside the womb is called female foeticide.
- For a healthy society, a balanced sex ratio is needed that can be achieved by educating people to avoid malpractices like female foeticide and prenatal sex determination.
- Prenatal sex determination is a legal offence in our country so as to maintain a balanced sex ratio.



VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

- 1. Name the two types of reproduction.
- 2. What type of reproduction takes place in plasmodium ?
- 3. Define vegetative propagation.
- 4. Where is DNA present in a cell?
- 5. Name the glands associated with male reproductive system.
- 6. What is menstruation ?
- 7. Name two contraceptive methods.
- 8. Where are the reproductive parts located in a plant ?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

- 1. Write two important functions of testosterone.
- 2. What is placenta ? Also write its functions.
- 3. Why do we see different types of organisms around us ?
- 4. What is the importance of variation ?
- 5. Why is vegetative propagation practiced for growing some types of plants ?



How do Organisms reproduce

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- 6. Write names of male and female sex hormones.
- 7. Mention the parts of a flower.
- 8. Differentiate between bisexual and unisexual flowers.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

- 1. What is tissue culture ?
- 2. Explain the process of fertilisation in flowering plants.
- 3. Name the different constituents of semen.
- 4. Draw a well-labelled diagram of male reproductive system.
- 5. What is pre-natal sex determination ? Why is it banned ?
- 6. Draw a labelled diagram of the longitudinal section of a flower.

LONG ANSWER TYPE QUESTIONS (5 Marks)

- 1. What are the different modes of asexual reproduction ?
- 2. Draw a labelled diagram of female reproductive system and write the function of its different parts.
- 3. What is contraception ? Give different methods of contraception.
- 4. What happens in human female :
 - (a) when egg is fertilised ?
 - (b) when egg is not fertilised ?
- 5. Trace and explain the steps involved in the formation of seed.

VALUE BASED QUESTIONS

A pregnant woman, who is a mother of one daughter, requests the doctor of an ultrasound clinic to test and determine the sex of the baby in her womb. The doctor, very politely, refused and explained the legal and ethical point of view of the situation. On the basis of arguments and counseling, the doctor prepared the woman to happily accept the baby.

- (a) Why is pre-natal sex determination ethically wrong ?
- (b) Had you been in place of the doctor, what argument you would have placed to counsel the mother ?
- (c) State the values exhibited by the doctor.

Hints to Long Answer Type Questions

- 1. Methods of asexual reproduction :
 - (a) Fission
 - (b) Fragmentation
 - (c) Regeneration
 - (d) Budding
 - (e) Vegetative propagation
 - (f) Spore formation
- 2. Labelled diagram of female reproductive system.

Functions :

Ovary : Production of eggs.

Oviduct : Site for fertilization.

Uterus : Place of development of embryo.

- 3. Contraception : Barrier for fertilisation.
 - Physical barrier
 - Chemical methods
 - Surgical methods
 - Intrautrine contraceptive device (IUCD)
- 4. (a) (i) Zygote is formed \rightarrow Implanted in uterus
 - (ii) Onset of pregnanacy
 - (b) Menstruation
- 5. Labelled diagram of germination of pollen grain on stigma of flower.





qq



Accumulation of Variation during Reproduction



Importance of Variation :

(i) Depending upon the nature of variations different individuals would have different kinds of advantage.

Example, Bacteria that can withstand heat will survive better in a heat wave.

(ii) Main advantage of variation to species is that it increases the chances of its survival in a changing environment.

Free ear lobes and **attached ear lobes** are two variants found in human populations.

Mendel and His Work on Inheritance

• Gregor Johann Mendel (1822 & 1884) : Started his experiments on plant breeding and hybridisation. He proposed the laws of inheritance in living organisms.

Mendel was known as Father of Genetics.

• **Plant selected by Mendel :** *Pisum sativum* (garden pea). Mendel used a number of contrasting characters for garden pea.



Heredity and Evolution



★ (TABLE OF CONTRASTING CHARACTERS. SEVEN PAIRS)			
CHARACTER	DOMINANT TRAIT	RECESSIVE TRAIT	
Flower colour	Violet	White	
Flower position	Axial	Terminal	
Seed colour	Yellow	Green	
Seed shape	Round	Wrinkled	
Pod shape	Inflated	Constricted	
Pod colour	Green	Yellow	
Height of plant	Tall	Dwarf/Short	

- Seven pairs of contrasting characters in Garden Pea.

Medel's Experimental Material : He chose Garden Pea *(Pisum sativum)* as his experiment material because of :

- (i) Availability of detectable contrasting traits of several characters.
- (ii) Short life span of the plant.
- (iii) Normally allows self-fertilisation but cross-fertilisation can also be carried out.
- (iv) Large no. of seeds produced.
- **Mendel's Experiments :** Mendel conducted a series of experiments in which he crossed the pollinated plants to study one character (at a time).

Monohybrid Cross

Cross between two pea plants with one pair of contrasting characters is called a monohybrid cross.

Example : Cross between a tall and a dwarf plant (short).



MONOHYBRID CROSS

SELF POLLINATION	\rightarrow	Tt	>	<	Tt
of F_1 gametes					
GAMETES		Т	t	Т	t
F ₂ GENERATION	\rightarrow	Gametes -	→ T	t	
-		\checkmark	TT	Tt	
		Т	tall	tall	
			Tt	tt	
		t	tall	dwarf	
Phenotypic ratio	\rightarrow	3:1	Tall : I	Dwarf	
			3:1		
Genotypic ratio	\rightarrow	1:2:1	TT : T	't : tt	
			1:2:	1	

CHARACTER	DOMINANT TRAIT	RECESSIVE TRAIT
Seed shape		
	Round	Wrinkled
Seed colour		
	Yellow	Green
Flower colour	R	
	Violet	White
Pod shape	Inflated/full	Constricted
	Heredity ar	nd Evolution 39



Genotype \rightarrow Genetic make up [TT, Tt or tt]

Observations of Monohybrid Cross

- (i) All F1 progeny were tall, no medium height plant. (Half way characteristic)
- (ii) F2 progeny $\frac{1}{4}$ were short, $\frac{3}{4}$ were tall.
- (iii) Phenotypic ratio F2 3 : 1 (3 tall : 1 short)

Genotypic ratio F2 - 1 : 2 : 1
$$\begin{pmatrix} TT : Tt : tt \\ 1 : 2 : 1 \end{pmatrix}$$

Conclusions

- 1. TT and Tt both are tall plants while tt is a short plant.
- 2. A single copy of T is enough to make the plant tall, while both copies have to be 't' for the plant to be short.
- 3. Characters/traits like 'T' are called dominant trait (because it express itself) and 't' are recessive trait (because it remains suppressed).

Dihybrid Cross

A cross between two plants having two pairs of contrasting characters is called dihybrid cross.





Heredity and Evolution



	RY	Ry	rY	ry
RY	RRYY	RRYy	RryY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

Phenotypic Ratio

 F_1 gametes \rightarrow

Round, yellow : 9

Round, green : 3

Wrinkled, yellow : 3

Wrinkled, green : 1

Observations

- (i) When RRyy was crossed with rrYY in F1 generation all were Rr Yy round and yellow seeds.
- (ii) Self pollination of F1 plants gave parental phenotype and two mixtures (recombinants round yellow and wrinkled green) seeds plants in the ratio of 9 : 3 : 3 : 1.

Conclusions

1. Round and yellow seeds are Dominant characters.

2. Occurrence of new phenotype combinations show that genes for round and yellow seeds are inherited independently of each other.

How do these traits get expressed

Cellular DNA (Information source) ↓ For synthesis of Proteins (Enzyme) ↓ Works efficiently More Hormone

 \downarrow produced

Tallness of plant

Therefore, genes control characteristics/traits.

SEX DETERMINATION

Determination of sex of an offspring.

FACTORS



Sex Chromosomes : In human beings, there are 23 pairs of chromosome. Out of these 22 chromosomes pairs are called autosomes and the last pair of chromosome that help in deciding gender of that individual is called sex chromosome.



This shows that half the children will be boys and half will be girls. All children will inherit an X chromosome from their mother regardless whether they are boys or girls. Thus, sex of children will be determined by what they inherit from their father, and not from their mother.

EVOLUTION

Evolution is the sequence of gradual changes which takes place in the primitive organisms, over millions of years, in which new species are produced.

Situation I



Number of green bettles increases

Conclusion

Green beetles got the survival advantage or they were naturally selected as they were not visible in green bushes. This natural selection is exerted by crows resulting in adaptations in the beetles to fit better in their environment.

Situation II

Group of red beetles



Conclusion

Blue beetles did not get survivals advantage. Elephant suddenly caused major havoc in beetles population otherwise their number would have been considerably large.

From this we can conclude that accidents can change the frequency of some genes even if they do not get survival advantage. This is called genetic drift and it leads to variation.

Situation III





Heredity and Evolution



Conclusion

No genetic change has occurred in the population of beetle. The population gets affected for a short duration only due to environmental changes.

Acquired Traits	Inherited Traits
1. These are the traits which are	1. These are the traits which are
developed in an individual	passed from one generation
due to special conditions.	to the next.
2. They cannot be transferred to	2. They get transferred to the
the progeny.	progeny.
3. They cannot direct evolution.	3. They are helpful in evolution.
<i>E.g.</i> , Low weight of starving	<i>E.g.</i> , Colour of eyes and hair.
beetles.	

ACQUIRED AND INHERITED TRAITS

WAYS BY WHICH SPECIATION TAKES PLACE

Speciation takes place when variation is combined with geographical isolation.

1. Gene flow : Occurs between population that are partly but not completely separated.



2. Genetic drift : It is the random change in the frequency of alleles (gene pair) in a population over successive generations.

3. Natural selection : The process by which nature selects and consolidate those organisms which are more suitable adapted and possesses favourable variations.

4. Geographical isolation : It is caused by mountain ranges, rivers etc. Geographical isolation leads to reproductive isolation due to which there is no flow of genes between separated groups of population.



Genetic drift takes place due to :

- (a) Severe changes in the DNA
- (b) Change in number of chromosomes

Evolution and Classification

Both evolution and classification are interlinked.

1. Classification of species is reflection of their evolutionary relationship.

2. The more characteristic two species have in common the more closely they are related.

3. The more closely they are related, the more recently they have a common ancestor.

4. Similarities among organisms allow us to group them together and to study their characteristic.



Heredity and Evolution





Analogous organ of flying birds TRACING EVOLUTIONARY RELATIONSHIPS

(Evidences of Evolution)

I. Homologous Organs : (Morphological and anatomical evidences). These are the organs that have same basic structural plan and origin but different functions.

Homologous organs provides evidence for evolution by telling us that they are derived from the same ancestor.

Example :

Forelimb	of horse	(Runn	ino)
rorennin	01 110130	(Kuim	mg)

Winds of bat	(Flying)
--------------	----------

Same basic structural plan, but different functions perform.

Paw of a cat (Walk/scratch/attack) diffe

II. Analogous Organs : These are the organs that have different origin and structural plan but same function.

Example : Analogous organs provide mechanism for evolution.

Wings of bat \rightarrow	Elongated fingers with	
	skin folds	Different basic structure,
		but perform similar
Wings of bird \rightarrow	Feathery covering along	function <i>i.e.</i> , flight.
	the arm	
III. Fossils : (Pale	ontological evidences)	

The remains and relics of dead organisms of the past.

FOSSILS ARE PRESERVED TRACES OF LIVING ORGAN-ISMIS

Fossil Archaeopteryx possess features of reptiles as well as birds. This suggests that birds have evolved from reptiles.

Examples of Fossils

AMMONITE	-	Fossil-invertebrate
TRILOBITE	-	Fossil-invertebrate
KNIGHTIA	-	Fossil-fish
RAJASAURUS	-	Fossil-dinosaur skull
AGE OF THE FOSSILS		

I. Deeper the fossil, older it is.		(Top layer of the earth
Recent —		surface)
II. Detecting the ratios of difference of the	2.	
same element in the fossil material <i>i.e.</i> ,	3.	
Radio-carbon dating [C-(14) dating]	4.	
	5.	
		• ← Older

Evolution by Stages

Evolution takes place in stages *i.e.*, bit by bit generations.

I. Fitness Advantage

Evolution of Eyes: Evolution of complex organs is not sudden. It occurs due to minor changes in DNA, however takes place bit by bit over generations.

- Flat worm has **rudimentary eyes.** (Enough to give fitness advantage)
- Insects have **compound eyes**.
- Humans have **binocular eyes**.

6.



II. Functional Advantage

Evolution of Feathers : Feathers provide insulation in cold weather but later they might become useful for flight.

Example, Dinosaurs had feathers, but could not fly using feathers. Birds seem to have later adapted the feathers to flight.



Evolution by artificial selection

Evolution by Artificial Selection

Humans have been a powerful agent in modifying wild species to suit their own requirement throughout ages by using artificial selection. *E.g.*,

- (i) From wild cabbage many varieties like broccoli, cauliflower, red cab bage, kale, cabbage and kohlrabi were obtained by artificial selection.
- (ii) Wheat (many varieties obtained due to artificial selection).

Molecular Phylogeny

- It is based on the idea that changes in DNA during reproduction are the basic events in evolution.
- Organisms which are most distantly related will accumulate greater differences in their DNA.



Although there is great diversity of human forms all over the world, yet all humans are a single species.



GENETIC FOOTPRINTS OF HUMANS

- They did not go in a single line.
- They went forward and backward.
- Moved in and out of Africa.
- Sometimes came back to mix with each other.

Genetic Terminology

1. Gene : Mendel used the term factor for a gene. A gene is the unit of DNA responsible for the inheritance of character.

2. Allele : A pair of genes that control the two alternatives of the same character *e.g.*, TT/tt.

3. Heterozygous : The organism in which both the genes of a character are unlike *e.g.*, Tt.

4. Homozygous : The organism in which both the genes of a character are similar *e.g.*, TT, tt.

5. **Dominant :** The gene which expresses itself in F_1 generation is known as dominant gene.

6. **Recessive :** The gene which is unable to express itself in presence of the dominant gene.

7. Genotype : It is the genetic constitution of an organism which determines the characters.

8. **Phenotype :** It is the appearance of an individual.





9. Micro-evolution : It is the evolution which is on a small scale.

10. Species : A group of similar individuals within a population that can interbreed and produce fertile offspring.

11. Chromosome : Thread like structures present in the nucleus of a cell, containing hereditary information of the cell.

12. DNA : Deoxyribose Nucleic Acid.

It is present in chromosomes which carries traits in a coded form, from one generation to the next.

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

- 1. Write the scientific name of men and garden pea.
- 2. Where are genes located ?
- 3. No two individuals are absolutely alike in a population. Why?
- 4. What are the chromosomes XY and XX known as ?
- 5. Name five varieties of vegetables which have been produced from 'wild cabbage' by the process of artificial selection.

SHORT ANSWER TYPE QUESTIONS (2 Marks)

- 1. Differentiate between homologous and analogous organs, with examples.
- 2. What are fossils ? How can the age of fossils be determined ?

SHORT ANSWER TYPE QUESTIONS (3 Marks)

- 1. Variation is beneficial to the species but not necessarily for the individual. Give three reasons to justify it.
- 2. The human hand, cat paw and horse foot, when studied in detail show the same structure of bones and point towards a common origin.
 - (a) What do you conclude from this ?
 - (b) What is the term given to such structures ?

LONG ANSWER TYPE QUESTIONS (5 Marks)

- 1. Which one is the edible part in kale, kohlrabi, broccoli, cabbage and cauliflower?
- 2. Name a recessive trait which is quiet common in human beings.

VALUE BASED QUESTION

Raghu often taunts his wife for having only daughters and no son. As a student of biology, how will you convince Raghu that his wife has no role in giving birth to girls only ?

Hints to Long Answer Type Questions

- Kale Large leaves
 Kohl rabi Swollen part
 Broccoli Arrested flower
 Cauliflower Sterile flower
 Cabbage Leaves with short distance between them
- 2. (a) Human height
 - (b) Skin colour
 - (c) Attachment of ear lobes
 - (d) Eye colour









Light

• Light is the form of energy that enables us to see.

Properties of Light

- Electromagnetic wave, so does not require any medium to travel.
- Light tends to travel in straight line.
- Light has dual nature *i.e.*, wave as well as particle.
- Light casts shadow.
- Speed of light is maximum in vaccum. Its value is 3×10^8 ms⁻¹.
- When light falls on a surface, following may happen :
 - (a) Reflection
 - (b) Refraction
 - (c) Absorption

REFLECTION

Bouncing back of light when it strikes on a polished surface like mirror.

Laws of Reflection :

(1) Angle of incidence is equal to the angle of reflection.

(2) The incident ray, the reflected ray and the normal at the point of incidence, all lie in the same plane.





Image : It is a point where atleast two light rays actually meet or appear to meet.

Real Image	Virtual Image
• Formed when light rays actually	• Formed when light rays appear to
meet.	meet.
• Can be obtained on screen.	• Can't be obtained on screen.
• Inverted	• Erect
• <i>E.g.</i> , image formed on cinema	• <i>E.g.</i> , image formed by plane mirror
screen	or convex mirror

Image Formed by Plane Mirror



Characteristics of Image

- (i) Virtual and erect.
- (ii) Size of image is equal to the size of object.
- (iii) Image is formed as far behind the mirror as the object is in front of it.
- (iv) Laterally inverted.

Lateral Inversion : The right side of the object appears left side of the image and vice-versa.

Application of lateral inversion : The word AMBULANCE is written as **EDNAJUEMA** so that it can be read correctly in rear view mirror of vehicles going in front of it.

Spherical Mirrors : Mirrors whose reflecting surface is curved.





- Reflecting surface is curved outwards. Reflecting surface is curved inwards.
- Diverging mirror

• Converging mirror



- **Principal axis :** The line joining the pole and center of curvature.
- **Pole (P) :** The centre of the spherical mirror.
- Aperture (MN) : It is the effective diameter of the spherical mirror.
- Center of Curvature (C) : The centre of the hollow glass sphere of which the mirror was a part.
- **Radius of Curvature (R) :** The distance between the pole and the centre of curvature.
- Focus (F) : The point on principal axis where all the parallel light rays actually meet or appear to meet after reflection.
- Focal length (*f*) : The distance between the pole and the focus.

Relationship between focal length and radius of curvature :

$$f = \frac{R}{2}$$

Rules for making ray diagrams by concave mirror

(i) A ray parallel to the principal axis will pass through the principal focus, after reflection.



(ii) A ray passing through the principal focus of concave mirror will emerge parallel to principal axis after reflection.



(iii) A ray of light passing through the centre of curvature of a concave mirror is reflected back along the same path as it is a normally incident ray.



(iv) A ray incident obliquely to the principal axis of a concave mirror is reflected obliquely making equal angle.



Ray diagrams for images formed by concave mirror



Image

Position – At 'F' Nature – Real, inverted Size – Point sized or highly diminished



Image

Position – Between 'F' and 'C' Nature – Real, inverted Size – Diminished



Uses of Concave Mirror

(i) Used in torches, search lights and vehicles headlights to get powerful parallel beam of light.



(ii) Concave mirrors are used by dentists to see large image of teeth of patients. (Teeth have to be placed between pole and focus).



- (iii) Concave mirror is used as shaving mirror to see a larger image of the face.
- (iv) Large concave mirrors are used to concentrate sunlight to produce heat in solar furnace.

Rule for image formation by Convex Mirror

(i) A ray of light parallel to the principal axis of a convex mirror appear to diverge from the principal focus.



(ii) A ray which is directed towards the focus of the convex mirror will emerge parallel to the principal axis after reflection.







(iii) A ray directed towards the center of curvature of a convex mirror is reflected back along the same.



(iv) A ray incident obliquely to the principal axis is reflected obliquely.



Ray diagrams of images formed by convex mirror

(i) When object is placed at infinity :



Image

Position – At 'F' Nature – Virtual, erect Size – Point sized

(ii) When object is placed between pole and infinity Image



Position – Between 'P' and 'F' Nature – Virtual, erect Size – Diminished

• A full length image of a tall building/tree can be seen in a small convex mirror.

Uses of Convex Mirror

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(i) Convex mirrors are used as rear view mirrors in vehicles because

- (a) they always give an erect though diminished image.
- (b) they have a wider field of view as they are curved outwards.



- (ii) Convex mirrors are used at blind turns and on points of merging traffic to facilitate vision of both side traffic.
- (iii) Used in shops as security mirror.

Sign Convention for Reflection by Spherical Mirror Or

New Cartesian Sign Convention

- (i) The object is placed to the left of the mirror.
- (ii) All distances parallel to the principal axis are measured from the pole of the mirror.
- (iii) All distances measured in the direction of incident ray (along + X-axis) are taken as positive and those measured against the direction of incident ray (along X-axis) are taken as negative.
- (iv) Distance measured perpendicular to and above the principal axis are taken as positive.
- (v) Distances measured perpendicular to and below the principal axis are taken as negative.



- Object distance = 'u' is always negative.
- Focal length of concave mirror = Negative
- Focal length of convex mirror = Positive

Mirror Formula :

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

where, v = Image distance

u = Object distance

f = Focal length

Magnification of Spherical Mirrors

It is the ratio of the height of image to the height of object.

 $m = \frac{\text{Height of image}}{\text{Height of object}}$

$$m = \frac{h_i}{h_o}$$

Also,

$$m = -\frac{v}{u}$$

If 'm' is negative, image is real.

If '*m*' is positive, image is virtual.

If $h_i = h_o$ then m = 1, *i.e.*, image is equal to object.

If $h_i > h_i$ then m > 1 *i.e.*, image is enlarged.

If $h_i < h_o$ then m < 1 *i.e.*, image is diminished.

Magnification of plane mirror is always + 1.
'+' sign indicates virtual image.

'1' indicates that image is equal to object's size.

- If '*m*' is '+ve' and less than 1, it is a convex mirror.
- If '*m*' is '+ve' and more than 1, it is a concave mirror.
- If '*m*' is '.ve', it is a concave mirror.

Check Your Knowledge

- 1. Magnification of plane mirror is + 1. What does it indicate ?
- 2. A real image, 1/5 th size of object is formed at a distance of 18 cm from a mirror. What is the nature of the mirror ? Calculate its focal length.

- 3. Name the type of mirror used in the following and reason for using it :
 - (a) Solar furnace
 - (b) Rear view mirror in a vehicle
- 4. What should be the position of the object, when a concave mirror is used :
 - (a) as a shaving mirror ?
 - (b) in torches as reflecting mirror ?
- 5. (a) Define principal focus of a spherical mirror.
 - (b) For what position of the object does a concave mirror form a real, inverted and diminished image of the object ? Draw the ray diagram.
 - (c) An object 4 cm high is placed at a distance of 6 cm in front of a concave mirror of focal length 12 cm. Find the position of the image.
- 6. For what position of an object, a concave mirror forms a real image equal to size of object ?
- 7. Identify the nature of mirror and mention two characteristics of image formed when magnification m = + 6.
- 8. Suggest a method to find approximate focal length of a concave mirror.
- 9. Draw ray diagram when :
 - (a) object is placed between pole and focus of a concave mirror.
 - (b) object is placed at infinity from a convex mirror.
- 10. Name the type of spherical mirror which
 - (a) has positive focal length.
 - (b) always forms a virtual image.

REFRACTION

Bending of light when it enters obliquely from one transparent medium to another.

- Speed of light is maximum in vaccum. It is 3×10^8 m/s.
- Cause of refraction : Change in speed of light.
- Some examples of refraction :
 - (i) The bottom of swimming pool appears higher.



Light Reflection and Refraction

(ii) A pencil partially immersed in water appears to be bent at the interface of water and air.



- (iii) Lemons placed in a glass tumbler appear bigger.
- (iv) Letters of a book appear to be raised when seen through a glass slab.

Refraction through glass slab



- The extent of bending of ray of light at the opposite parallel faces of rectangular glass slab is equal and opposite, so the ray emerges parallel to incident ray.
- Lateral displacement depends on :
 - (a) Refractive index of glass slab
 - (b) Thickness of the glass slab

Laws of Refraction

(i) The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane.
(ii) Snell's law : The ratio of sine of angle of incidence to the sine of angle of refraction is a constant, for a light of given colour and for a given pair of media.

$$\frac{\sin i}{\sin r} = \text{constant}$$

Refractive index (n) : The ratio of speed of light in a given pair of media

$$n = \frac{\text{Velocity of light in medium 1}}{\text{Velocity of light in medium 2}}$$

 \boldsymbol{n}_{21} means refractive index of second medium with respect to first medium, and

$$n_{21} = \frac{v_1}{v_2}$$

 n_{12} means refractive index of first medium with respect to second medium.

$$n_{12} = \frac{v_2}{v_1}$$

• Absolute Refractive Index : Refractive index of a medium with respect to vaccum or air.

$$n = \frac{c}{v} c = 3 \times 10^8 \,\mathrm{ms}^{-1}$$

• Refractive index of one medium is reciprocal of other's refractive index in a given pair.

$$n_{12} = \frac{1}{n_{21}}$$

If refractive index of medium 1 w.r.t. air is given as $_1n^{air}$, and If refractive index of medium 2 w.r.t. air is given as $_2n^{air}$

Then, refractive index of medium 1 w.r.t. medium $2 = \frac{1}{2} \frac{n^{air}}{n^{air}}$

- Refractive index of diamond is the highest till date. It is 2.42. It means speed of light is $\frac{1}{2.42}$ times less in diamond than in vaccum.
- **Optically denser medium :** Out of two given media, the medium with higher value of refractive index.

Light Reflection and Refraction



- **Optically rarer medium :** Out of two given media, the medium with lower value to refractive index.
- When light enters obliquely from a rarer to a denser medium, it bends towards the normal.



• When light enters obliquely from denser to a rarer medium, it bends away from the normal.



• Refractive index of a medium does not depend on physical density.

Spherical lens : A transparent medium bound by two surfaces, of which one or both surfaces are curved.



Rules for image formation by convex lens

(i) A ray of light parallel to principal axis of a convex lens always pass through the focus on the other side of the lens.



(ii) A ray of light passing through the principal focus will emerge parallel to principal axis after refraction.



(iii) A ray of light passing through the optical center will emerge without any deviation.



Ray Diagrams of Imaged formed by Convex Lens



Image

Position – At 'F₂' Nature – Real, inverted Size – Point sized or highly diminished

Light Reflection and Refraction





Rules for Image Formation by Concave Lens

(i) A ray of light parallel to the principal axis appear to diverge from the principal focus located on the same side of the lens.



(ii) A ray of light appearing to meet at the principal focus of a concave lens will emerge parallel to principal axis.



(iii) A ray of light passing through the optical centre of a lens will emerge without any deviation.



Ray Diagrams of Images Formed by a Concave Lens

(i) When object is placed at infinity :



Image Position – At 'F₁' Nature – Virtual, erect Size – Point sized or highly diminished

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Light Reflection and Refraction

(ii) When object is placed between infinity and optical centre



Position – Between 'F' and 'O' Nature – Virtual, erect

Size-Diminished

Sign convention for spherical lenses

- Sign conventions are similar to the one used for spherical mirrors, except that measurements are taken from optical center of the lens.
- Focal length of convex lens = Positive Focal length of concave lens = Negative

Lens Formula :

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

Magnification:

$$m = \frac{h_i}{h_o}$$

Also,

$$m = \frac{v}{u}$$

Power of a lens :

It is defined as the reciprocal of focal length in meter.

The degree of convergence or divergence of light rays is expressed in terms of power.

Power =
$$\frac{1}{\ddot{u}\ddot{u}=\ddot{u}\ddot{u}\ddot{u}\ddot{u}\ddot{u}\ddot{u}\ddot{u}\ddot{u}}$$
 P = $\frac{1}{f}$

• SI unit of Power = dioptre = D

 $1 D = 1 m^{-1}$

1 dioptre is the power of lens whose focal length is one meter.

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- Power of convex lens = Positive
- Power of concave lens = Negative
- Power $\propto \frac{1}{\text{focal length or thickness}}$
- Power of a lens combination

 $P = P_1 + P_2 + P_3$

CHECK YOUR KNOWLEDGE

- 1. Refractive indices of medium A, B and C are 1.3, 1.5 and 1.4 respectively. In which of the following the speed of light will be the :
 - (a) fastest ?
 - (b) slowest?
- 2. A compound lens is made up of two thin lenses having power + 12.5 D and -2.5 D. Find the focal length and power of the combination.
- 3. Light enters from air to kerosene having a refractive index of 1.47. What is the speed of light in kerosene ?
- 4. A 5 cm tall object is placed perpendicular to principal axis of a convex lens of focal length 10 cm. If the object is placed 30 cm away from the lens, find the position, size and nature of image.
- 5. One half of a convex lens is covered with black paper.
 - (a) Show the formation of image of a object placed at 2F, of such covered lens with the help of ray diagram. Mention the position and nature of the image.
 - (b) Draw the ray diagram for same object at same position in front of the same lens, but now uncovered. Will there be any difference in image obtained in the two cases ? Give reasons for your answers.
- 6. A thin converging lens forms a (i) real magnified image, (ii) virtual magnified image.
 - (a) Write the position of object in each case.
 - (b) Draw labelled diagram for each case.
- 7. (a) What happens to a ray of light when it travels from one medium to another having equal refractive indices ?
 - (b) State the cause of refraction of light.



Light Reflection and Refraction



- 8. (a) Define 1 dioptre of power. Find the focal length of a lens of power -2.0 D.
 - (b) Why does a lemon kept in water in a glass tumbler appear to be bigger than actual size ?
- 9. A ray travelling in water enters obliquely into glass. Does the light bend towards or away from the normal and why ?
- 10. An object is placed at the focus of a convex lens. Draw ray diagram to locate the position of image formed.

Hints to Long Answer Type Questions

- 7. (a) No bending of light.
 - (b) Change in refractive index of two medium.
- 8. (a) 1 dioptre : It is the power of lens whose focal length is 1 m.

$$\mathbf{P} = \frac{1}{f}$$

(b) Due to refraction of light.

10. Ray diagram.

Image formed	:	At infinity
Size	:	Enlarged
Nature	:	Real and inverted

q q



The Human Eye and The

Colourful World

Human eye : The sense organ that helps us to see.

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- Located in eye sockets in skull.
- Diameter of eye ball 2.3 cm

Parts of Human Eye

Cornea : It is the outermost, transparent part. It provides most of the refraction of light.

Lens : It is composed of a fibrous, jelly like material. Provides the focused real and inverted image of the object on the retina. This is convex lens that converges light at retina.

Iris: It is a dark muscular diaphragm that controls the size of the pupil.

Pupil : It is the window of the eye. It is the central aperture in iris. It regulates and controls the amount of light entering the eye.

Retina : It is a delicate membrane having enormous number of light sensitive cells.

Far point : The maximum distance at which object can be seen clearly is far point of the eye. For a normal adult eye, its value is infinity.

Near point or Least distance of distinct vision

The minimum distance at which objects can be seen most distinctively without strain.

- For a normal adult eye, its value is 25 cm.
- Range of human vision 25 cm to infinity.

Accomodation : The ability of the eye lens to adjust its focal length is called accommodation. Focal length can be changed with the help of ciliary muscles.



The Human Eye and the Colourfur world





The Structure of human eye

Myopia (Near sightedness)

- A myopic person can see nearby objects clearly but cannot see distant objects clearly.
- Image is formed in front of retina.

Causes of Myopia

- Excessive curvature of eye lens
- Elongation of eye ball

Correction

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Use of concave lens of appropriate power.

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(a) In a myopic eye, image of distant object is formed in front of the retina (and not on the retina)



(b) The far point (F) of a myopic eye is less than infinity



(c) Correction of myopia. The concave lens placed in front of the eye forms a virtual image of distant object at far point (F) of the myopic eye.

Hypermetropia (Far sightedness)

- Affected person can see far objects clearly but cannot see nearby objects clearly.
- The near point of the eye moves away.
- Image is formed behind the retina.

Causes of Hypermetropia

- Focal length of the eye lens becomes too long.
- Eye ball becomes too small.



Correction

Use of convex lens of suitable power can correct the defect.



Presbyopia (Old age Hypermetropia)

It is the defect of vision due to which an old person cannot see the nearby objects clearly due to loss of power of accomodation of the eye.

• The near-point of the old person having presbyopia gradually recedes and becomes much more than 25 cm away.

Causes

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- Gradual weakening of ciliary muscles.
- Diminishing flexibility of eye lens.

Correction

- Use of convex lens of suitable power.
- Sometimes a person may suffer from both myopia and hypermetropia.
- Such people require bifocal lens for correction.

Advantage of the eyes in front of the face

- It gives a wider field of view.
- It enhances the ability to detect faint objects.
- It provides three dimensional view.

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CHECK YOUR KNOWLEDGE

VERY SHORT ANSWER TYPE QUESTIONS

- 1. What type of lens is used to correct (a) Hypermetropia, (b) Myopia?
- 2. Name the defect of vision in which the eye-lens loses its power of accommodation due to old age.
- 3. What is the far point of a person suffering from myopia?
- 4. What is the other name of old age hypermetropia ?
- 5. You friend can read a book perfectly well but cannot read the writing on black-board unless she sits on the front row in class. Is she short-sighted or long-sighted ?

SHORT ANSWER TYPE QUESTIONS

- 1. Differentiate between Hypermetropia and Myopia.
- 2. What is presbyopia ? Write two causes of this defect. Name the type of lens which can be used to correct presbyopia.
- 3. The near point of a person suffering from hypermetropia is at 50 cm from his eye. What is the nature and power of the lens needed to correct this defect ?
- 4. How is the amount of light entering the eye controlled ?

LONG ANSWER TYPE QUESTIONS

- 1. (a) What happens to the size of pupil of our eye in (i) dim light, (ii) bright light ?
 - (b) Name the cells on the retina sensitive to (i) bright light, (ii) dim light.
- 2. (a) Draw a simple diagram of the human eye and label clearly the cornea, iris, pupil, ciliary muscles, eye lens, retina and optic nerve.
 - (b) Describe the working of the human eye with the help of the above diagram.
- 3. What is short sightedness ? State the two causes of short-sightedness. With the help of ray diagrams, show :
 - (a) the eye defect short sightedness.
 - (b) correction of short sightedness by using a lens.



The Human Eye and the Colourfur world

Hints to Long Answer Type Questions

- 1. (a) (i) Increases (b) (i) Cones
- (ii) Decreases

(ii) Rods

- 2. Labelled diagram of eye
- 3. A person can see nearby objects clearly but cannot see distinct objects clearly.

Reason :

- (a) Elongation of eye ball.
- (b) Excessive curvature of eye lens.

Diagram of myopic eye and correction using concave lens.

Prism : It is a pyramidal piece of glass with two triangular bases and three rectangular lateral surfaces.

Angle of Prism : The angle between two adjoining lateral surfaces.



Angle of deviation (*d*) : It is the angle between incident ray and emergent ray.



When white light is passed through a glass prism, it splits into its seven constituent colours to form a band of seven colours. This phenomenon is called dispersion.

Spectrum : The band of seven colours formed due to dispersion of white light is called spectrum.

Acronym : It is a group of alphabets that represent sequential colours in spectrum.



- Red is the **least deviated** colour as it has largest/longest wavelength.
- Violet is the **most deviated** colour as it has smallest wavelength in visible spectrum.

Q. Why spectrum is formed when white light is passed through a glass prism ?

Ans. Each colour has a definite wavelength and for each wavelength the angle of deviation differs. Red is the least deviated and violet is the most deviated colour so different colours deviate at different angles to form spectrum.



Issac Newton was the first person who proved that sunlight is made up of seven colours :

- (i) He passed sunlight through a glass prism to form a band of seven colours.
- (ii) He tried to split the colours further by putting another prism ahead of the prism forming spectrum but he failed to obtain more colours.
- (iii) He formed a spectrum from sunlight and placed an identical but inverted prism in front of prism forming the spectrum. All the seven colours combined by the inverted prism and emerged as white light.

Q. What is referred as white light ?

Ans. Any light that forms a spectrum similar to that of sunlight is referred as white light.

Total Internal Reflection

When light enters obliquely from a denser medium to a rarer medium and the angle of incidence exceeds critical angle, the light reflects in the denser medium. This is called internal reflection.



Conditions necessary for Internal Reflection

- (i) Light should enter obliquely from a denser to a rarer medium.
- (ii) The angle of incidence should exceed critical angle, the light reflects in the denser medium.

Critical angle : The angle of incidence for which the angle of refraction is 90°.

Rainbow : It is a natural spectrum appearing in the sky after rain showers.

- Rainbow is observed in the direction opposite to the sun.
- Three phenomenon which are involved in rainbow formation are :
 - (a) Dispersion
 - (b) Refraction
 - (c) Internal reflection

Some water droplets remain suspended in air after rain. These droplets behave as glass prism. When light enters the rain drop, it first refracts and disperses. Then it reflects internally and again refracts as it come out of the drop and the seven colours reach the eye of observer in form of rainbow.



Atmospheric Refraction : The refraction by different layers of atmosphere is called atmospheric refraction.

- (i) Apparent flickering of objects placed behind a hot object or fire.
- (ii) Stars near the horizon appear slightly higher than their actual position.
- (iii) Advanced sunrise and delayed sunset.
- (iv) Apparent flattering of sun's disc.
- (v) Twinkling of stars.
- (i) An object placed behind the fire or a hot surface appears to flicker when seen through the air.

The air above hot surface becomes hot and rises. The space is occupied by cool air. The refractive index of hot air is less than that of cool air. So, the physical condition of the medium are not constant. Due to changing Refractive Index (RI) of medium, the light appears to come from different directions.

It results in fluctuation in apparent position of object.



The Human Eye and the Colourfur world

(ii) Stars when seen near the horizon appear slightly higher than their actual position due to atmospheric refraction.



The refractive index of earth's atmosphere in general increases from top to bottom. So, the light coming from a star near the horizon has to travel from rarer to denser medium and it bends towards the normal. As a result the star appears higher.

(iii) Advanced sunrise

The sun appears about two minutes earlier than actual sunrise and the sun remains visible for about two minutes after actual sunset.

When the sun is below horizon, the rays have to pass from rarer to denser medium. So rays bend towards the normal. As a result the sun appears higher than its actual position.



(iv) Twinkling of stars

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Stars are very far from us, so they behave as point source of light. Since the physical conditions of the earth's atmosphere are not constant the light from stars appears to come from different directions. This results in fluctuation of apparent position of star.

The amount of light coming from stars also vary due to changing Refractive Index of atmosphere.

The star appears bright when more light from star reaches our eyes and the same star appears dull when less amount of light reaches our eyes.

Both these effects are responsible for twinkling of stars.

Q. Why do planets not twinkle ?

Ans. The planets are much closer to the earth and are thus seen as extended source. If we consider a planet as a collection of a large number of point-sized sources of light, the total variation in the amount of light entering our eye from all individual point sized sources will average out to zero and will nullify the twinkling effect.

Scattering effect : Spreading of light in various directions by colloid particles.

Scattering $\infty \frac{1}{\text{wavelength}}$

Tyndall effect : When light passes through a colloid its path becomes visible. This is called **Tyndall effect.**

E.g.,

- (i) Path of light becomes visible when light enters a dark and dusty room through a slit or ventilator.
- (ii) Path of light becomes visible when light passes through dense canopy of trees in a forest.

The colour of scattered light depends on the size of scattering particles

- (i) If particles are very fine, they scatter mainly the blue colour of light (shorter wavelength).
- (ii) Medium sized particles scatter mainly the red colour (longer wavelength).
- (iii) Even larger particles scatter all the colours of light that is why it appears white.
- Wavelength of red light is about 1.8 times to that of blue light.

Q. Why danger signs are made in red colour ?

Ans. Red is the least scattered colour. It is least scattered by fog and smoke and can be seen in the same colour over a long distance. So, danger signs are made in red colour.



The Human Eye and the Colourfur world

Q. Why the colour of sky appears blue on a clear day ?

Ans. The upper layer of atmosphere contains very fine particles of water vapours and gases. These particles are more effective in scattering of light of shorter wavelength mainly blue than larger wavelength. So, the sky appears blue.

Q. How does the sky appear to an astronaut in the space or to a passenger of jet plane flying at high altitude ?

Ans. The sky would appear dark to an astronaut in the space as scattering is not very prominent at such high altitude due to absence of particles.

Q. Why clouds appear white ?

Ans. Clouds are formed by water vapours. Water vapours condense to form water droplets due to larger size of droplets, all colours of light are scattered and clouds appear white.

Q. Why colour of sun appear red during sunrise and sunset ?

Ans. While sunset and sunrise, the colour of the sun and its surrounding appear red. During sunset and sunrise, the sun is near horizon and therefore the sunlight has to travel larger distance in atmosphere. Due to this most of the blue light (shorter wavelength) are scattered away by the particles. The light of longer wavelength (red colour) will reach our eye. This is why sun appear red in colour.

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS

- 1. Which of the two is scattered more easily light of shorter wavelength or light of longer wavelength ?
- 2. What is the near and far point of a normal eye?
- 3. State two effects produced by the scattering of light by the atmosphere.
- 4. What is tyndall effect ?

- 5. Which light has longer wavelength red light or blue light ?
- 6. What do you understand by dispersion of light?
- 7. As light rays pass from air into a glass prism, are they refracted towards or away from the normal ?

SHORT ANSWER TYPE QUESTIONS

- 1. Why do stars twinkle at night?
- 2. Describe the formation of rainbow in the sky with the help of a diagram.
- 3. Why the sun appear red while sunset and sunrise ? Explain.
- 4. Why do stars seem higher than they actually are ? Illustrate your answer with the help of a diagram.

LONG ANSWER TYPE QUESTIONS

- 1. What is atmospheric refraction ? What causes atmospheric refraction ?
- 2. Draw a neat and labelled diagram of the experimental set-up for observing the scattering of light in a colloidal solution of sulphur to show how the sky appears blue and the sun appears red at sunrise and sunset.







Ore Environment

- Everything that surrounds us is environment. It includes both living (biotic) and non-living (abiotic) components.
- Interaction between these biotic and abiotic components form an ecosystem.
- In an ecosystem living components depend on each other for their food which give rise to food chains and food webs in nature.
- Human activities lead to environmental problems such as depletion of ozone layer and production of huge amount of garbage.

Ecosystem

All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem. *E.g.*, forest, pond etc.

Types of ecosystem : It is of two types :

(a) Natural ecosystem : The ecosystem which exist in nature on its own. *E.g.*, forest, lake, ocean.

(b) Artifical ecosystem : Man-made ecosystems are called artificial ecosystem. *E.g.*, crop field, aquarium, garden.



- (a) Abiotic Components : All the non-living components such as air, water, land, light, temperature etc. form the abiotic components.
- (b) **Biotic Components :** All the living components such as plants,

animals, bacteria, fungi etc. form the biotic components.

On the basis of nutrition biotic components are further divided into :

Producers : All green plants and blue-green algae can produce their own food using abiotic components (photosynthesis), hence called producers.

Consumers : Include all animals which depend on producers directly or indirectly for their food.

Consumers are further divided into :

- (i) Herbivores : Plant eaters *e.g.*, goat, deer.
- (ii) Carnivores : Flash eaters *e.g.*, tiger, crocodile.
- (iii) Omnivores : Eats both plants and animals *e.g.*, human.
- (iv) **Parasites :** Live on the body of host and take food from it *e.g.*, lice, cascuta.

Decomposers : Include organisms which decompose the dead plants and animals *e.g.*, bacteria, fungi. These help in the replenishment of natural resources.

FOOD CHAIN

• Food chain is a series of organisms in which one organism eats another organism as food. For *e.g.*,

 $Grass \rightarrow Deer \rightarrow Lion$

• In a food chain various steps where transfer of energy takes place is called a trophic level.

Flow of energy between trophic levels

- Flow of energy in a food chain is unidirectional.
- Green plants capture 1% of sunlight and convert it into food energy.
- **10 percent law :** Only 10% of energy is transferred to the next trophic level. The remaining 90% energy is used in life processes (digestion, growth, reproduction etc.) by present trophic level.





Due to this gradual decrease in energy, food chains contain 3-4 trophic levels.



- **Biological magnification :** The concentration of harmful chemicals increases with every next trophic level in a food chain. This is called biological magnification.
- Maximum concentration of such chemicals get accumulated in human bodies as human occupy the top level in any food chain.

Food web : In nature large numbers of food chains are interconnected forming a food web.





Environmental problems : Changes in the environment affect us and our activities change the environment around us. Human activities leads to pollution, deforestation etc.

Ozone layer

- Ozone layer is a protective blanket around the earth which absorbs most of the harmful UV (ultraviolet) radiations of the sunlight, thus protecting living beings from many health hazards such as skin cancer, cataract, destruction of plants etc.
- Ozone (O₃) layer is present at higher levels of atmosphere (*i.e.*, stratosphere). It is a deadly poison at ground level.

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Formation of ozone molecule

(i) The high energy UV radiations break down the O₂ molecules into free oxygen (O) atoms.

 $O \xrightarrow{UV} O + O$ (atoms)

(ii) These oxygen atoms then combine with oxygen (O_2) molecule to form the ozone molecule.

$$O_2 + O \rightarrow O_3$$
 (ozone)

Depletion of ozone layer

- The decrease in the thickness of ozone layer over Antarctica was first observed in 1985 and was termed as ozone hole.
- This decrease was linked to excessive use of synthetic chemicals like chlorofluorocarbons (CFCs) which are used in refrigerators, ACs, fire-extinguishers, aerosols sprays etc.
- United Nations Environment Programme (UNEP) succeeded in forging an agreement to stop CFC production at 1986 levels (KYOTO PROTOCOL) by all countries.

Garbage disposal

Improvements in lifestyle have resulted in accumulation of large amounts of waste materials.

Garbage contains following type of materials :

(a) **Biodegradable :** Substances which can be decomposed by the action of micro-organisms are called biodegradable wastes.

E.g., fruit and vegetable peels, cotton, jute, dung, paper, etc.

(b) Non-biodegradable wastes : Substances which cannot be decomposed by the action of micro-organisms are called non-biodegradable wastes.

E.g., plastic, polythenes, metals, synthetic fibres, radioactive wastes, pesticides etc.

Micro-organisms release enzymes which decompose the materials but these enzymes are specific in their action that's why enzymes cannot decompose all the materials.





Some methods of waste disposal

- (a) **Biogas plant :** Biodegradable waste can be used in biogas plant to produce biogas and manure.
- (b) Sewage treatment plant : The drain water can be cleaned in sewage treatment plant before adding it to rivers.
- (c) Land fillings : The wastes are buried in low lying areas and are compacted by rolling with bulldozers.
- (d) **Composting :** Organic wastes are filled in a compost pit and covered with a layer of soil, after about three months garbage changes to manure.
- (e) **Recycling :** Non-biodegradable wastes are recycled to make new items.
- (f) **Reuse**: It is a conventional technique to use an item again *e.g.*, newspaper for making envelops.



VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

- 1. Define trophic level.
- 2. What is the full form of CFC and UNEP?
- 3. Name the radiations that are absorbed by the ozone layer.
- 4. Which will get more energy secondary consumers or tertiary consumers ?
- 5. What is the functional unit of environment?
- 6. Which of the following are not biodegradable : Wool, glass, silver foil, leather.
- 7. Name any two parasites.

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8. What is KYOTO protocol?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

- 1. Why are green plants called producers ?
- 2. Name two materials which can be recycled.
- 3. What will happen if we kill all the organisms of a trophic level ?
- 4. Why only 10% energy is transferred to the next trophic level ?

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- 5. Which bag will you prefer for shopping and why?
 - (a) Jute bag (b) Polythene bag
- 6. Why is ozone layer important for the existence of life on earth ?
- 7. What is the role of decomposers in ecosystem ?
- 8. Draw an energy pyramid showing different trophic level.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

- 1. Differentiate between biodegradable waste and non-biodegradable waste.
- 2. How ozone molecule is formed in the atmosphere ?
- 3. Define consumers. What are its further divisions ?
- 4. Why natural ecosystem is more stable than artificial ecosystem ?
- 5. Why some materials are not decomposed by the action of micro-organisms?
- 6. What is a food web? Explain with example.
- 7. Give any two ways in which non-biodegradable wastes would affect the environment.
- 8. How the components of an ecosystem are dependent on each other ?

LONG ANSWER TYPE QUESTIONS (5 Marks)

- 1. What are different methods for disposal of garbage ?
- 2. What is food chain ? Give its characteristics. Explain how energy flows through different trophic levels in a food chain.
- 3. Explain how harmful chemicals enter our body.

Hints to Long Answer Type Questions

- 1. Methods for Garbage disposal :
 - Land filling
 - Composting
 - Recycling
 - Reuse
 - Biogas plant
 - Sewage treatment plant

Our Environment



- 2. Food chain : Transfer of energy through various trophic level in an ecosystem. Characteristics : (i) Unidirectional
 - (ii) 1% of total solar energy is absorbed by plants.
 - (iii) Transfer of energy through various trophic level is in accordance with 10 percent law.
- 3. Bio magnification



Management of Natural

Resources

Natural Resources : Anything in the environment 'which can be used' is called natural resource. For example, soil, air, water, forests, wildlife, coal and petroleum.

Chapter - 16



Management of Natural Resources : It is the use of natural resources in such a way so as to avoid wastage and conserve them for future.

There are national and international laws and acts to protect the environment.

GANGA ACTION PLAN (GAP) : Multi crore project came in 1985 to improve the quality of Ganga.

Contamination of river water is indicated by :

- (i) The presence of coliform (a group of bacteria found in human intestine) whose presence indicate contamination by disease causing bacteria.
- (ii) The pH of water that can be easily checked by using universal indicator.

Management of Natural Resources

Three R's to save the environment :



unnecessary lights and fans.

can be recycled instead of synthesizing or extracting new ones. things away, they can be used again.

- 2. Repairing leaky taps.
- 3. Not wasting food.

Reuse is better than recycling as it saves energy.

We need to use our resources carefully because

- (a) they are limited.
- (b) demand for all resources is increasing as human population is increasing at a tremendous rate due to improvement in health care.

Sustainable Management

Management of resource wisely so that they meet current basic human needs while preserving them for the needs of future generations.

The management of natural resources require :

- (a) Long term perspective so that these will last for generations to come.
- (b) Ensure equitable distribution of resources so that all economic sections benefit from these resources.
- (c) Safe disposal of waste.

Forest and Wildlife Conservation

Forest are biodiversity hot spots. Main aim of conservation is to preserve the biodiversity as loss of diversity may lead to ecological instability.

Biodiversity : Biodiversity of an area is the number of plant and animal species found in that particular area like bacteria, fungi, insects, birds, plants etc.

Hot spots : It means an area full of biological diversity.

Stake holder : A person having interest or concern for something is called stake holder.



Instances where various people has played an important role in conservation of forests

(i) Khejri Trees : Amrita Devi Bishnoi, in 1731, sacrificed her life along with 363 others for the protection of Khejri trees in a village in Rajasthan.

Govt. of India instituted 'Amrita Devi Bishnoi' National award for wildlife conservation in her memory.

- (ii) Chipko Andolan : This movement originated in a remote village in Garhwal. Women of the village reached the forest when contractor's men came to cut the trees. Women clasped the tree trunk thus preventing the workers from felling the trees. The Chipko Movement quickly spread across communities and forced govt. to rethink their priorities in the use of forest products.
- (iii) West Bengal Forest Department revived the degraded SAL forest of Arabari.

Water for all

- Water is the basic necessity for all terrestrial forms of life.
- Rain is an important source of water.
- Irrigation methods like dams, tanks and canals have been used in various parts of India.

Dams

Dams ensure the storage of adequate water for irrigation and are also used for generating electricity.

Various dams have been built on rivers to regulate the flow of water.

- *E.g.*, (a) Tehri Dam On river Ganga
 - (b) Sardar Sarovar Dam On river Narmada
 - (c) Bhakra Nangal Dam On river Satluj

Interesting facts :

Hirakud Dam built across Narmada river is the longest man-made dam in the world – 26 km in length.

Tehri Dam is Asia's highest dam – 261 m high.

Bhakra Nangal Dam is Asia's second highest dam at 225.5 m.



Management of Natural Resources

Advantages of Dams

- (a) Ensures adequate water for irrigation.
- (b) To generate electricity.
- (c) Continuous supply of water to cities and towns.

Disadvantages of Dams

(a) Social problems :

- (i) Many tribals and peasants are displaced and rendered homeless.
- (ii) They do not get adequate compensation or rehabilitation.

(b) Environmental problems :

- (i) Deforestation
- (ii) Loss of biodiversity
- (iii) Disturb ecological balance

(c) Economic problems :

- (i) Huge amount of public money is used.
- (ii) No proportionate benefit to people.
- (iii) No equitable distribution of water.

Rain Water Harvesting

Rain water harvesting is to make rain water percolate under the ground so as to recharge 'groundwater'.

- Rain water harvesting is an age old practice in India.
- Various ancient methods of water harvesting :

State
Rajasthan
Maharastra
Madhya Pradesh, UP
Bihar
Himachal Pradesh
Jammu region
Tamil Nadu
Delhi



Advantages of storing water in the ground

- (a) It does not evaporate.
- (b) It spreads out to recharge wells.
- (c) It provides moisture for vegetation over a wide area.
- (d) It does not provide breeding grounds for mosquitoes.
- (e) It is protected from contamination by human and animal waste.

Coal and Petroleum

- Coal and Petroleum are **non-renewable** natural resources.
- Coal and Petroleum are called **Fossil Fuels**.
- Formation :

Coal : Coal was formed from the remains of trees buried deep inside the earth some 300 million years ago.

Petroleum : Petroleum is formed by the bacterial decomposition of dead marine plants and animals (buried at the bottom of the seas). This decomposition takes place under high pressure and temperature and formation of petroleum take millions of years of time.

- Coal and petroleum will exhaust very soon.
 - (a) **Coal :** At present rate, coal will last another 200 years.
 - (b) **Petroleum :** At present rate of usage, it will last for about 40 years.

Harmful effects of using fossil fuels

Air pollution : Combustion of coal and hydrocarbons release a large amount of carbon monoxide, carbon dioxide, oxides of nitrogen etc. which cause air pollution.

Diseases : This polluted air causes various diseases like respiratory and throat problems, congestion etc.

Global Warming : Excessive emission of green house gases like carbondioxide cause a rise in atmospheric temperature leading to global warming.

- Fossil fuels should be used judiciously.
 - (a) Because they are limited and exhaustible.
 - (b) Once exhausted they will not be available in near future because they are formed very slowly over a period of many years.
- Steps taken to conserve energy resources (like coal and petroleum)
 - (a) Switch off electric appliances when not in use.



Management of Natural Resources

- (b) Use electric appliances that are energy efficient like CFL at home.
- (c) Use public transport like bus or metro instead of private vehicles.
- (d) Use stairs to climb instead of lift.
- (e) Whenever possible, use solar cookers.



VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

- 1. Name a clean fuel other than LPG and Natural gas.
- 2. Name two fossil fuels.
- 3. Name the most common practice used to recharge ground water.
- 4. Name any two inexhaustible resources.
- 5. Name the bacteria whose presence in water indicate contamination of water.
- 6. Write full form of CFC.
- 7. What is biodiversity?
- 8. Why is reuse better than recycle ?
- 9. Name the person who is remembered for protection of Khejri trees in Rajasthan.
- 10. Who are called stake holders ?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

- 1. What is meant by sustainable development?
- 2. Name two measures you would take to conserve electricity in your house.
- 3. Why should fossil fuels be used judiciously?
- 4. List two advantages of water harvesting.
- 5. List two disadvantages of building dams.
- 6. Why should we conserve forest and wild life ?
- 7. What are the 3R's to save our environment?
- 8. How is burning of fossil fuels affecting our environment?
- 9. What are the uses of coal and petroleum products ?
- 10. Name the rivers with which following dams are associated :
 - (a) Tehri Dam

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(b) Bhakra Dam

Science Class - 10 (SA - II)

LONG ANSWER TYPE QUESTIONS (5 Marks)

- 1. Write a short note on 'Chipko Andolan'.
- 2. (a) What is rain water harvesting ?
 - (b) What are the advantages of storing water in the ground ?
- 3. Explain the four main stake holders in the management of forest resource.
- 4. (a) What is natural resource ?
 - (b) Why do we need to manage our natural resources ?
- 5. List five methods that can be taken to conserve energy resources.





qq



Series RSH/1

Code No. 31/1/1

कोड नं. 31/1/1

- Please check that this question paper contains 32 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 42 questions.
- Please write down the serial number of the question before attempting it.
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-script during this period.
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 32 हैं।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 42 प्रश्न हैं।
- कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, प्रश्न का कृमांक अवश्य लिखें।
- इस प्रश्न-पत्र को पढ़ने के लिए 15मिनट का समय दिया गया है। प्रश्न-पत्र का वितरण पूर्वा 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे।
Summative Assessment-II, 2015-16 संकलित परीक्षा - II

Subject : Science (विज्ञान)

Class : X

Time allowed : 3 Hours] निर्धारित समय : 3 घण्टे]

[Maximum Marks : 90 [अधिकतम अंक : 90

General Instructions :

- (i) The question paper comprises of two sections, A and B. You are to attempt both the sections.
- (ii) All questions are compulsory.
- (iii) All questions of Section A and all questions of Section B are to be attempted separately.
- (iv) Question numbers 1 to 3 in Section A are one mark questions. These are to be answered in one word or in one sentence.
- (v) Question numbers 4 to 7 in Section A are two marks questions. These are to be answered in about 30 words each.
- (vi) Question numbers 8 to 19 in Section A are three marks questions. These are to be answered in about 50 words each.
- (vii) Question numbers 20 to 24 in Section A are five marks questions. These are to be answered in about 70 words each.
- (viii) Question numbers 25 to 42 in Section B are multiple choice questions based on practical skills. Each question is a one mark question. You are to select one most appropriate response out of the four provided to you.

सामान्य निर्देश :

- (i) इस प्रश्न-पत्र को दो भागों, भाग-अ और भाग-ब में बाँटा गया है। आपको दोनों भागों के प्रश्नों के उत्तर लिखने हैं।
- (ii) सभी प्रश्नों के उत्तर अनिवार्य हैं।
- (iii) आपको भाग-अ और भाग-ब के सभी प्रश्नों के उत्तर पृथक्-पृथक् लिखने है।
- (iv) भाग-अ के प्रश्न संख्या 1 से 3 के प्रश्न एक-एक अंक के हैं। इनके उत्तर एक शब्द अथवा एक वाक्य में दें।
- (v) भाग-अ के प्रश्न संख्या 4 से 7 के प्रश्न दो अंकों के हैं। इनके उत्तर लगभग 30 शब्दों में दें।



- (vi) भाग-अ के प्रश्न संख्या 8 से 19 के प्रश्न तीन अंकों के हैं। इनके उत्तर लगभग 50 शब्दों में दें।
- (vii) भाग-अ के प्रश्न संख्या 20 से 24 के प्रश्न पाँच अंकों के हैं। इनके उत्तर लगभग 70 शब्दों में दें।
- (viii) भाग–ब के प्रश्न संख्या 25 से 42 के प्रश्न प्रयोगात्मक कौशल पर आधारित बहुविकल्पी प्रश्न हैं। प्रत्येक प्रश्न एक अंक का है। दिए गए चार विकल्पों में से आपको केवल एक सबसे उपयुक्त विकल्प चुनना है।

SECTION A

(भाग-अ)

 How many vertical columns are there in the modern periodic table and what are they called ?
 आधुनिक आवर्त सारणी में कितने ऊर्ध्वाधर स्तम्भ हैं और इनका क्या नाम है\

1

- 2. What is speciation ? जाति उद्भवन क्या है।
- 3. Why should biodegradable and non-biodegradable wastes be discarded in two separate dustbins ? 1

जैव-निम्नीकरणीय तथा अजैव-निम्नीकरणीय अपशिष्टों को दो पश्थक् कूड़ेदानों में क्यों फेंकना चाहिए।

- 4. "The chromosomes number of the sexually reproducing parents and their offspring is the same." Justify this statement.
 2 ''लैंगिक जनन करने वाले जीवों के जनकों एवं उनकी संततियों में गुणसूत्रों की संख्या समान होती है।'' इस कथन की पुष्टि कीजिए।
- 5. "A ray of light incident on a rectangular glass slab immersed in any medium emerges parallel to itself." Draw labelled ray diagram to justify the statement.

''किसी भी माध्यम में डूबे काँच के आयताकार स्लैब पर आपतित कोई प्रकाश किरण अपने मूल पथ के समान्तर निर्गत होती है।'' इस कथन की पुष्टि के लिए नामांकित प्रकाश किरण आरेख खींचिए।

6. We often observe domestic waste decomposing in the bylanes of residential colonies. Suggest ways to make people realise that the improper disposal of waste is harmful to the environment.2



हम प्राय: आवासीय कॉलोनियों की गलियों में घरेलू अपशिष्टों को अपघटित होते देखते हैं। वह उपाय सुझाइए जिनके द्वारा लोगों को यह अनुभूति हो कि अपशिष्टों का अनुपयुक्त निपटारा पर्यावरण के लिए हानिकर है।

7. List and explain any two advantages associated with water harvesting at community level. 2

सामुदायिक स्तर पर जल संग्रहण से संबद्ध दो लाभों की सूची बनाकर उनकी व्याख्या कीजिए।

8. Write the name and structural formula of the compound formed when ethanol is heated at 443 K with excess of conc. H_2SO_4 . State the role of conc. H_2SO_4 in this reaction. Write chemical equation for the reaction. 3

एथेनॉल को आधिक्त सांद्र H_2SO_4 में 443 K पर गर्म करने पर बनने वाले यौगिक का नाम तथा उसका संरचना-सूत्र लिखिए। इस अभिक्रिया मे a सांद्र H_2SO_4 की भूमिका का उल्लेख कोजिए। होने वाली अभिक्रिया का रासायनिक समीकरण लिखिए।

9. Why homologous series of carbon compounds are so called ? Write chemical formula of two consecutive members of a homologous series and state the part of these compounds that determines their (i) physical properties, and (ii) chemical properties.
3

कार्बन के यौगिकों की समजातीय श्रेणी को यह नाम क्यों दिया गया है? किसी समजातीय श्रेणी के दो कृमागत सदस्यों के रासायनिक सूत्र लिखिए तथा इन यौगिकों के उन भागों का उल्लेख कीजिए जो इनके (i) भौतिक गुणधर्म (ii) रासायनिक गुणधर्म निर्धारित करते हैं।

10. Given below are some elements of the modern periodic table :

₄Be, ₉Fe, ₁₄Si, ₁₉K, ₂₀Ca

- (i) Select the element that has one electron in the outermost shell and write its electronic configuration.
- (ii) Select two elements that belong to the same group. Give reason for your answer.
- (iii) Select two elements that belong to the same period. Which one of the two has bigger atomic size ?
- नीचे आधुनिक आवर्त सारणी के कुछ तत्व दिए गए हैं %
- ₄Be, ₉Fe, ₁₄Si, ₁₉K, ₂₀Ca
- (i) इनमें से वह तत्व चुनिए जिनके बा५तम कोश में एक इलेक्ट्रॉन है तथा इस तत्व का इलेक्ट्रॉनिक विन्यास लिखिए।
- (ii) इन तत्वों में से समान समूह के दो तत्वों को चुनिए। अपने उत्तर का कारण लिखिए।
- (iii) इन तत्वों में से समान आवर्त के दो तत्व चुनिए। इन दोनों तत्वों में किसका परमाणु साइज बड़ा है।



11. Write the number of periods the modern periodic table has. How do the valency and metallic character of elements vary on moving from left to right in a period ? How do the valency and atomic size of elements vary down a group ?

आधुनिक आवर्त सारणी में आवर्तों की संख्या लिखिए। किसी आवर्त में बायीं से दायीं ओर जाने पर तत्वों की संयोजकता तथा धात्विक गुणधर्म में किस प्रकार परिवर्तन होता है? किसी समूह में नीचे जाने पर तत्वों की संयोजकता तथा परमाणु–साइज में किस प्रकार परिवर्तन होता है\

- 12. (a) Explain the process of regeneration in Planaria.
 - (b) How is regeneration different from reproduction ?
 - (a) प्लेनेरिया में पुनरुद्भवन (पुनर्जनन) प्रक्रिया की व्याख्या कीजिए।
 - (b) पुनरुद्भवन की प्रक्रिया जनन से किस प्रकार भिन्न है ?
- Write two examples each of sexually transmitted diseases caused by (i) virus, (ii) bacteria. Explain how the transmission of such disease be prevented ? 3
 (i) वायरस, तथा (ii) जीवाणु प्रत्येक के द्वारा होने वाले दो-दो लैंगिक संचरित रोगों के नाम लिखिए। व्याख्या कीजिए कि इस प्रकार के रोगों के संचरण की रोकथाम कैसे की जाए।
- 14. Tabulate two distinguishing features between acquired traits and inherited traits with one example of each.
 3 उपार्जित लक्षणों तथा आनुवंशिक लक्षणों में विभेदन करने वाली दो विशेषताओं को तालिकाबद्ध कीजिए। प्रत्येक लक्षण का एक उदाहरण भी दीजिए।
- 15. "The sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it." Justify this statement with the help of flow chart showing the determination of sex of a newborn.
 3 ''किसी नवजात शिशु का लिंग मात्र संयोग है तथा जनकों (माता व "ता) में से किसी को भी इसके लिए उत्तरदायी नहीं माना जा सकता।'' किसी नवजात शिशु के लिंग निर्धारण की प्रक्रिया को दर्शाने वाले प्रवाह आरेख की सहायता से इस कथन की पुष्टि कीजिएA
- 16. Mention the types of mirrors used in (i) rear view mirrors, (ii) shaving mirrors. List two reasons to justify your answer in each case.
 (i) पश्च दश्श्य दर्पणों, तथा (ii) शेविंग दर्पणों में उपयोग किए जाने वाले दर्पण के प्रकारों का उल्लेख कीजिए। प्रत्येक प्रकरण में अपने उत्तर की पुष्टि के लिए दो कारणों की सूची बनाइए।
- 17. An object of height 6 cm is placed perpendicular to the principal axis of a concave lens of focal length 5 cm. Use lens formula to determine the position, size and nature of the image if the distance of the object from the lens is 10 cm.



6 cm ऊँचाई का कोई एक बिम्ब 5 cm फोकस दूरी से किसी अवतल लेंस के मुख्य अक्ष के लम्बवत् लेंस से 10 cm दूरी पर स्थित है। लेंस-सूत्र का उपयोग करके लेंस द्वारा बनने वाले प्रतिबिम्ब की स्थिति, साइज एवं प्रकृति निर्धारित कीजिए।

- State the difference in colours of the sun observed during sunrise/sunset and noon. Give explanation for each.
 सूर्योदय/सूर्यास्त तथा दोपहर के समय सूर्य के वर्ण में अन्तर होने का उल्लेख कीजिए। प्रत्येक के लिए व्याख्या कीजिए।
- 19. (a) What is an ecosystem ? List its two main components. 3
 - (b) We do not clean ponds or lakes, but an aquarium needs to be cleaned regularly. Explain.
 - (a) पारितंत्र क्या है? इसके दो प्रमुख घटकों की सूची बनाइए।
 - (b) हम तालाबों एवं झीलों की सफाई नहीं करते, किन्तु जलजीवशाला की नियमित सफाई करने की आवश्यकता होती है। ऐसा क्यों है? व्याख्या कीजिए।
- 20. (a) Define the term 'isomers'.
 - (b) Draw two possible isomers of the compound with molecular formula C_3H_6O and write its names.
 - (c) Give the electron dot structures of the above two compounds.
 - (a) 'समावयव' की परिभाषा लिखिए।
 - (b) किसी यौगिक जिसका अणु सूत्र $C_{3}H_{6}O$ है, के दो संभावित समावयवों की संरचना खींचकर उनके नाम लिखिए।
 - (c) उपरोक्त दोनों यौगिकों की इलेक्ट्रॉन-बिन्दु संरचना खींचिए।
- 21. (a) List three distinguishing features between sexual and asexual types of reproduction.
 - (b) Explain why variations are observed in the offsprings of sexually reproducing organisms.
 - (a) लैंगिक तथा अलैंगिक प्रकार के जनन में विभेदन करने वाले तीन लक्षणों (विशेषताओं)
 की सूची बनाइए।
 - (b) व्याख्या कीजिए कि लैंगिक जनन द्वारा उत्पन्न संतति में विभिन्नताएँ क्यों दिखाई देती हैं।

Paper

22. (a) Identify A, B and C in the given diagram and write their functions.5(b) Mention the role of gamete and zygote in sexually reproducing organisms.



- (a) दिए गए चित्र में A, B तथा C को पहचानिए और इनके कार्य लिखिए।
- (b) लैंगिक जनन करने वाले जीवों में युग्मक तथा युग्मनज की भूमिका का उल्लेख कीजिए।



- 23. (a) State the laws of refraction of light. Give an expression to relate the absolute refractive index of a medium with speed of light in vacuum. 5
 - (b) The refractive indices of water and glass with respect to air are 4/3 and 3/2 respectively. If the speed of light in glass is 2×10^8 ms⁻¹, find the speed of light in (i) air, (ii) water.
 - (a) प्रकाश के अपवर्तन के नियमों का उल्लेख कीजिए। किसी माध्यम के निरपेक्ष अपवर्तनांक तथा प्रकाश की निर्वात में चाल के बीच सम्बन्ध को दर्शाने वाला व्यंजक लिखिए।
 - (b) वायु के सापेक्ष जल तथा काँच के अपवर्तनांक कृमश: 4/3 तथा 3/2 हैं। यदि काँच में प्रकाश की चाल 2×10^8 ms^{.1} है, तो (i) वायु, (ii) जल में प्रकाश की चाल ज्ञात कीजिए।
- 24. (a) A person cannot read newspaper placed near than 50 cm from his eyes. Name the defect of vision he is suffering from. Draw a ray diagram to illustrate this defect. List its two possible causes. Draw a ray diagram to show how this defect may be corrected using a lens of appropriate focal length.



- (b) We see advertisements for eye donation on television or in newspapers. Write the importance of such advertisements.
- (a) कोई व्यक्ति अपने नेत्रों से 50 cm से कम दूरी पर स्थित समाचार पत्र को नहीं पढ़ पाता। उस दर्शष्ट-दोष का नाम लिखिए जिससे यह व्यक्ति पीड़ित है। इस दोष की व्याख्या के लिए प्रकाश किरण आरेख खींचिए। इस दोष के दो संभावित कारणों की सूची बनाइए। किसी उपयुक्त लेंस का उपयोग करके इस दोष का संशोधन किस प्रकार किया जा सकता है, इसे दर्शाने के लिए किरण आरेख खींचिए।
- (b) हम समाचार पत्रों एवं टेलीविजन पर नेत्र-दान से सम्बन्धित विज्ञापन देखते हैं। इस प्रकार के विज्ञापनों का महत्व लिखिए।

SECTION B

(भाग-ब)

- 25. A student takes 2 mL acetic acid in a dry test tube and adds a pinch of sodium hydrogen carbonate to it. He makes the following observations : 1
 - I. A colourless and odourless gas evolves with a brisk effervescence.
 - II. The gas turns lime water milky when passed through it.
 - III. The gas burns with an explosion when a burning splinter is brought near it.

IV. The gas extinguishes the burning splinter that is brought near it.

The correct observations are :

- (A)I, II and III (B) II, III and IV
- (C) III, IV and I (D) IV, I and II

कोई छात्र किसी शुष्क परखनली में 2 mL ऐसीटिक अम्ल लेकर इसमें एक चुटकी सोडियम हाइड्रोजन कार्बोनेट मिलाता है। वह निम्नलिखित प्रेक्षण करता है।

- I. तीव्र बुदबुदाहट के साथ कोई रंगहीन व गंधहीन गैस निकलती है।
- II. यह गैस चूने के पानी में गुजारे जाने पर उसे दूधिया कर देती है।
- III. जब कोई जलती छिपटी इस गैस के पास लाते हैं तो यह गेस विस्फोट के साथ जलती है।
- IV. यह गैस, जब जलती छिपटी इसके सम्पर्क में लाई जाती है, तो उसे बुझा देती है। इनमें से सही प्रेक्षण हैं।
- (A) I, II और III (B) II, III और IV
- (C)III, IV और I (D) IV, I और II
- 26. In an experiment to study the properties of acetic acid a student takes about 2 mL of acetic acid in a dry test tube. He adds about 2 mL of water to it and shakes the test tube well. He is likely to observe that : 1



(A) the acetic acid dissolves readily in water

(B) the solution becomes light orange

(C) water floats over the surface of acetic acid

(D) acetic acid floats over the surface of water

ऐसीटिक अम्ल के गुणधर्मों का अध्ययन करने के किसी प्रयोग में कोई विद्यार्थी एक शुष्क परखनली में लगभग 2 mL ऐसीटिक अम्ल लेता है। वह इस परखनली में लगभग 2 mL जल मिलाकर परखनली को भली–भाँति हिलाता है। संभावना यह है कि वह यह प्रेक्षित करे कि।

(A) ऐसीटिक अम्ल जल में सहज घुल जाता है

(B) विलयन हल्का संतरी रंग का हो गया है

(C) जल ऐसीटिक अम्ल के पश्ष्ठ पर तैर रहा है

- (D) ऐसीटिक अम्ल जल के पश्ष्ठ पर तैर रहा है।
- 27. A student prepared 20% sodium hydroxide solution in a beaker containing water. The observations noted by him are given below : 1
 - I. Sodium hydroxide is in the form of pellets.

II. It dissolves in water readily.

III. The beaker appears cold when touched from outside.

IV. The red litmus paper turns blue when dipped into the solution.

किसी छात्र ने एक जल से आधे भरे बीकर में 20% सोडियम हाइड्रॉक्साइड विलयन बनाया। उसके द्वारा नोट किए गए कुछ प्रेक्षण नीचे दिए गए हैं।

I. सोडियम हाइड्रॉक्साइड गुटिकाओं के रूप में है।

II. यह जल में शीघ्र घुल जाता है।

III. बाहर से छूने पर बीकर ठंडा प्रतीत होता है।

IV. प्राप्त विलयन में लाल लिटमस पत्र को डुबाने पर यह उसे नीला कर देता है। इनमें सही प्रेक्षण है।

(A) I, II व III	(B) II, III व IV
(C) III, IV व I	(D) I, II व IV

28. Read the following statemens :

I. When a red litmus paper is dipped into reaction mixture of a saponification reaction, it turns blue and the reaction is exothermic.

- II. When a blue litmus paper is dipped into reaction mixture of a saponification reaction, its colour does not change and the reaction is exothermic.
- III. When a red litmus paper is dipped into reaction mixture of a saponification reaction, its colour does not change and the reaction is endothermic.

IV. When a blue litmus paper is dipped into reaction mixture of a saponification reaction, its colour does not change and the reaction is endothermic.

Which of the above statements are correct?

- (A)I and II (B) II and III
- (C) III and IV (D) I and IV

निम्नलिखित कथनों का अध्ययन कोजिए।

- साबुनीकरण अभिक्रिया के अभिक्रिया–मिश्रण में लाल लिटमस पत्र डुबोने पर यह नीला हो जाता है तथा यह ऊष्माक्षेपी अभिक्रिया है।
- II. साबुनीकरण अभिक्रिया के अभिक्रिया-मिश्रण में नीला लिटमस पत्र डुबोने पर इसके रंग में परिवर्तन नहीं होता तथा यह ऊष्माक्षेपी अभिक्रिया है।
- III. साबुनीकरण अभिक्रिया के अभिक्रिया–मिश्रण में लाल लिटमस पत्र डुबोने पर इसके रंग में परिवर्तन नहीं होता तथा यह ऊष्माशोषी अभिक्रिया है।
- IV. साबुनीकरण अभिक्रिया के अभिक्रिया–मिश्रण में नीला लिटमस पत्र डुबोने पर इसके रंग में परिवर्तन नहीं होता तथा यह ऊष्माशोषी अभिक्रिया है।

उपरोक्त कथनों में से सही कथन है।

- (A)I तथा II(B) II तथा III
- (C) III तथा IV(D) I तथा IV

29. Hard water required for an experiment is not available in a school laboratory. However, following salts are available in the laboratory. Select the salt which may be dissolved in water to make it hard for the experiment : 1

- (1) Calcium sulphate
- (3) Potassium chloride
- (4) Sodium hydrogen carbonate
- (a) (1), (2) and (4)
- (c) (3), (5) and (6)

- (2) Sodium sulphate
- (4) Potassium sulphate
- (6) Magnesium chloride
- (b) (1), (3) and (6)
- (d) (2), (4) and (5)

किसी प्रयोग को करने के लिए आवश्यक कठोर जल स्कूल की प्रयोगशाला में उपलब्ध नहीं है। परन्तु प्रयोगशाला में नीचे दिए लवण उपलब्ध हैं। उन लवणों को चुनिए जिनको जल में घोलने पर प्रयोग के लिए आवश्यक कठोर जल बन जाएगा।

- (1) कैल्सियम सल्फेट
- (3) कैल्सियम क्लोराइड
- (5) सोडियम हाइड्रोजन कार्बोनेट
- (A)(1), (2) व (4)
- (C)(3),(5) व(6)

- (2) सोडियम सल्फेट
- (4) पोटैशियम सल्फेट
- (6) मैग्नीशियम क्लोराइड
- (B) (1), (3) व (6)
- (D) (2), (4) च (5)



30. A student focused the image of a distant object using a device 'X' on a white screen 'S' as shown in the figure. If the distance of the screen from the device is 40 cm, select the correct statement about the device.



- (A) The device X is a convex lens of focal length 20 cm
- (B) The device X is a concave mirror of focal length 40 cm
- (C) The device X is a concave mirror of radius of curvature 40 cm
- (D) The device X is a convex lens of focal length 40 cm.

किसी छात्र ने चित्र में दर्शाए अनुसार किसी दूरस्थ वस्तु का प्रतिबिम्ब एक युक्ति 'X' के द्वारा पर्दे 'S' पर प्राप्त किया। यदि पर्दे की उस युक्ति से दूरी 40 cm है, तो निम्नलिखित में से सही कथन चुनिए।

- (A) युक्ति X उत्तल लैंस है, जिसकी फोकस दूरी 20 cm है
- (B) युक्ति X अवतल दर्पण है, जिसकी फोकस दूरी 40 cm है
- (C) युक्ति X अवतल दर्पण है, जिसकी वकृता त्रिज्या 40 cm है
- (D) युक्ति X उत्तल लैंस है जिसकी फोकस दूरी 40 cm है।
- 31. A student obtained a sharp image of a burning candle, placed at the farther end of a laboratory table, on a screen using a concave mirror. For getting better value of focal length of the mirror, the subject teacher suggested him for focusing a well-illuminated distant object. What should the student do ?
 - (A)He should move the mirror away from the screen
 - (B) He should move the mirror slightly towards the screen
 - (C) He should move the mirror as well as the screen towards the newly selected object
 - (D) He should move only the screen towards the newly selected object.

किसी छात्र ने अवतल दर्पण द्वारा प्रयोगशाला-मेज के दूरस्थ सिरे पर रखी मोमबत्ती की ज्वाला का तीक्ष्ण प्रतिबिम्ब पर्दे पर प्राप्त किया। दर्पण की फोकस दूरी का और अच्छा मान प्राप्त करने के लिए शिक्षक महोदय ने उसे भली-भाँति चमकीले किसी दूरस्थ बिम्ब को फोकसित करने का सुझाव दिया। उस छात्र को क्या करना चाहिए। (A) उसे दर्पण को पर्दे से दूर सरकाना चाहि,

(B) उसे दर्पण को थोड़ा पर्दे की ओर सरकाना चाहि,

(C) उसे दर्पण तथा पर्दे दोनों को अब चुने गए नए बिम्ब की ओर सरकाना चाहि,

(D) उसे केवल पर्दे को अब चुने गए नए बिम्ब की ओर सरकाना चाहि,

32. After tracing the path of rays of light through a glass slab for three different angles of incidence, a student measured the corresponding values angle of refraction r and angle of emergence e and recorded them in the table given below : 1

S. No.	∠i	∠r	∠e
Ι	30°	20°	31°
II	40°	25°	40°
III	50°	31°	49°

The correct observations are :

(A)I and II

(B) II and III

(C) I and III (D) I, II and III

तीन विभिन्न आपतन कोणों के लिए काँच से गुजरने वाली प्रकाश किरण का पथ अनुरेखित करने के पश्चात् किसी छात्र ने तद्नुरूपी अपवर्तन कोण *r* तथा निर्गत कोण *e* के मानों को मापा और उत्तर नीचे दिए अनुसार तालिका में नोट किया %

S. No.	∠i	∠r	∠e
Ι	30°	20°	31°
II	40°	25°	40°
III	50°	31°	49°

इनमें सही प्रेक्षण हैं।

(A)I ব II	(B) II व III
(A)I 여 II	(B) II d III

(C) । व III ((D)	I, II	व	Ш
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33. Select from the following the best set-up for tracing the path of a ray of light through a rectangular glass slab : 1

(A)I	(B)	II
------	-----	----

(C) III (D) IV



काँच के आयताकार स्लैब से गुजरने वाली प्रकाश किरण का पथ अनुरेखित करने के लिए नीचे दी गई व्यवस्थाओं में से सर्वश्रेष्ठ व्यवस्था कौन–सी है।



34. While performing the experiment to trace the path of a ray of light passing through a glass prism, four students marked the incident ray and the emergent ray in their diagrams in the manner shown below : 1

The correct path of the rays has been shown by :

(A)I	(B)	II
(C) III	(D)	IV

काँच के प्रिज्म से गुजरने वाली प्रकाश किरण का पथ अनुरेखित करने का प्रयोग करते समय चार छात्रों ने अपने आरेखों में आपतित किरण तथा निर्गत किरण के पथ नीचे दिए गए ढंग से दर्शाए।



- 35. In an experiment to trace the path of a ray of light through a glass prism for different values of angles of incidence a student would find that the emergent ray :
 - (A) is parallel to the incident ray
 - (B) is perpendicular to the incident ray
 - (C) is parallel to the refracted ray
 - (D) bends at an angle to the direction of incident ray

आपतन कोण के विभिन्न मानों के लिए काँच के प्रिज्म से गुजरने वाली प्रकाश किरण का पथ अनुरेखित करने के प्रयोग में कोई छात्र यह प्रेक्षण करेगा कि निर्गत किरण।

- (A)आपतित किरण के समान्तर है (B) आपतित किरण के लम्बवत् है
- (C) अपवर्तित किरण के समान्तर है
- (D)आपतित किरण की दिशा से किसी कोण पर झुक जाती है।
- 36. Study the following ray diagrams :

The diagrams showing the correct path of the ray after passing through the lens are :





Paper



निम्नलिखित किरण आरेखों का अध्ययन कीजिए।

उन आरेखों को चुनिए जिनमें लैंस से गुजरने के पश्चात् प्रकाश किरण का सही पथ दर्शाया गया है।

- (A) केवल II व III(B) केवल I व II
- (C) I, II ㅋ III (D) I, II ㅋ IV
- 37. Out of the five incident rays shown in the figure find the three rays that are obeying the laws of refraction and may be used for locating the position of image formed by a convex lens :

(A) 1, 2 and 3	(B) 2, 3 and 4
(C) 3, 4 and 5	(D) 1, 2 and 4

आरेख में दर्शायी गई पाँच आपतित किरणों में से उन तीन किरणों को चुनिए जो अपवर्तन के नियमों का पालन कर रही हैं और जिनका उपयोग उत्तल लैंस द्वारा बने प्रतिबिम्ब की स्थिति ज्ञात करने में किया जा सकता है।



38. A student after observing a slide showing different stages of binary fission in amoeba draws the following diagrams. However, these diagrams are not in proper sequence : 1

The correct sequence is :

(A) I, V, IV, III, II	(B) I, III, IV, V, II
(C) I. V. III. IV. II	(D) I. IV. V. III. II

अमीबा में द्विखण्डन के विभिन्न चरणों की किसी स्लाइड का प्रेक्षण करने के पश्चात् किसी छात्र ने नीचे दिए गए आरेख खींचे, जो उचित कृम में नहीं दिए गए हैं।



इनका सही कृम है।

- (A) I, V, IV, III, II
- (C) I, V, III, IV, II

(B) I, III, IV, V, II(D) I, IV, V, III, II

- 39. Select the correct statements for the process of budding in yeast :
 - I. A bud arises from a particular region on a parent body.
 - II. A parent cell divides into two daughter cells, here the parental identity is lost.
 - III. Before detaching from the parent body a bud may form another bud.
 - IV. A bud when detaches from the parent body grows into a new individual.
 - (A) I, II and III (B) II, III and IV
 - (C) III, IV and I (D) IV, I and II

यीस्ट में मुकुलन की प्रक्रिया के लिए सही कथन चुनिए।

- I. मुकुल "तश्काय के किसी विशेष भाग से उगता है।
- II. पितृ कोशिका दो संतति कोशिकाओं में विभाजित होती है तथा इसमें पैतृक पहचान लुप्त हो जाती है।
- III. पितृकाय से पृथक् होने से पूर्व मुकुल एक अन्य मुकुल बना सकता है।
- IV. जब कोई मुकुल पितृकाय से पृथक् हो जाता है तब वह नया जीव बन जाता है।
- (A) I, II ㅋ III (B) II, III ㅋ IV
- (C) III, IV ㅋ I (D) IV, I ㅋ II
- 40. Study the different conclusions drawn by students of a class on the basis of observations of preserved/available specimens of plants and animals.
 - I. Potato and sweet potato are analogous organs in plants.
 - II. Wings of insects and wings of birds are homologous organs in animals.
 - III. Wings of insects and wings of bats are analogous organs in animals.

IV. Thorns of citrus and tendrils of cucurbita are analogous organs in plants.

The correct conclusions are :

(A) I and II

(C) I and III

(B) II and IV(D) III and IV



पादप एवं जंतुओं के उपलब्ध/परिरक्षित नमूनों के प्रेक्षणों के आधार पर किसी कक्षा के छात्रों के विभिन्न निष्कर्षों का अध्ययन कीजिए।

- I. आलू तथा शकरकंदी पादपों में समरूप अंग हैं।
- II. कीटों के पंख तथा पक्षियों के पंख जन्तुओं में समरूप अंग हैं।
- III. कीटों के पंख तथा चमगादड़ों के पंख जन्तुओं में समरूप अंग हैं।
- IV. सिट्रस के कंटक तथा कुकुरबिटा (अमरबेल) का प्रतान पादपों में समरूप अंग हैं। इनमें सही निष्कर्ष हैं।
- (A) I ㅋ II (B) II ㅋ IV
- (C) I ㅋ III (D) III ㅋ IV
- 41. You have potato, carrot, radish, sweet potato, tomato and ginger bought from the market in your jute bag. Identify two vegetables to represent the correct homologous structures.
 - (A) Potato and tomato (B) Carrot and tomato
 - (C) Potato and sweet potato (D) Carrot and radish

आपके जूट के थैले में बाजार से खरीद कर लायी गई सब्जियाँ जैसे आलू, गाजर, मूली, शकरकंदी, टमाटर तथा अदरक हैं। इनमें से दो वनस्पति पहचानिए जो समजात संरचनाओं को निरू"त करती हैं।

- (A) आलू तथा टमाटर (B) गाजर तथा टमाटर
- (C) आलू तथा शकरकंदी (D) गाजर तथा मूली
- 42. In the figure, the parts marked A, B and C are sequentially :
 - (A) Plumule, Radicle and Cotyledon
 - (B) Radicle, Plumule and Cotyledon
 - (C) Plumule, Cotyledon and Radicle
 - (D) Radicle, Cotyledon and Plumule

दर्शाए गए आरेख में A, B तथा C भाग कृमश: हैं।



- (A) प्रांकुर, मूलांकुर तथा बीजपत्र(C) प्रांकुर, बीजपत्र तथा मूलांकुर
- (B) मूलांकुर, प्रांकुर तथा बीजपत्र
- (D) मूलांकुर, बीजपत्र तथा प्रांकुर

Summative Assessment-II, 2015-16 Subject : Science

Class : X

Time allowed : 3 Hours]

[Maximum Marks : 90

General Instructions :

- (i) The question paper comprises of two sections, A and B. You are to attempt both the sections.
- (ii) All questions are compulsory.
- (iii) There is no choice in any of the questions.
- (iv) All questions of Section A and all questions of Section B are to be attempted separately.
- (v) Question numbers 1 to 3 in Section A are one mark questions. These are to be answered in one word or in one sentence.
- (vi) Question numbers 4 to 6 in Section A are two marks questions. These are to be answered in about 30 words each.
- (vii) Question numbers 7 to 18 in Section A are three marks questions. These are to be answered in about 50 words each.
- (viii) Question numbers 19 to 24 in Section A are five marks questions. These are to be answered in about 70 words each.
- (ix) Question numbers 25 to 33 in Section B are multiple choice questions based on practical skills. Each question is a one mark question. You are to select one most appropriate response out of the four provided to you.
- (x) Question numbers 34 to 36 in Section B are questions based on practical skills. Each question is a two marks question.

सामान्य निर्देश

- (i) प्रश्न-पत्र को दो भागों, भाग-अ और भाग-ब में बाँटा गया है। आपको दोनों भागों के प्रश्नों के उत्तर लिखने हैं।
- (ii) सभी प्रश्नों के उत्तर अनिवार्य हैं।
- (iii) पूरे प्रश्न-पत्र में किसी प्रश्न में कोई चयन प्राप्त नहीं है।
- (iv) आपको भाग-अ और भाग-ब के सभी प्रश्नों के उत्तर पृथक्-पृथक् लिखने होंगे।





- (v) भाग-अ के प्रश्न संख्या 1 से 3 के प्रश्न एक-एक अंक के हैं। इनके उत्तर एक शब्द अथवा एक वाक्य में दें।
- (vi) भाग-अ के प्रश्न संख्या 4 से 6 के प्रश्न दो-दो अंकों के हैं। इनके उत्तर लगभग 30 शब्दों में देने हैं।
- (vii) भाग-अ के प्रश्न संख्या 7 से 18 के प्रश्न तीन-तीन अंकों के हैं। इनके उत्तर लगभग 50 शब्दों में देने हैं।
- (viii) भाग-अ के प्रश्न संख्या 19 से 24 के प्रश्न पाँच-पाँच अंकों के हैं। इनके उत्तर लगभग 70 शब्दों में देने हैं।
- (ix) भाग-ब के प्रश्न संख्या 25 से 33 के प्रश्न प्रयोगात्मक कौशल पर आधारित बहुविकल्पी प्रश्न हैं। प्रत्येक प्रश्न एक अंक का है। दिए गए चार विकल्पों में से आपको केवल एक सबसे उपयुक्त विकल्प चुनना है।
- (x) भाग-ब के प्रश्न संख्या 34 से 36 के प्रश्न प्रयोगात्मक कौशल पर आधारित प्रश्न हैं। प्रत्येक प्रश्न दो अंकों का है।

SECTION 'A'

(भाग-अ)

1

1

 The formula of citric acid is shown below : State the name of functional group in it. सिट्रिक अम्ल का सूत्र निम्न है। इसके प्रकार्यात्मक समूह का नाम लिखिए। COOH

$$| CH_2 \\ | H_3C - C - COOH \\ | CH_2 \\ | COOH$$

When does the process of gene flow take place ?
 जीन प्रवाह को प्रक्रिया कब घटित होती है।

- Mention the two areas emphasized by watershed management.
 जलसंभर प्रबंधन द्वारा जिन दो क्षेत्रों पर महत्व दिया जाता है, उन्हें लिखिए।
- 4. What is meant by least distance of distinct vision ? Give the value of near point and far point for a normal human eye.
 २ स्पष्ट दर्शन की न्यूनतम दूरी का क्या अभिप्राय है ? सामान्य मानव नेत्र के लिए दूर-बिन्दु और निकट-बिन्दु का मान लिखिए।
- Arrange the following substances under recycle and reuse categories : 2 Glass, paper, plastic bottle, metallic objects.
 निम्न पदार्थों को पुन: प्रयोग और पुन: चक्रण वर्गों में वर्गीकृत कीजिए – काँच, कागज, प्लास्टिक की बोतल, धात की वस्तएँ।

6. Coal produces energy on burning, but we do not get energy by eating it while eating an apple gives us energy. Explain why is it so.
2 कोयला जलने पर ऊर्जा देता है, परन्तु इसे खा लेने से हमें ऊर्जा प्राप्त नहीं होती है, जबकि सेब खाने से हमें ऊर्जा प्राप्त होती है। समझाइए ऐसा क्यों होता है।

- 7. Write balanced chemical equations for the following :
 - (a) Reaction of sodium with ethanol
 - (b) Heating ethanol with excess conc. sulphuric acid at 443 K
 - (c) Reaction of ethanoic acid with sodium hydroxide

निम्न के लिए संतुलित रासायनिक समीकरण लिखिए —

- (a) एथेनॉल से सोडियम की अभिक्रिया
- (b) 443 K तापमान पर एथेनॉल को आधिक्य सांद्र सल्फ्यूरिक अम्ल के साथ गर्म करना
- (c) एथेनॉइक अम्ल की सोडियम हाइड्रॉक्साइड के साथ अभिक्रिया
- 8. A molecule of ethane has the chemical formula C₂H₄. Draw electron dot structure of this molecule. Mention the number of single, double or triple bonds present in this molecule.
 3

एथीन के अणु का रासायनिक सूत्र C_2H_4 है। इसकी इलेक्ट्रॉन बिन्दु संरचना लिखिए। इसके अणु में एकल आबन्ध, द्वि-आबन्ध अथवा त्रि-आबन्धों की संख्या लिखिए।

- 9. (a) Find the atomic number of the element that belongs to second group and has :
 - (i) 2 shells
- (ii) 3 shells

- (iii) 4 shells
- (b) Identify the elements.





- (a) उन तत्वों की कृमश: परमाणु संख्या ज्ञात कीजिए जो दूसरे समूह में रखे गए हैं और जिनमें कृमश:
- (i) 2 कोश है। (ii) 3 कोश है।
- (iii) 4 कोश है।
- (b) इन तत्वों को पहचानिए।
- 10. An element has electronic configuration 2, 8, 8, 1.
 - (a) Write the atomic number of this element.
 - (b) To which period does this element belong ? Name the element.

3

3

(c) Write the chemical formula of its oxide.

किसी तत्व का इलेक्ट्रॉनिक विन्यास 2, 8, 8, 1 है।

- (a) इस तत्व की परमाणु संख्या लिखिए।
- (b) यह किस आवर्त से सम्बन्ध रखता है? इसका नाम लिखिए।
- (c) इस तत्व के ऑक्साइड का रासायनिक सूत्र लिखिए।
- 11. What are the different ways in which individuals with a particular trait may increase in population ? Why the traits acquired during the lifetime of an individual not inherited ?

किसी समष्टि में विशिष्ट लक्षण की व्यष्टियों की वर्शद्ध किन विभिन्न पथों द्वारा हो सकती है? किसी व्यक्ति के जीवनकाल में उपार्जित लक्षण वंशानुगत क्यों नहीं होते।

- 12. (a) What function is performed by human arms, forelimbs of dog and forelimbs of whales ?
 - (b) Which type of organs are these ?
 - (c) Why do we call them so ?
 - (a) मानव के अग्रपादों, कुत्ते के अग्रपादों तथा व्हेल के अग्रपादों द्वारा किए जाने वाले कार्य क्या हैं।
 - (b) ये अंग किस प्रकार के हैं।
 - (c) हम इन्हें इस प्रकार के अंग क्यों कहते हैं।
- 13. Study the diagram given below :
 - (a) Identify the process.

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- (b) Which organism uses the above method for reproduction ?
- (c) How is the above method different from the process of budding ? 3



- (a) प्रक्रिया को पहचानिए।
- (b) उपरोक्त जनन विधि को प्रयोग करने वाले जीवन का नाम लिखिए।
- (c) उपरोक्त विधि मुकुलन प्रक्रिया से किस प्रकार भिन्न है।
- 14. Give the function of the following parts of a flower :
 - (a) Stigma (b) Male germ cell
 - (c) Style

पुष्प के निम्न भागों के प्रकार्य लिखिए –

- (a) वर्तिकाग्र (b) नर युग्मक
- (c) वर्तिका
- 15. What is the importance of DNA copying in reproduction ? Why do offsprings formed by asexual reproduction are genetically similar to their parents ? 3

जनन में DNA प्रतिड्डति का क्या महत्व है? अलैंगिक जनन द्वारा उत्पन्न संतति अपने जनक से आनुवंशिक रूप से किस प्रकार एकसमान होती है।

16. Name two defects of vision. Mention their cause and the type of lenses used to correct them.3

दो दशष्टि दोष लिखिए। इनके कारण लिखिए और इन्हें संशोधित करने के लिए प्रयुक्त लैंस के प्रकार लिखिए।

- 17. Rohit wants to have an erect image of an object, using a converging mirror of focal length 40 cm.
 - (a) Specify the range of distance where the object can be placed in front of the mirror. Give reason for your answer.
 - (b) Will the image be bigger or smaller than the object ?
 - (c) Draw a ray diagram to show the image formation in this case.

रोहित 40 cm फोकस दूरी के किसी अभिसारी दर्पण का प्रयोग करके एक वस्तु का सीधा प्रतिबिम्ब प्राप्त करना चाहता है।





3

- (a) वस्तु की दर्पण से उस दूरी का परिसर लिखिए जहाँ वस्तु को रखा जा सकता है। अपना उत्तर कारण सहित दीजिए।
- (b) प्रतिबिम्ब का साइज वस्तु से छोटा होगा अथवा बड़ा।
- (c) इस स्थिति में प्रतिबिम्ब की रचना का किरण आरेख खींचिए।
- 18. Recently the Delhi Government has imposed a ban on use of polythene bags. After this many shopkeepers have started using paper/jute/cloth bags.
 - (a) Mention two reasons why polythene bags are not environment friendly.
 - (b) Is the decision of using paper bags correct ? Comment.
 - (c) Mention the associated values.

हाल में दिल्ली सरकार ने पॉलीथीन थैलों के उपयोग पर प्रतिबंध लगाया है। इसके पश्चात् बहुत-से दुकानदारों ने पेपर/जूट/कपड़े के थैलों का उपयोग करना आरंभ कर दिया है।

- (a) पॉलीथीन की थैलियाँ पर्यावरण हितैषी क्यों नहीं हैं ? किन्हीं दो कारणों का उल्लेख कीजिए।
- (b) क्या पेपर से बने थैलों के उपयोग का निर्णय सही है? टिप्पणी कीजिए।
- (c) सम्बद्ध मूल्यों का उल्लेख कीजिए।
- 19. H, Li, Na and K are the elements of same group of Modern Periodic Table.
 - (a) Arrange them in increasing order of their atomic size.
 - (b) How many valence electrons would each have ?
 - (c) How many shells are present in each?
 - (d) Which amongst them is most electropositive ?

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- H, Li, Na और K आधुनिक आवर्त सारणी के एक ही समूह के तत्व हैं।
- (a) इन्हें इनके परमाणु साइज के बढ़ते कृम में व्यवस्थित कीजिए।
- (b) प्रत्येक में कितने संयोजनकता इलेक्ट्रॉन होंगे।
- (c) प्रत्येक में कितने कोश हैं।
- (d) इनमें से कौन सबसे अधिक वैद्युत धनात्मक है।
- 20. (a) Explain the importance of fossils in deciding evolutionary relationships.
 - (b) What factors could lead to the rise of new species ? Explain any three briefly.5
 - (a) विकासीय सम्बन्ध सुनिश्चित करने के लिए जीवाश्मों के महत्व को स्पष्ट कीजिए।
 - (b) वे कौन-से कारक हैं जो जाति उद्भव की ओर ले जाते हैं? किन्हीं तीन का संक्षेप में वर्णन कीजिए।

- 21. (a) Name any three asexual modes of reproduction.
 - (b) Explain with diagram the method by which planaria reproduces.
 - (c) How is spore formation different from fragmentation ?
 - (a) अलैंगिक जनन की कोई तीन विधियाँ लिखिए।
 - (b) चित्र की सहायता से उस विधि को समझाइए जिससे प्लेनेरिया जनन करता है।
 - (c) बीजाणु समासंघ खंडन से किस प्रकार भिन्न है।
- 22. (a) Explain atmospheric refraction.
 - (b) Traffic signals on crossroads are of red colour. Give reason for choosing only this colour.
 - (c) Explain why do stars twinkle but planets do not twinkle. Draw diagram to support your answer.
 - (a) वायुमंडलीय अपवर्तन को समझाइए।
 - (b) चौराहों पर ट्रैफिक "ग्नल लाल रंग के होते हैं। केवल इसी रंग को चुनने का कारण लिखिए।
 - (c) समझाइए कि तारे क्यों टिमटिमाते हैं, जबकि ग्रह नहीं टिमटिमाते हैं। अपना उत्तर चित्र की सहायता से समझाइए।
- 23. (a) Explain the term refractive index. Differentiate between relative and absolute refractive index.
 - (b) A coin in a beaker appears above than its actual level as the beaker is slowly filled with water. Explain why.
 - (a) पद अपवर्तनांक को स्पष्ट कीजिए। आपेक्षिक तथा निरपेक्ष अपवर्तनांक में विभेदन कीजिए।
 - (b) बीकर में रखा सिक्का, उस बीकर में धीरे–धीरे जल भरे जाने पर ऊपर की ओर उठता प्रतीत होता है। कारण लिखिए।
- 24. Draw the ray diagram in each of the following cases to show the position and nature of the image formed when the object is placed : 5
 - (a) at the centre of curvature of a concave mirror
 - (b) between the pole P and focus F of a concave mirror
 - (c) between the pole P and infinity of a convex mirror
 - (d) at 2 of a convex lens
 - (e) at infinity in front of a concave lens

नीचे दिए गए प्रत्येक प्रकरण में बनने वाले प्रतिबिंब की स्थिति तथा प्रति दर्शाने के लिए किरण आरेख खींचिए। जब वस्तु स्थित है —





- (a) अवतल दर्पण के वकृता केन्द्र पर
- (b) अवतल दर्पण के ध्रुव P तथा फोकस F के मध्य
- (c) उत्तल दर्पण के ध्रुव P तथा अनंत के बीच
- (d) उत्तल लैंस के 2F पर
- (e) अवतल लैंस के सामने अनंत पर

SECTION 'B'

(भाग-ब)

- 25. After performing saponification reaction, Rupal dipped a strip of red litmus paper in the resulting mixture. Which of the following is a correct observation?
 - (a) Red litmus changes to white (b) Red litmus changes to green
 - (c) Red litmus changes to blue (d) Red litmus remains red

साबुनीकरण अभिक्रिया सम्पन्न करने के पश्चात् रूपल ने लाल लिटमस पत्र की पत्री परिणामी मिश्रण में डुबोई। नीचे दिए गए में से कौन-सा प्रेक्षण सही है।

- (a) लाल लिटमस सफेद हो जाता है (b) लाल लिटमस हरा हो जाता है
- (c) लाल लिटमस नीला हो जाता है (d) लाल लिटमस लाल ही रहता है।

26. In the process of preparation of soap, the purpose of adding sodium chloride is : 1

- (a) complete saponification (b) complete hydrolysis
- (c) complete precipitation (d) complete neutralization

साबुन तैयार करने की प्रक्रिया में सोडियम क्लोराइड मिलाने का उक्श्य है —

- (a) संपूर्ण साबुनीकरण (b) संपूर्ण जलीकरण
- (c) संपूर्ण अवक्षेपण (d) संपूर्ण उदासीनीकरण।
- 27. The cleansing action of soap will be the most in the water obtained from the source : 1
 - (a) tap (b) rain
 - (c) well (d) hand pump

जिस स्रोत द्वारा प्राप्त जल में साबुन की सफाई प्रक्रिया सबसे अधिक होगी, वह है —

- (a) टोंटी (b) वर्षा
- (c) कुआँ (d) हैंड पंप
- 28. While doing an experiment, a student found that if the object moves from infinity towards pole of a mirror, the image also moves from pole to infinity.

The mirror must be :

- (a) diverging (b) concave
- (c) convex (d) plane

एक प्रयोग करते हुए, किसी छात्र ने पाया कि यदि बिंब को अनंत से दर्पण के ध्रुव की ओर लाया जाए, तो प्रतिबिंब भी ध्रुव से अनंत की ओर स्थानांतरित होता है। दर्पण होगा —

- (a) अपसारी (b) अवतल
- (c) उत्तल (d) समतल
- 29. The convex lenses A and B have same aperture with thickness 1 cm and 1.5 cm respectively. Then : 1
 - (a) $f_A = f_B$ (b) $f_A > f_B$

(c)
$$f_A < f_B$$
 (d) $f_A = \frac{2}{3} f_B$

दो उत्तल लेंस A तथा B की मोटाई कृमश: 1 cm तथा 1.5 cm तथा द्वारक समान है। तब —

- (a) $f_A = f_B$ (b) $f_A > f_B$ (c) $f_A < f_B$ (d) $f_A = \frac{2}{2} f_B$
- 30. The following are the steps (not in sequence) for doing an experiment on tracing the path of the ray of light passing through a rectangular glass slab : 1
 - (i) Draw the outline of the glass slab at three positions on the drawing sheet.
 - (ii) Draw the incident rays on the three outlines in the direction making angles 30°, 40° and 60° with the normal drawn.
 - (iii) Draw normals on the top side of these outlines near their left hand.
 - (iv) Look for the images on the bases of these pins while fixing two pins from other side to get emergent ray.
 - (v) Fix two pins vertically on each of these incident rays at two points nearly 6 cm apart.
 - (a) (i), (iii), (ii), (iv), (v) (b) (i), (ii), (iii), (v), (iv)
 - (c) (i), (iii), (i), (v), (iv) (d) (i), (iii), (iv), (ii), (v)

किसी काँच के आयताकार स्लैब से गुजरती हुई प्रकाश की किरण का पथ आरेखित करने के प्रयोग में निम्न चरण दिए गए हैं जो कृमानुसार नहीं हैं —

- (i) ड्राइग शीट में तीन स्थानों पर काँच की स्लैब की बहिरेखा खींचिए।
- (ii) तीन स्थानों पर खींचे गए अभिलंब के साथ 30°, 40° तथा 60° के कोणों पर आपतित करण खींचिए।



- (iii) तीनों बहिरेखाओं के बायीं ओर ऊपर की तरफ अभिलंब खींचिए।
- (iv) निर्गत किरण प्राप्त करने के लिए दूसरी ओर दो "नें गाड़ते हुए "नों के पैरों के प्रतिबिंब की ओर देखिए।
- (v) प्रत्येक आपतित किरण के दो स्थानों पर जो 6 cm की दूरी पर हैं, दो "नों को ऊर्ध्वाधर गाडि़ए।

प्रयोग के चरणों का सही कृम है –

- (a) (i), (iii), (ii), (iv), (v) (b) (i), (ii), (iii), (v), (iv)
- (c) (i), (iii), (i), (v), (iv) (d) (i), (iii), (iv), (ii), (v)

31. A student while doing the experiment of tracing the path of a ray of light through a triangular glass prism not able to see the image of object (pins). This may be due to :

- (a) angle of incidence is 40° (b) angle of incidence is 10°
- (c) brightness in laboratory (d) prism is placed on a white paper

कोई छात्र काँच के त्रिभुजाकार प्रिज्म से गमन करती हुई प्रकाश की किरण का पथ आरेखित करने के प्रयोग में बिंब (पिन) का प्रतिबिम्ब नहीं देख पाता है। ऐसा होने का कारण है —

- (a) किरण का आपतन कोण 40° है (b) किरण का आपतन कोण 10° है
- (c) प्रयोगशाला में दीप्ति है (d) प्रिज्म श्वेत पेपर पर रखा गया है।

32. Tendrils in Passiflora are modified stems, tendrils in Pea are modified leaflets and thorns of Bougainvillea are modified stems. The homologous organs are of : 1

- (a) Passiflora and Pea (b) Passiflora and Bougainvillea
- (c) Pea and Bougainvillea (d) Pea, Passiflora and Bougainvillea

पेसीफ्लोरा के प्रतान रूपान्तरित तने हैं, मटर के प्रतान रूपान्तरित पत्तियाँ हैं और बोगनविला के काँटे रूपान्तरित तने हैं। इनमे से तने समजात अंग हैं —

- (a) पेसीफ्लोरा तथा मटर के (b) पेसीफ्लोरा तथा बोगनविला के
- (c) मटर तथा बोगनविला के (d) मटर, पेसीफ्लोरा तथा बोगनविला के
- 33. A student drew a sketch of a cotyledonous seed as shown below, but he did not label it. The correct labeling for parts A, B, C and D respectively is : 1
 - (a) radicle, plumule, cotyledon, seed coat
 - (b) plumule, radicle, cotyledon, seed coat
 - (c) radicle, plumule, seed coat, cotyledon
 - (d) plumule, radicle, seed coat, cotyledon



एक छात्र ने द्विबीजपत्री बीज का निम्न आरेख खींचा, परन्तु उसका नामांकन नहीं किया। भागों A, B, C तथा D का सही नामांकन कुमश: है —

- (a) मूलांकुर, प्रांकुर, बीजपत्र, बीज आवरण
- (b) प्रांकुर, मूलांकुर, बीजपत्र, बीज आवरण
- (c) मूलांकुर, प्रांकुर, बीज आवरण, बीजपत्र
- (d) प्रांकुर, मूलांकुर, बीज आवरण, बीजपत्र
- 34. The following symbols A and B are usually shown on the bottle of commercial acetic acid. What do these symbols indicate ? 2



व्यावसायिक एसीटिक अम्ल की बोतल पर प्राय: उपरोक्त A तथा B चिन्ह दर्शाए जाते हैं। यह चिक्या इंगित करते हैं।

35. A student is given a permament slide showing binary fission in amoeba.Write the various steps to focus slide under microscope.2

एक छात्र को अमीबा में द्विखंडन दर्शाती हुई स्थायी स्लाइड दी गई है। स्लाइड को सूक्ष्मदर्शी के नीचे फोक"त करने के विभिन्न चरण लिखिए।

36. Image formed by a convex lens is inverted, magnified and beyond 2F. The object is placed between..... and.....of the lens. Draw a ray diagram to justify your answer.

उत्तल लेंस द्वारा निर्मित प्रतिबिंब वास्तविक, उलटा, आवर्धित तथा 2F से परे है। बिंब रखा गया है लेंस के......तथा.....तथा.....के मध्य।

अपने उत्तर की पुष्टि के लिए किरण आरेख खींचिए।





MARKING SCHEME Summative Assessment-II, (2015-16) Science (Class : X)

General Instructions :

- (i) The Marking Scheme provides general guidelines to reduce subjectivity and maintain uniformity. The answers given in the marking scheme are the best suggested answers.
- (ii) Marking be done as per the instructions provided in the marking scheme. (It should not be done according to one's own interpretation or any other consideration).
- (iii) Alternative methods be accepted. Proportional marks be awarded.
- (iv) If a question is attempted twice and the candidate has not crossed any answer, only first attempt be evaluated and 'EXTRA' be written with the second attempt.
- (v) In case where no answers are given or answers are found wrong in this Marking Scheme, correct answers may be found and used for evaluation purpose.

SECTION A

- 1. Carboxylic acid
- 2. When population is not completely separated.
- 3. Soil and water conservation.
- 4. The minimum distance, at which objects can be seen most distinctly without strain, is called the least distance of distinct vision. It is also called the near point of the eye. 1 + 1 = 2

For a young adult with normal vision, the near point is about 25 cm. The farthest point upto which the eye can see objects clearly is called the far point of the eye. It is infinity for a normal eye.

- 5. Reuse Paper and plastic bottle; Recycle Metal and glass 1 + 1 = 2
- 6. Cannot be broken down into simple substances by enzymes present in our body, so no energy released. But apple gets broken down by enzymes present in the body and chemical reactions involved release of energy. 1 + 1 = 2
- 7. (i) $2Na + 2CH_3CH_3OH \cong 2CH_3CH_2ONa + H_2$ $1 \times 3 = 3$

Sodium methoxide

1

1

1

(ii)
$$CH_3 - CH_2OH \xrightarrow{Hot conc.} H_2SO_4 \rightarrow CH_2 = CH_2 + H_2O$$

Ethene

(iii)
$$NaOH + CH_3COOH \cong CH_3COONa + H_2O$$

Sodium ethanoate

8.



Η Η Η Η

Single bond – 4 Double bond -1Triple bond - None

Or

9. (a) (i) 4
$$1\frac{1}{2}$$

(b) Be; Mg; Ca
$$1\frac{1}{2}$$

(i) Atomic number - 19 $1 \times 3 = 3$

- (ii) It belongs to 4th period. Its name is potassium.
- (iii) Its oxide is K₂O.
- 11. Natural selection, genetic drift.

Acquired traits : Traits that are not inherited but develop in response to the environment. These are not genetically inherited. 1

E.g.,

- Tailless mice will not have tailless progeny.
- Reduction in size because of starvation.
- 12. (a) Human arm holding things $1\frac{1}{2}$ Forelimb of dog – running Forelimb of whale - paddles ... <u>a</u> \ 1 /

Budding – A bud develops as on outgrowth due to repeated all division at one specific site e.g., hydra.



 $1\frac{1}{2}$

 $1\frac{1}{2}$

- 14. (a) Receiving pollen grain. $1 \times 3 = 3$ (b) Fuses with the female germ cell for fertilization. (c) Has the growing pollen tube. 15. Transfer of characters from parents to offsprings. Error in copying leads to variations necessary for evolution. Asexual reproduction - Single parent offspring genetically identical. 1 + 1 + 1 = 316. Myopia – Person can see near objects clearly but not far off objects. Cause – Elongation of eye ball. Remedy – Using concave lens. $1\frac{1}{2}$ Hypermetropia – Person can see far objects clearly but not near objects. Cause – Shortening of eye ball. Remedy – Using convex lens. $1\frac{1}{2}$ 0-40 cm, because to obtain erect image, which is virtual, object has to 17. (a) be placed between pole and focus. 1 1 (b) Bigger. (c) For ray diagram refer Fig. 10.7 (f) Page 166 NCERT Text-book 1 It takes a lot of time to decompose. Made of chemicals which pollute 18. (a) the environment, burning leads to harmful gases. 1 Use of paper bags will encourage cutting of trees, so it is incorrect, (b) instead we should use cloth or jute bags. 1 (c) Concern towards the environment, responsible citizen. 1 19. (a) H, Li, Na, K 1 Each has 1 valence electron. 1 (b) 2 (c) H - 1 shell Li - 2 shells Na - 3 shells K - 4 shells (d) K is most electropositive. 20. (a) Age of fossil can be found out by the estimation of the depth of the layer of rocks in which it is found. It can also be found out from the ratio of isotopes in the fossil contains rocks. 2 3 (b) (i) Genetic drift with brief explanation (ii) Natural selection with brief explanation (iii) Mutation with brief explanation Fission, regeneration, budding $1\frac{1}{2}$ 21. (a) (b) Planaria reproduces by regeneration. $1\frac{1}{2}$
 - For diagram, Figure 8.3, Page 131

(c) Fragmentation – Formation of many fragments each forming new individual, multi-cellular.

Spore formation – In many simple multi-cellular organisms thread like structures develop, they have tiny blob-on-a-stick involved in reproduction. The blobs are sporangia which contain spores that develop into new rhiopus individuals. 1 + 1

- 22. (i) Air above the surface of earth has different temperature at different heights which continuously changes refractive index of air at different heights. So, light coming from a distant object (or sun) passes through layers of continuously varying refractive index and suffers refraction. 2
 - (ii) Red colours is least scattered by fog or smoke. Therefore, it can be seen in the same colour at distance.
 - (iii) (a) Atmospheric refraction
 - (b) Temperature of air layer changing continuously which change refractive index.

Fig. 11.9, Page 194 NCERT Textbook

Planets are comparatively closer so they behave like extended source. Average change imposition of all points becomes zero.

23. (a) Refractive index – Refractive index of medium 2 with respect to medium 1 is equal to the ratio of the speed of light in medium 1 and the speed of light in medium 2 that is : $1 \times 3 = 3$

$$n_{21} = \frac{\text{Speed of light in medium 1}}{\text{Speed of light in medium 2}} = \frac{V_1}{V_2}$$

Relative refractive index : The refractive index of a medium with respect to any medium other than vacuum or air.

- (b) It is due to refraction of light. A ray of light starting from the coin goes from water to air and bends away from the normal. Therefore, bottom of the beaker on which the coin lies appears to be raised.
- 24. (i) Figure 10.7 (c) Page 183
 - (ii) Figure 10.7 (f) Page 183
 - (iii) Figure 10.8 (b) Page 184
 - (iv) Figure 10.16 (c) Page 199
 - (v) Figure 10.17 (a) Page 199



 $1 \times 5 = 5$

SECTION 'B'

25. (c)		1
26. (c)		1
27. (b)		1
28. (b)		1
29. (b)		1
30. (b)		1
31. (b)		1
32. (b)		1
33. (d)		1
34. A –	flammable $B-Corrosive$ $1+1=$	2
35. (1)	Place the slide on the stage, look through the eyepiece and adjust the mirror and diaphragm to get even illumination. $\frac{1}{2} \times 4 =$	ne 2
(2)	Look through the eyepiece and raise the objective using coars adjustment until the object is focused.	se
(3)	Make the focus sharp with fine adjustment.	
(4)	Look through the eyepiece and move the slide until object is visible.	
36. Foci	us, centre of curvature $\frac{1}{2}, \frac{1}{2}$	/2
Ray	diagram	1
	P	q





To study saponification reaction for preparation of soap.

- 1. Soap solution turns :
 - (a) Red litmus green

- (b) Red litmus blue
- (c) Blue litmus red
- (d) Blue litmus yellow 2. A student prepared 20% sodium hydroxide solution in a beaker
 - containing water. The observation noted by him are given below :
 - Sodium hydroxide is in the form of pellets. I.
 - II. It dissolves in water readily.
 - III. The beaker appears cold when touched from outside.

IV. The red litmus paper turns blue when dipped into solution.

The correct observations are :

- (a) I, II and III
- (c) III, IV and I

- (b) II, III and IV
- (d) I, IV and III
- 3. Hard water required for an experiment is not available in a school laboratory. However, following salts are available in the laboratory. Select the salt which may be dissolved in water to make it hard for the experiment :
 - (1) Calcium sulphate
 - (3) Potassium chloride
 - (4) Sodium hydrogen carbonate
 - (a) (1), (2) and (4)
 - (c)(3), (5) and (6)

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- (2) Sodium sulphate
- (4) Potassium sulphate
- (6) Magnesium chloride
- (b) (1), (3) and (6)
- (d) (2), (4) and (5)

- 4. Acetic acid reacts with sodium hydrogen carbonate :
 - (a) Slowly forming gas
 - (b) Vigorously with effervescence
 - (c) Slowly with effervescence
 - (d) Vigorously without gas formation
- 5. Which of the following oil cannot be used for preparation of soap?
 - (a) Coconut oil (b) Paraffin oil
 - (c) Cotton seed oil (d) Linseed oil
- 6. The products obtained by saponification of oil and fats is/are :
 - (a) Only soap (b) Only detergent
 - (c) Only glycerol (d) Both soap and glycerol
- 7. The hydrolysis of oils and fats with solution of NaOH or KOH is called :
 - (a) Saponification (b) Esterification
 - (c) Neutralization (d) Dehydration
- 8. Hard water does not easily produces lather with soap because it contains :
 - (a) Only Mg²⁺ ions (b) Only Ca^{2+} ions
 - (c) Both Mg^{2+} and Ca^{2+} ions (d) Both Na^+ and K^+ ion
- 9. The cleansing action of soap will be the most in water obtained from :
 - (a) Tap (b) Rain
 - (c) Well
- 10. In the preparation of soap, the purpose of adding sodium chloride is :
 - (a) Complete saponification
 - (c) Complete precipitation
- (b) Complete hydrolysis
- (d) Complete neutralisation





(d) Hand pump

- 11. Read the following statements :
 - I. When a red litmus paper is dipped into reaction mixture of a saponification reaction, it turns blue and reaction is exothermic
 - II. When a blue litmus paper is dipped into reaction mixture of a saponification reaction, it colour does not change and the rection is exothermic
 - III. When a red litmus paper is dipped into reaction mixture of saponification reaction, its colour does not change and the reaction is endothermic
 - IV. When a blue litmus paper is dipped into reaction mixture of saponification reaction, its colour does not change and the reaction is endothermic

Which of the above statements is correct?

(a) I and II	(b)	II and III
(c) III and IV	(d)	I and IV

To study (a) binary fission in Amoeba, and (b) budding in yeast with the help of prepared slides.

1. Out of the following diagrams which one depicts a stage in binary fission of amoeba :



- 2. In which of the following types of asexual reproduction, the organization of the parent body remains :
 - (a) Binary fission (b) Budding
 - (c) Multiple fission (d) All of the above

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(a) I

(c) III

3. The diagram given below illustrates :



- (a) Bud formation in yeast
- (b) Binary fission in amoeba
- (c) Formation of daughter cells in yeast
- (d) Pseudopodia formation in amoeba
- 4. Binary fission in amoeba starts with :
 - (a) Constriction in cell membrane (b) Elongation of nucleus
 - (c) Two amoeba come together (d) Both (b) and (c)
- 5. Following diagrams were drawn by four different students on having seen a prepared slide of budding in yeast.



The correct diagram is :

- (a) I (b) II
- (c) I and III

(d) II and IV

6. The following figures illustrates binary fission in amoeba in an incorrect sequence. The correct sequence is :


To identify the different parts of an embryo of a dicot seed (Pea, gram or red kidney bean).

- 1. Grass belong to :
 - (a) Monocots

(b) Dicots

(c) Gymnosperm

- (d) Pteridophytes
- 2. In the given figure, the parts A, B and C are sequently :



- (a) Cotyledon, plumule and radicle
- (b) Radicle, plumule and cotyledon
- (c) Plumule, cotyledon and radicle
- (d) Radicle, cotyledon and plumule
- 3. Which one of the following is dicot?
 - (a) Wheat (b) Maize
 - (c) Grass (d) Pea
- 4. Thick outer seed coat is called as :
 - (a) Tegmen (b) Hilum
 - (c) Funicle (d) Testa
- 5. The part of embryo axis between radicle and point of attachment is called :
 - (a) Hypocotyl (b) Epicotyle
 - (c) Plumule (d) Hilum
- 6. Which part of the embryo axis is considered as future shoot?
 - (a) Radicle (b) Hilum
 - (c) Plumule (d) Testa



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- 7. What is true about the root ?
 - (a) Root derived from radicle of seed
 - (b) Roots have root cap
 - (c) Roots have unicellular root hair
 - (d) All of the above
- 8. The petal, sepals and stamens of the monocot flowers are usually found in :
 - (a) Threes or multiples of threes
 - (b) Fours or multiples of fours
 - (c) Twos or multiple of twos
 - (d) None of the above

CHAPTER 9

HEREDITY AND EVOLUTION

MCQ Based on Practicals

- 1. The wings of birds and insects are analogous organs. The reason for it is :
 - (a) Both perform same function
 - (b) Both perform different function
 - (c) They have same origin and function
 - (d) They have different origin and different function
- 2. Which group out of the following represents homologous organs ?
 - (a) Potato, ginger, sweet potato
 - (b) Ginger, potato, carrot
 - (c) Turnip, raddish, carrot
 - (d) Carrot, sweet potato, potato



- 3. The presence of which of the following types of organs in two organisms indicates that they are derived from the same ancestor ?
 - (a) Excretory organs (b) Reproductive organs
 - (c) Homologous organs (d) Digestive organs
- 4. Correct definition of analogous organs is :
 - (a) Different functions, same origin
 - (b) Same function, different organs
 - (c) Same or different functions, but similar origin
 - (d) Same function or different function but different origin
- 5. The forelimb of human and bird are examples of :
 - (a) Homologous organs
- (b) Analogous organs

(c) Vestigial organs

(d) Excretory organs

CHAPTER 10

LIGHT – REFLECTION AND REFRACTION

MCQ Based on Practicals

- 1. While performing an experiment to determine the focal length of a concave mirror, the mirror fell on the floor from a student's hand and the mirror broke from its center into two pieces. The student completed the experiment with one piece. The image formed by this mirror piece is :
 - (a) At the same position as it would be with the whole mirror
 - (b) Blurred for all positions of the screen
 - (c) Of same brightness as with the whole mirror
 - (d) Closer to the piece of mirror than for the whole mirro
- 2. To find the focal length of a concave mirror, four students Ram, Shamim, Kamla and Rukhsana obtained the image of the window grill on the wall. They measured the distance as given below :

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Ram – Between window grill and the wall only Shamim – Between window grill and mirror only Kamla – Between mirror and wall only Rukhsana – Between window grill and wall and also between the mirror and the wall Who obtained the correct focal length? (b) Shamim (a) Ram

(c) Kamla

(d) Rukhsana

Practical

3. While performing the experiment on tracing the path of a ray of light passing through a rectangular glass slab, four students interpreted the results as given below. The correct interpretation is :

(a)
$$\angle i > \angle e > \angle r$$
(b) $\angle i > \angle r > \angle e$ (c) $\angle i = \angle e < \angle r$ (d) $\angle i = \angle e > \angle r$

4. Four students A, B, C and D carried out the experiment to measure focal length of a concave mirror as shown in the figures :



The correct diagram is drawn by the student :

- (a) A (b) B
- (c) C (d) D

5. Study the following ray diagram in which five rays are coming towards convex lens and refract through it. Select two rays with the help of which you can determine the nature of the image formed at focus.



- 6. A student determines the focal length of a device 'X' by focusing the image of a distant object on a screen placed on the same side of the object. The device 'X' is :
 - (a) Concave lens

- (b) Convex lens
- (c) Concave mirror (d) Convex mirror
- 7. The focal length of a concave mirror shown below is equal to :



8. Four students showed the following traces of path of a ray of light passing through a rectangular glass slab.



The trace most likely to be correct is that of :

- (a) A (b) B (c) C (d) D
- 9. Where should an object be placed in front of a convex lens of focal length 'F' so that image formed is equal to size of object :
 - (a) Between 'F' and '2F'
 - (c) Beyond 2F

- (b) At 2F
- (d) None of the above
- 10. The following does not change when light enters from one medium to another :
 - (a) Velocity
 - (c) Frequency

- (b) Wavelength
- (d) None of the above

P P



