DELHI PUBLIC SCHOOL JAMMU

QUESTION BANK

SESSION: 2018-19

CLASS: X

SUBJECT: SCIENCE

Topics:

1. **Heredity and Evolution**
2. **Our Environment**
3. **Natural Resources**
4. **Light (Reflection and Refraction)**
5. **Human Eye and Colourful World**
6. **Carbon and Its Compounds**
7. **Periodic Classification of Elements**

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Important Question Bank-II

SUBJECT-BIOLOGY

CHAPTERS-1.HEREDITY AND EVOLUTION

2.OUR ENVIRONMENT

3.NATURAL RESOURCES.

1. Only variations that confer an advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not?

Ans. Variations that confer an advantage to an individual organism may or may not survive in the population depending upon the social behaviour of the organism. A variation in a social animal like ant may not survive in a population while a variation in an animal like a leopard may survive.

2. What are the different approaches to determine evolutionary history of man?

Ans. To construct evolutionary history of man, there are three approaches-
(1) Historical method- It gives direct evidence in the form of fossil records. The age of fossils can be determined by carbon dating methods.
(2) Comparative method- By comparing several existing forms, we can makes ideas about their common ancestors and reconstruct their about possible history.
(3) Analytic method- By observing present day human being vestigial organs and by studying the development pattern from embryo to adult.

3. What is fossilization? How are fossils formed?

Ans. The process of fossils formation is called fossilization. Fossils are formed when organisms die; their bodies get decomposed and lost. Sometimes the body or a part of it may be in such an environment that it does not let it decompose completely. The mud will eventually harden and retain the impression of the body parts of the organism. This mud with the impression will be called fossil of the organism

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4. What are homologous and analogous organ? Explain with the help of example.

Ans. Homologous organs are those which have similar basic structure and origin but may have different functions. For example- Hands of human beings and wings of birds.
Analogous organs- Organs which have different basic structure and origin but have similar function are called analogous organs.
For example- (1) wing of bat and wing of bird.
(2) wing of birds and wing of insect.

5. What are the different ways in which individuals with a particular trait may increase in a population?

Ans. The factors which are responsible for raising a new species are selection of environmental conditions for survival of a particular species. If a variation occurs in a population and that variation results in better survival of the organism in the prevailing natural conditions, then the trait would be selected naturally and more in the population.

6. What are the different theories about origin of life?

Ans. (a) Theory of special creation- According to this theory the almighty god created life.

(b) Theory of spontaneous generation- According to this theory, life originated from nonliving materials by the process of a biogenesis wring mud, decomposing matter, sun, air and water, etc.

(c) Cosmozoic theory- It states that life came to Earth from some heavenly bodies in the form of spores or seeds.

(d) Biogenesis- This theory states that life originated from pre-existing life.

(e) Modern theory of origin of life- According to this, complex organic molecule was formed from simple inorganic molecules only in suitable condition.

7. State three laws of Mendel.

Ans. Mendel's law-

(a)Law of dominance- when two dissimilar factors of a character are present in an organism only one expresses itself (dominant factor) while other remain unexpressed (recessive factor)

(b)Principle of segregation – two factors of a character are separated at the time of gamete formation and each gamete gets only one factor for that character.

(c)Principle of independent assortment- this principle states that inheritance of two or more pair of contrasting traits is such a way that one pair of contrasting traits is independent of the other pair of contrasting traits.

8. Describe how the sex of the offspring is determined in the zygote ins human beings?

Ans. The males can produce two types of gametes, either X-type or Y-type. The females produce only one type of gametes or ova, X-type. If X-type sperm fuses with the ovum, then the sex of the baby will be female. If Y-type sperm uses with the ovum, then the sex of the baby will be male. Sex of the baby is decided at the time. Sex of the baby is decided at the time of fertilization.

9. Give a suitable explanation for "geographical isolation of individual of a species lead to formation of a new species?

Ans. Reproduction barrier such as river (geographical isolation) between the sub population leading to:

(a)Genetic drift or random changes in the gene frequency by chance alone e.g. selection of red or blue beetles instead of green in presence of crows.

(b)Natural selection or selection of the fittest by nature itself eg. Selection of green beetles instead of red ones in the presence of crows.

10. State the evolutionary force which leads to origin of a new species.

Ans. Various elemental forces of evolution are-

(a)Mutation

(b)Recombination (Crossing over during meiosis, Random assortment of gene at the time of gamete formation).

(c)Natural selection or survival of the fittest.

(d)Genetic drift.

11. What is a fossil? How do fossils tell us about the process of evolution?

Ans. The dead remains of former living organisms are called fossils. The branch of biology which deals with the study of fossils is called paleontology. The study of fossils tells us that species arose from previously existing ones or that the evolution has occurred in nature and is still continuing.

12. How does Archaeopteryx provide evidence for organic evolution?

Ans. Archeoptyrx has some features of reptiles, characters of dinosaurs as well as some features of birds like wings. This shows that birds are closely related to reptiles. Birds could evolve from reptiles.

13. Write similarities between Mendalian's factors and gene.

Ans. Mendel proposed the inheritance of traits from parents to offsprings by hereditary units called factors. Mendel suggested that every character is controlled by a pair of factors. Sutton and Boveri (1902) found striking similarities between the behaviours of Mendelian factors and the chromosomes during meiosis and fertilization. Factor and chromosomes are present in paired condition in the parents, seprate during meiosis and again get paired after fertilization.

14. How does the creation of variations in a species promote survival?

Ans. Depending on the nature of variations different individuals would have difference kinds of advantage to adjust in particular habitat. Variation help the individual to have different traits that may develop the organisms more tolerable.

15. How do Mendel's experiments show that traits may be dominant or recessive?

Ans. In Monohybrid cross of Mendel between tall and dwarf pea plant, all progeny in generation are tall and in generation, 75% of pea plants are tall but 25% are dwarf. This shows that traits are dominant or recessive.

16. How do Mendel's experiments show that traits are inherited independently?

Ans. When a pea plant having round green seeds is crossed with a pea plant having wrinkled yellow seeds in generation all the plants have round yellow seeds. But in generation two new traits that is round yellow and wrinkled green appear. This shows that traits are inherited independently.

17. A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of the traits-blood group A or O- is dominant? Why or why not?

Ans. No, the information is not enough because the blood group is determined by a pair of gene. One inherited from mother and other from father. In this case, the child inherited gene for O blood group from mother as well as father.

18. How is the sex of the child determined in human beings?

Ans. A child which inherits X chromosome from her father will be a girl and one who inherits Y chromosome from him will be a boy.

19. What factors could lead to the rise of a new species?

Ans. Following factors could lead to the rise of new species:

(a) Changes in gene frequency in small breeding isolated populations.

(b) Natural selection

(c) Changes in number of chromosome.

20. Will geographical isolation be a major factor in the speciation of self-pollinating plant species? Why or why not?

Ans. No, because geographical barrier do not allow breeding between such individuals of a population which reproduce sexually. Moreover asexually reproducing organism pass on the parental DNA to offspring which gives no chance of speciation.

21. Will geographical isolation be a major factor in the speciation of an organism that reproduces asexually? Why or why not?

Ans. Yes, due to geographical isolation, the two populations are separated. The levels of gene flow between them will decrease. The isolated population will breed with local population resulting in entry of isolated population into new population.

22. What are fossils? What do they tell us about the process of evolution?

Ans. Preserved traces if living organisms are called fossils found closer to the surface of earth are more recent in origin than the fossils we find in deeper layers. Fossils also help us to find evolutionary relation between organisms.

23. A study found that children with light-coloured eyes are likely to have parents with light coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not?

Ans. No, since two copies of traits are inherited from parents, one from mother and the other form father. Unless we know the nature of these two variants of traits we can not tell which is dominant and which is recessive. Recessive traits appear when both the parents contribute recessive allele. From this statement we can only presume are that both parents are contributing recessive allele.

24. Explain the terms analogous and homologous organs with examples.

Ans. Analogous organs: Such organs which perform similar function but are different in structure and origin. Example- Wings of birds and wings of insects.

Homologous organs: Such organs which may have different functions but similar structure and origin. Example- fore arm of frog, lizard and bird.

25. Explain how sexual reproduction gives rise to more viable variations than asexual Reproduction. How does this affect the evolution of those organisms that reproduce sexually?

Ans. Variations arise either because of errors in DNA copying or as a result of sexual reproduction. Due to sexual reproduction genetic variability increases in the population from one generation to another. This happens due to the fact that sexually reproducing

organism inherits half the genes from each parent. These variations are very important for the process of evolution.

26. Only variations that confer an advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not?

Ans. No, depending on the nature of variations different individuals have been different kinds of advantages. However, when a drastic change occurs in environment only those organisms in the population will survive which have an advantageous variation in that population to survive in changed environment.

27. How is the equal genetic contribution of male and female parents ensured in the progeny?

Ans. Equal contribution of male and female parents is ensured in progeny during sexual reproduction. Each trait of progeny is determined by a pair of alleles and gametes of male and female contain one allele. Each allele pairs during fertilisation combine together to determine traits. Thus, the traits of progeny are determined by equal genes from male and female.

28. Why are traits acquired during life-time of an individual not inherited?

Ans. Traits acquired during life-time of an individual not inherited because change in nonreproductive tissue or somatic cells cannot be passed on to the DNA of germ cells. Thus, the acquired trait will die with the death of the individual. It is therefore non-heritable and cannot be passed on to its progeny.

30. What are the causes of variations in clones?

Ans. i. inaccuracies during DNA copying
ii. Effect of environment termed acquired variation.
iii. Mutations are sudden stable changes which are discontinuous inheritable as produced due to changes in genetic make-up.

31. Give scientific terms for the following-

(a) the process of eating and being eaten
(b) the relationship between abiotic and biotic component
Ans. (a) Food chain
(b) Ecosystem

32. What is meant by environment? Name its components.

Ans. The aggregate of all external conditions and their influences affecting the life and the development of an organism in its natural habitat is environment. It has two components-
(1) Abiotic components (non-living): For example- air, water, soil, temperature, etc.
(2) Biotic components (living): For example- Plant, animals and micro-organisms.

33. What is 10% law? Give an example.

Ans. According to 10% law only 10% of energy is available at the next trophic level. For example- If energy available at producer level is 1000J then at next level only 10% of 1000J i.e. 100J is available.

34. What is artificial ecosystem? Give two examples.

Ans. Man-made ecosystem are called artificial ecosystem. For example- Garden, Aquarium.

35. Energy transfer is said to be unidirectional whereas biochemical transfer is said to be cyclic. Why?

Ans. The flow of energy is unidirectional because the energy lost as heat to the environment can't be reutilized by plants for photosynthesis. Energy decrease at each trophic level (10% of previous level). Hence it can't be reused again. Whereas, biochemical transfer is cyclic because nutrients utilized by plants and animals are returned to environment after the death of organisms.

36. Why is there a need to ban the use of polythene bags?

Ans. Polythene bags need to be banned because they are non-biodegradable; microorganisms are not able to decompose it. So it goes on accumulating on the land and causes land pollution.

37. What is the significance of food chain?

Ans. Significance of food chain-

(a)It is a means of transfer of food from one trophic level to another.

(b)It provides information about the living components of our ecosystem.

(c)It helps us in understanding the interactions and interdependence among different organisms in an ecosystem.

(d)It is a pathway for the flow of energy in any ecosystem.

38. How would you dispose the following wastes:

(a) domestic wastes like vegetables peels

(b) industrial wastes

Ans. (a) Domestic wastes like vegetables peels should be disposed off in a pit.

(b) Industrial wastes should be treated first to remove poisonous salts or chemicals and disposed off in water resources like river.

39. Why vegetarian food habit help us in getting more energy?

Ans. A person having vegetarian food habits is closed to the producer level get maximum amount of energy as compare to the organism at higher trophic level because only 10% of energy is available at the successive level than previous level.

40. Why is there a need to ban the use of polythene bags?

Ans. Polythene bags are non- biodegradable, they are not decomposed by micro-organisms hence, cause land pollution.

41. What are the two functions of ecosystem?

Ans. Interactions of any ecosystem refers to its functions these interactions are-

(a)Biogeochemical cycles- The cyclic transfers between the living and non- living components.

(b)Flow of energy- in a food chain, through various steps of eating and being eaten food energy flow from one tropic level to another.

42. What percentage of solar energy is trapped and utilized by plants?

Ans. Plants utilized only 1% of total sun's energy, which is utilized by plants in the process of photosynthesis.

43. What are the harmful effects of acid rain?

Ans. (1) Acid rain makes the soil acidic which affects the growth of trees and cereal crops badly.
(2) It makes the water of lakes, ponds, etc acidic which affects the growth of aquatic plants and animals.
(3) Bacteria useful for maintaining soil fertility are killed.
(4) It affects the historical monuments and building badly specially those made up of marble.

44. Give any two methods reducing the problem of waste disposal.

Ans. (a) Use of recycled material.
(b) Separation of biodegradable and non-biodegradable waste during disposal.

45. What is the role of decomposers in the ecosystem?

Ans. They decompose dead remains of plants and animals and their wastes organic products into simple inorganic substances which are released into the atmosphere for reuse by the plants. Thus, they help in recycling of materials.

46. How can you help in reducing the problems of waste disposal? Give any two methods.

Ans. The following measures can be adopted for reducing the problem of waste disposal:
(i) Reduce the volume of wastes by burning in incinerator.
(ii) Produce compost and biogas from biodegradable waste.

47. What are the problems caused by non-biodegradable wastes that we generate?

Ans. (a) Non-biodegradable pesticides and fertilizers run off to water bodies to cause water pollution.
(b)Some of the non-biodegradable pesticides like DDT enter the food chain and cause biomagnifications in humans and other animals.

48. Write the harmful effect of ozone depletion.

Ans. i. Cause the skin cancer
ii. Damage to eyes
iii. Immune system

49. What are the effects of deforestation?

Ans. Effects of deforestation-
(a) Extinction of plants, animals and microbial species.
(b) Threatening of indigenous people whose culture and physical survival depends upon the forests.
(c) Regional and global climate change as the rainfall decrease and drought is common in deforested areas.
(d) Global warming by releasing stored carbon into the atmosphere as carbon-dioxide which is green-house gas.
(e) Increase in soil erosion and decrease in soil fertility.
(f) Increase in floods.

50. What are the benefits of water harvesting?

Ans. Benefits of water harvesting-
(a) It provides: -

(i) good quality water for homes.
(ii) Self sufficiency for supply of water.
(iii) Control over water sources.
(b) Reduces: -
(i) Local flooding and drainage problems.
(ii) Soil erosion.
(iii) Ground water pollution.
(iv) Cost of usage water.
(b) Conserve ground water and contributes to ecological use.

51. Who are the stake holders of forests.
Ans. Stakeholder of forest are-
(a) The local people who are living in or around the forests.
(b) The department of forest of the government.
(c) The industrialists.
(d) The wildlife and nature enthusiasts.

52. How are water resources managed and consumed?
Ans. Water is managed and conserved in following ways-
(a) Install rain water harvesting system in the houses for future use.
(b) Leakage of water in the toilet and pipes should be repaired when it comes in our notice.
(c) To reduce evaporation and improve irrigation efficiency, drip irrigation and sprinkling may be practiced.
(d) Reduce domestic water wastage and try to recycle the waste water at the home.
(e) Reduce water wastage in industry by recycling the used water.

53. Write any three steps that you would take for sustainable development of the environment.
Ans. To develop sustainable natural environment we would do following practices-
(a) Save electricity by switching off the lights, fans television, and other electrical appliances when not use/needed.
(b) Use energy efficient electrical appliances. This is done by using compact fluorescent lamps and fluorescent tubes light instead of traditional filament type electric bulbs.
(c) Use public transport for school instead of parent's car.

54. What are different ways to reduce consumption of the various natural resources?
Ans. (a) Spread awareness about the need of conservation.
(b) Install a system of rain water harvesting.
(c) Follow three R's- reduce, reuse and recycle.

55.What are the problems faced by construction of large dams?
Ans. Disadvantages of construction of large dams-
(a) Only privileged section of people get maximum water due to mismanagement of water.
(b) Construction of dams involves deforestation of large trees resulting in imbalance in ecosystem. It also threatens the wild life of the areas.
(c) People close to source canal grow water intensive crop like rice and sugarcane whereas people further down stream do not get any water.

56. List three things which increase pressure on our natural resources.

Ans. (a) More paper is used than required for printing on computer.

(b) Keeping fan on when there is no one in the rooms.

(c) Wastage of food.

(d) Burning of crackers.

(e) Wastage of petrol by unnecessarily starting the motorbike.

57. What are the factors to check the quality of water?

Ans. To check the quality of water certain measurable factors are always followed-

(a) Total coliform count- In human intestines, a group of bacteria called coliform are found. When these bacteria are present in water, it is assumed that water is contaminated by disease causing micro-organisms.

(b) PH of water- If water is highly acidic or basic, it is said to be polluted.

(c) Heavy metals and pesticides- Amount of heavy metals like copper, zinc, lead, etc and pesticide present in water indicates pollution.

58. What changes can you make in your habits to become more environment friendly?

Ans. (a) Separate wastes into recyclable and non- recyclable.

(b) Use electricity judiciously.

(c) Follow three R's (reduce, recycle and reuse).

(d) Eat as much as require do not waste food.

(e) Use water judiciously.

(f) Reuse newspapers and use less plastic.

(g) Have more windows in the house for natural light.

59. What are the results of chipko movement?

Ans. (i) The chipko movement spread across the communities which also awakened the media. This forced the government, to rethink their priorities before making use of forest resources.

(ii) Local people believed in the replenishment of the plants by cutting the unwanted branches and plucking the leaves in such a way that the plants may find time to replenish.

(iii) The destruction of forests could be prevented because the local people were aware of the fact that the destruction of forest always causes loss of forests products forever, degrade the quality of soil and water.

60. Explain in detail the three R's in the process of saving the environment.

Ans. For the management of waste in a very natural way, three R,S that is reuse, recycle and reduce should be followed-

(a) Recycle- It is the act of processing used materials for use in creating new products. For Ex-use of shopping bags made of cloth or jute

(b) Reuse- using things again and again. It is better then recycle as some energy is also used recycling which not required at all in reuse.

(c) Reduce- either reduces the generation of unnecessary waste or use less.

61. What are the benefits of water harvesting?

Ans. Benefits of water harvesting.

(a) It results in recharging of ground water. Hence water in collected and stored underground and free from contamination.

(b) It neither evaporates nor becomes as mosquito breeding place.

(c) It is very useful for providing underground moisture to vegetation of large area also.

62. Why there should be equitable distribution of our resources? What forces would be working against an equitable distribution of our resources?

Ans. There should be equitable distribution of resources so that all and not just a handful of rich and powerful people benefit from the development of these resources.

Rich and powerful would be working against an equitable distribution of our resources they would exploit the natural resources in such a way that the resources would not be available for the future generation. Some people may exploit the resources and cause pollution in turn. Like during metallurgy slag can cause pollution.

63. With the help of an example explain how participation of local people is useful for conservation of forest.

Ans. The local people who live in around the forests depend on various products of the forest. To manage the forest resources in very sustainable manner, the local people managed some movement in the near past for example. Chipko movement (Hug the trees movement) the women of Reni village of Tehri Garhwal had hugged the trees, because the workers of logging contractor started cutting the trees. Hence, the women of the village hugged the trees. Thus they prevented the workers felling the trees and the contractors had to withdraw ultimately.

64. What changes can you make in your habits to become more environment-friendly?

Ans. (a) Plant one tree on every birthday.
(b) Stop using polythene bags.
(c) Switch off unnecessary lights and fans.
(d) Take bus instead of personal vehicles.
(e) Use CFL in place of bulbs.

65. How did Chipko Andolan ultimately benefit the local population? Give any three Benefits.

Ans. a. The locals benefitted from forest produces
b. The wild life and nature were conserved
c. The quality of air and soil was preserved

Class: 10th
Subject: Physics
Chapters Covered: 1. Light (Reflection and Refraction). 2. Human eye and colourful world.
1. Light (Reflection and Refraction).

1 mark questions:

Q1: What is the magnification of the image formed by plane mirror and why?
Ans:- Magnification is 1 as size of the image is equal to the size of object.
Q2: Can refractive index of any material be less than one?
Ans: No, because the velocity of light in the medium is always less than the velocity of light in vacuum.
Q3: Specify the size of image formed by a concave mirror if m> *1*.
Ans: The image is enlarged.
Q4: Explain why a ray of light passing through the centre of curvature of a concave mirror gets reflected along the same path?

Ans: The ray passing through the centre of curvature incident to the mirror along its normal, so $< i =< r = 0$. Therefore the ray retraces its path.

Q5: The speed of light in a transparent medium is 0.6 times that of its speed in vacuum. What is the refractive index of the medium?

Ans: As, $n = \frac{c}{v}$ or $n = \frac{c}{0.6c} = 1.66$

2 marks questions:

Q1: Give the uses of concave and convex mirrors.

Ans:

(a) Uses of concave mirrors are:
1. Used as reflectors in the headlights of vehicles.
2. Used as shaving and makeup mirror.
3. Used by dentists to focus light on the tooth to be examined.

(b) Uses of convex mirror are:
1. Used as rear view mirrors in vehicles.
2. Used as vigilance mirrors in big shops and airports.
3. Used on curved roads to avoid accidents.

Q2: For the same angle of incidence in media P, Q and R, the angles of refractions are $45°, 35°$ and 15° respectively. In which medium will the velocity of light be minimum? Give reason.

Ans: As from Snell's law, $n = \frac{\sin i}{\sin r}$ and $n = \frac{c}{v}$

$\Rightarrow \frac{c}{v} = \frac{\sin i}{\sin r}$

$since\ c\ and\ i\ are\ constants.$ Therefore, $v \propto \sin r$

As the value of sin r will be least for $15°$ among the three, the velocity of light will be minimum in medium R.

Q3: Define (a) 1 dioptre and (b) refractive index.

Ans: 1 dioptre: It is the power of the lens having focal length equal to 1 meter.

P=1D, if f=1m

Refractive index is defined as the ratio of speed of light in vacuum to the velocity of light in a given medium.

$n = \frac{c}{v}$, where c is the velocity of light in vacuum and v is the velocity of light in a given medium.

Q4: The power of combination of two lenses MN is 5D. If the focal length of lens M is 15cm. State the nature and focal length of lens N.

Ans: Using combination of lens, $P = P_M + P_N$

$5 = \frac{100}{15} + \frac{1}{f_N}$ or $\frac{1}{f_N} = 5 - \frac{100}{15} = -\frac{25}{15}$ or $f_N = -\frac{15}{25} = -0.6m = -60cm.$

This negative focal length of N shows that it is a concave lens.

Q5: Why is a convex mirror preferred for its use as a driver's mirror?

Ans: This is because of two reasons:

1. It always forms an erect image of an object.
2. It covers large field of view to form large number of small size images of object.

3 marks questions:

Q1: Give difference between real and virtual image.

Ans: The differences are:

	Real image	Virtual image
1	It is formed when two or more reflected rays intersect each other at a point in front of a mirror.	It is formed when two or more reflected rays appear to intersect at a point behind a mirror.
2	It can be obtained on screen.	It cannot be obtained on screen.
3	Real images are inverted.	Virtual images are erect.

Q2: Define Snell's law. Show that ${}_2^1n \times {}_1^2n = 1$, if ${}_2^1n$ is the refractive index of medium 2 w.r.t 1 and ${}_1^2n$ is the refractive index of medium 1 w.r.t 2.

Ans: Snell's law: It states that if a incident ray refracts from one medium to another medium, then sine of angle of incident to the sine of angle of refraction is equal to some constant called refractive index.

$n = \frac{\sin i}{\sin r}$

When a incident ray incident from medium 1 to medium 2 then,

${}_2^1n = \frac{v_1}{v_2}$ ------1.

When a incident ray incident from medium 2 to medium 1, then

${}_1^2n = \frac{v_2}{v_1}$ ------2.

Multiplying 1st and 2nd we have,

${}_2^1n \times {}_1^2n = \frac{v_1}{v_2} \times \frac{v_2}{v_1} = 1$ (Proved)

Q3: (a) Define magnification. Give its formula in case of mirrors and lenses.

(b)What is the significance of it if (I) $m = 1$ (II) $m < 1$.

Ans: (a) It is defined as the ratio of height of image to the height of object.

$m = \frac{h_I}{h_O}$

For mirrors, m=$-\frac{v}{u}$

For lenses, m=$\frac{v}{u}$

(b)Magnification gives the measure of size of image with respect to object.

If m=1, it means that size of image is equal to the size of object.

If $m < 1$, it means that size of image is smaller than the size of object.

Q4: (a) Differentiate between reflection and refraction.

(b)What is the effect on focal length of mirror and lens if they are immersed in a liquid of refractive index 1.5?

Ans: Difference between reflection and refraction are:

	Reflection	Refraction
1	It is the phenomenon of change in the path of light rays in a particular direction into the same medium again.	It is the phenomenon of change in the path of light rays obliquely when passes from one medium to another medium.
2	The reflecting surfaces of all types obey the laws of reflection.	The refracting surfaces obeys the laws of refraction.
3	Speed of light cannot changes.	Speed of light changes.

(b)In case of mirror focal length remains same as they will not refracts light but in case of lenses it changes due to refraction through lenses.

Q5: An object is kept at a distance of 15cm, 20cm, 22cm and 30cm respectively from a lens of power +5D.

(a) In which case or cases would you get a magnified image?

(b) Which of the magnified image can be got on a screen?

Ans: (a) Power of lens, P=+5D, so $f = \frac{1}{P} = \frac{1}{5} = 0.2m = 20cm$.

So we would get a magnified image only when the object is kept at a distance of 15cm, 20cm and 22cm.

(b)The object at the position 15cm and 20cm forms a magnified image on a screen.

5 mark Questions:

Q1: (a) Define refraction of light. Also give laws of refraction. (b) Define refractive index. What are the factors affecting refractive index?

Ans: (a) *It is defined as the bending of a ray of light as it passes from one medium to another medium.*

Laws of refraction:

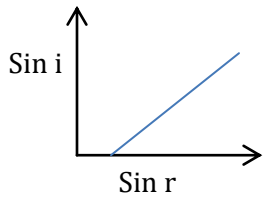
There are two laws of refraction:

Law 1st: It states that the ratio of sine of angle of incidence to the sine of angle of refraction for a particular pair of media is constant.

This law is also called **Snell's law.**
The constant is called refractive index of the material or media through which light refracts.
Mathematically,

$$\frac{sin\angle i}{sin\angle r} = constant = n = \mu$$

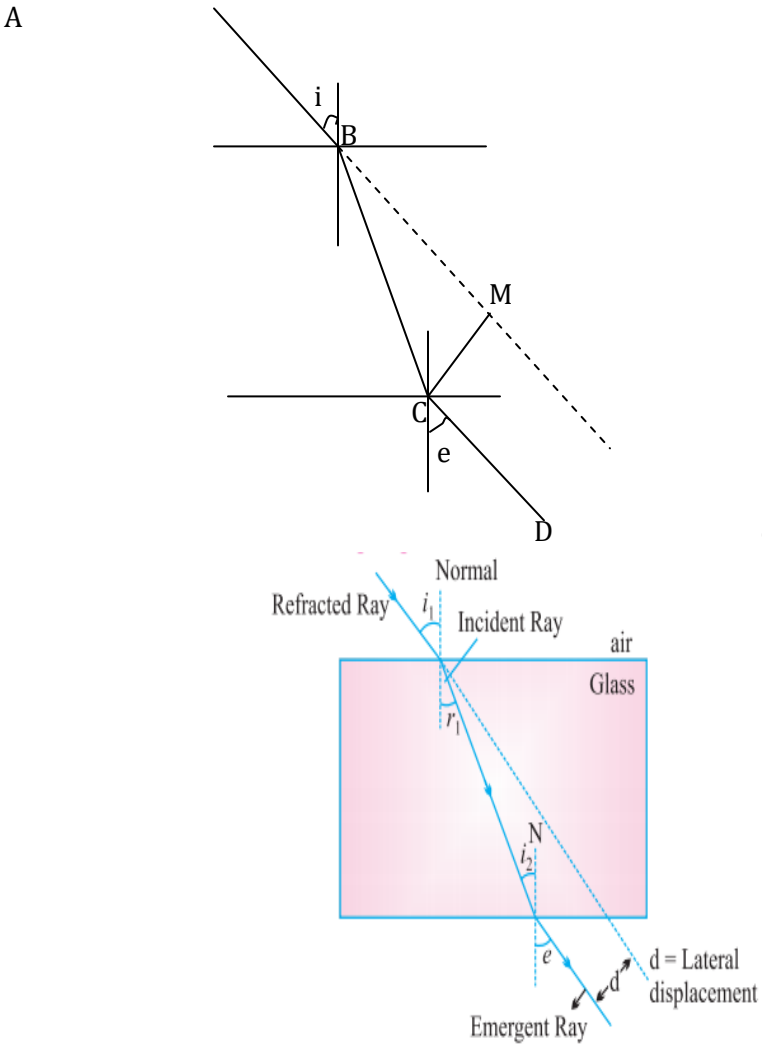
Its value depends upon the temperature and the wavelength of light used.
This law is also called Snell's law after the name of its discoverer **Willebrord Snell.**



When we draw a graph between the different sine values of angle of incidence and their corresponding sine values of angle of refraction, we obtain a straight line.
This shows that $\sin i \propto \sin r$
or $\frac{sin\angle i}{sin\angle r} = constant = n = \mu$
where n or μ is a constant, called refractive index.
Law 2nd: It states that the incident ray, the refracted ray and the normal all lies in the same plane.
(b) It is the ability of a transparent medium to bend light as it enters the medium.
It is defined as the ratio of velocity of light in vacuum to the velocity of light in a given medium.
It is a pure number and has no units.
Factors affecting refractive index:
Refractive index of a transparent material depends upon the following two factors:

1. Temperature as $velocity\ v \propto \sqrt{T}$ and $\mu \propto \frac{1}{v}$
2. Wavelength of light used, $n = \mu = \frac{1}{\lambda^2}$ (acc to Cauchy's relation)

Q2: Explain refraction through a rectangular glass prism. Also prove that $\angle i = \angle e$ and define lateral displacement.
Ans: Let a ray of light AB is incident on top face PQ of slab and it undergoes refraction from air to glass, then Refractive index of glass w.r.t air is given as,
$n_{ga} = \frac{sin\angle i}{sin\angle r_1}$ -------1. (Acc to Snell's law)
Since the incident ray is travelling from air to glass (rarer to denser medium), it bends towards the normal N_1 and follows path BC.
On reaching the boundary of bottom face RS of slab it again undergoes refraction from glass to air, then Refractive index of air w.r.t glass is given as,
$n_{ag} = \frac{sin\angle r_2}{sin\angle e}$ --------2. (Acc to Snell's law)
Since the ray is travelling from glass to air (denser to rarer medium), it bends away from the normal N_2 and follows path CD.
(a) At last on producing incident ray AB to M, we observe that incident ray is parallel to emergent ray CD.
(b) Also we know that $n_{ga} = \frac{1}{n_{ag}}$
$or\ \frac{sin\angle i}{sin\angle r_1} = \frac{1}{\frac{sin\angle r_2}{sin\angle e}}$
(as$\angle r_1\ and\ \angle r_2$ are alternate angles, hence equal)
So, $sin\angle i = sin\angle e$
$or\ \angle i = \angle e$



This shows that angle of incidence is equal to angle of emergence.

Lateral displacement:

It is the perpendicular distance of separation between the emergent ray and the original path of the incident ray. It is directly proportional to the thickness of the medium, angle of incidence, refractive index of the medium and inversely proportional to the wavelength of the light.

Q3: An object of height 2cm is placed at a distance of 8cm from a convex lens of focal length 10cm. Find the position, size of image. Also state the characteristics of image.

Ans: Using, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ or $\frac{1}{v} - \frac{1}{-8} = \frac{1}{10}$ or $\frac{1}{v} = -\frac{1}{40}$ or $v = -40cm$

$m = \frac{h_I}{h_O} = \frac{v}{u}$ or $h_I = 2 \times \frac{40}{8} = 10cm$

The image formed is virtual, erect and enlarged.

Q4: (a) Find the focal length of concave mirror and convex mirror having same radius of curvature equal to 40cm.

(b)An object of height 8cm is placed in front of a convex mirror at a distance of 12cm from it. If the length of the mirror is 24cm, find the nature, size and position of image formed.

Ans: (a) Using R=2f

For concave mirror, f=40/2=-20cm

For convex mirror, f=40/2==20cm

(b)Using, $\frac{1}{f}=\frac{1}{v}+\frac{1}{u}\ or\ \frac{1}{v}=\frac{1}{f}-\frac{1}{u}=\frac{1}{24}-\frac{1}{-12}=\frac{3}{24}\ or\ \frac{1}{v}=\frac{1}{8}\ or\ v=8cm$

$m=\frac{h_I}{h_O}=-\frac{v}{u}\ or\ h_I=-8\times\frac{8}{-12}=5.33cm$

Thus, image formed is diminished.

Since height of image is positive so image is erect and hence virtual.

2. Human eye and colourful world.

1 mark questions:

Q1: Do all transparent bodies disperse light?

Ans: No, bodies with parallel surfaces do not disperse the light.

Q2: What is Tyndall effect?

Ans: The scattering of light by colloidal solutions is called Tyndall effect.

For example: A fine beam of sunlight enters a room containing suspended particles of dust.

Q3: Which component of white light is least scattered by fog or smoke?

Ans: Red colour.

Q4: Name the part of our eyes that helps us focus near and distant objects in quick succession.

Ans: Ciliary muscles.

Q5: Name a thin membrane in a human eye, which allows light to enter the eye.

Ans: Cornea.

2. marks questions:

Q1: Explain the blue colour of sky?

Ans: Because blue color having smallest wavelength is scattered most and amount of scattering is directly proportional to $\frac{1}{\lambda^4}$. Hence sky appears blue.

Q2: Name the defect of vision in person

a. Whose near point is more than 25cm away?

b. Whose far point is less than infinity?

Ans: a. Hypermetropia

b. Myopia

Q3: When a person said to have developed cataract? How is the vision of such a person restored?

Ans: When the crystalline lens of eye becomes hazy (or even opaque) due to the formation of thin memebrane over it, this causes partial or complete loss of vision.

This defect can be restored by the cataract surgery.

Q4: The near point of Hypermetropic eye is 50cm. What is the nature and power of the lens required to enable him to read a book placed at 25cm from the eye?

Ans: In this u=-25 and v=-50 both are taken negative.

Now from lens formula, we have $\frac{1}{f}=\frac{1}{v}-\frac{1}{u}\ or\ \frac{1}{f}=\frac{1}{-50}-\frac{1}{-25}=\frac{1}{25}-\frac{1}{50}=\frac{2-1}{50}=\frac{1}{50}\ or\ f=+50$

$P=\frac{1}{f}=\frac{100}{50}=+2D$

Q5: If the earth has no atmosphere, what change would be observed in the length of day? Give reason.

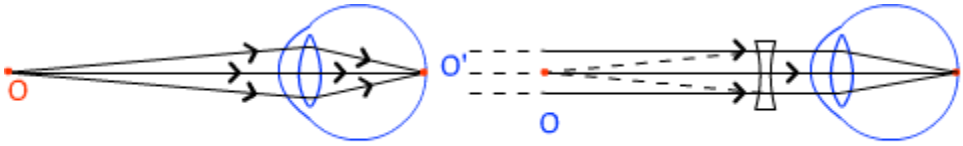
Ans: In this atmospheric refraction would not takes place and we would see the actual crossing of the horizon by the sun at the time of sunrise and sunset. The daytime would have been shorter by 4 minutes.

3marks questions:

Q1: Explain the defects of vision (a) Myopia and (b) Hypermetropia with their cause and correction.

Ans: **Myopia:** Myopia is also known as near-sightedness. A person with myopia can see nearby objects clearly but cannot see distant objects distinctly. In a myopic eye, the image of a distant object is formed in front of the retina and not at the retina itself. This defect may arise due to

a. excessive curvature of the eye lens, or
b. elongation of the eyeball.



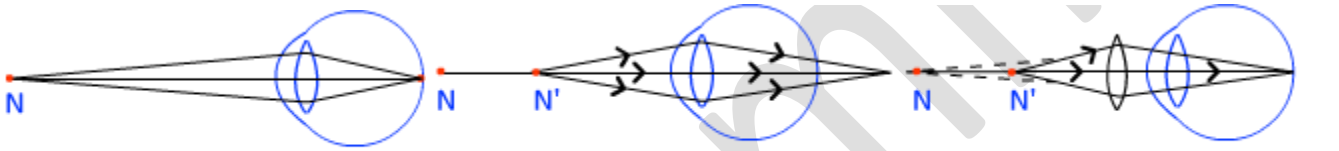
Far point of a myopic eye Correction of Myopia

Correction of Myopia: This defect can be corrected by using a **concave lens** of suitable power.

A concave lens of suitable power will bring the image back on to the retina and thus the defect is corrected.

Hypermetropia: Hypermetropia is also known as far-sightedness. A person with hypermetropia can see distant objects clearly but cannot see nearby objects distinctly. The near point, for the person, is farther away from the normal near point (25 cm). Such a person has to keep a reading material much beyond 25 cm from the eye for comfortable reading. This is because the light rays from a nearby object are focused at a point behind the retina. This defect arises either because

a. the focal length of the eye lens is too long, or
b. the eyeball has become too small.



Near point of hypermetropic eye Hypermetropic eye Correction for Hypermetropic eye

Correction of Hypermetropia: This defect can be corrected by using a **convex lens** of appropriate power.

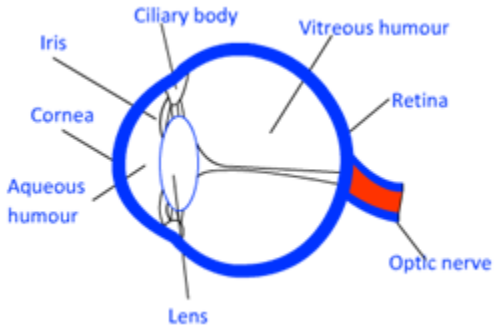
Eye-glasses with converging lenses provide the additional focusing power required for forming the image on the retina.

Q2: Explain the structure of human eye and describe the function of cornea, aqueous and vitreous Humour, pupil, iris

Ans: The human eye is a spherical structure which fits in the eye socket in the skull bone.

There are following main parts in the human eye.

1. Cornea: It is the outer most transparent layer which controls the entry of light rays coming from objects.
2. Aqueous humour and vitreous humour: It allows the light to refract and lubricates eyes to avoid infections. It also provides mechanical support to eye ball.
3. Pupil: Pupil is the round black spot in front of eye. It regulates the amount of light entering the eyes. Pupil works like aperture of a camera. In case of dim light pupil dilate to allow more light to enter the eyes. In case of strong light pupil constrict allowing less light to enter.
4. Iris: Iris is made of muscles. They control the size of opening of pupil.
5. Lens: Lens lies just behind the pupil. Lens becomes thin to increase its focal length. This enables us to see distant objects clearly. To focus on nearer objects, lens becomes thick to decrease its focal length. But there is a limit. The minimum distance of clear vision is 25 cm. Below this distance, we cannot see things clearly.
6. Retina: Retina works like a screen or camera film. Retina is full of light and colour sensitive cells. These cells, upon receiving image send electrical signals to the brain, which processes these information to make a mental image of what we see. The photoreceptor cells in the eye are of two types, viz. rod cells and cone cells. The rod cells are sensitive to dim light. The cone cells are sensitive to bright light and colour.



Q3: (a) Define dispersion and give the cause of dispersion.

(b)Explain dispersion through triangular prism.

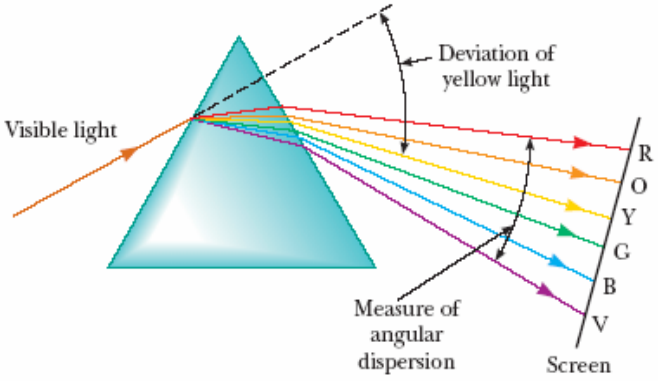
Ans: The splitting up of white light into its component colours is called dispersion.

The basic cause behind this phenomenon is that different colour/components of white light have different wavelengths, hence undergoes different speed due to different refractive indices to the material of the prism.

(b) When a ray of white light falls on one of the refracting face, then it disperse into seven components VIBGYOR forming a spectrum.

The ray diagram shows that the angle of deviation for violet colour is more than that of red colour after refraction through a glass prism.

Hence, the colour of light which bends the least is red and more is violet.



Q4: Describe an activity to show that the colours of white splitted by a glass prism can be recombined to get white light by another identical glass prism. Also draw ray diagram to show the recombination of the spectrum of white light.

Ans: Recombination of colours: The colours of white light splitted by a glass prism can be recombined to get white light by another identical glass prism.

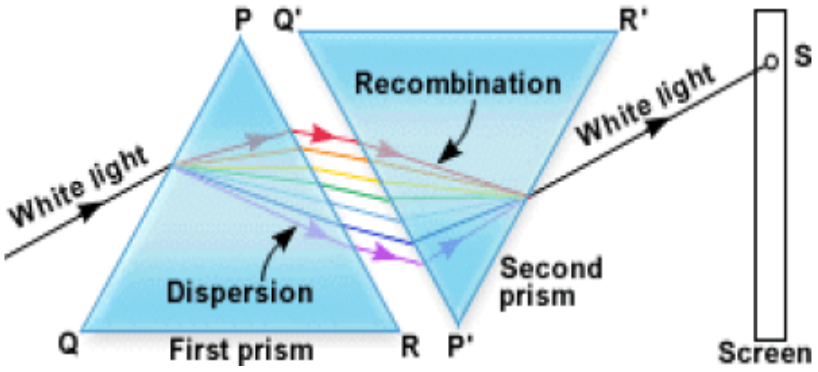
This was demonstrated by Newton.

The triangular prism PQR is placed on its base QR and a similar prism P'Q'R' is placed alongside in opposite direction with base Q'R'.

A beam of white light enter through face PQ undergoes refraction and is dispersed into seven colours as VIBGYOR, which are incident on the second inverted prism P'Q'R' on face P'Q', which further refracts.

The second prism recombines them into a beam of white light.

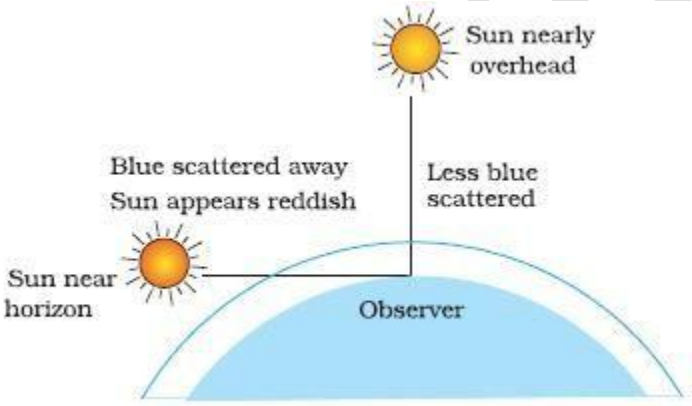
This causes the seven colours to recombine and a white light spot is obtained on screen.



Q5: (a) With the help of labelled diagram, explain why the sun appears reddish at the sunrise and the sunset.
(b)Why danger signals are red?

Ans: (a) At the time of sunrise/sunset, the sun is near the horizon, so the sunrays have to travel through a larger atmospheric distance. The fine particles of the atmosphere scatter away the blue component and other smaller wavelengths present in the components of sunlight.

As $\lambda_b < \lambda_r$, only red colour having longer wavelength and least scattered, reaches our eyes. Hence the sun appears red at sunrise and sunset.



(b)The wavelength of red colour is longer among the other colours of visible spectrum of sunlight. According to Rayleigh scattering law (Scattering $\propto \frac{1}{\lambda^4}$), red colour is least scattered while passing through the atmosphere and therefore, travels large distance. Hence, the red signals are used as danger signals.

CHAPTER-4 CARBON AND ITS COMPOUNDS

Q1. Name the two elements belong to carbon and lies in 14th group?

Ans: Silicon and germanium

Q2. Define covalent bond? Find the number of covalent bonds in But-2-ene?

Ans: Bond which is formed by sharing of electrons between two atoms.

12 bonds.

Q3. How many hexagonal and pentagonal rings are in C_{60} (fullerene)?

Ans: 20 hexagonal and 12 pentagonal rings.

Q4. What is the structure of central carbon with its four valence electrons?

Ans Tetrahedral with bond angle 109°28′′

Q5. What is glacial acetic acid?

Ans: 5 to 8% acetic acid dissolved in water.

Q6. Give uses of Fullerenes?

Ans: 1. It is used as semiconductor.

2. It is used as lubricant and catalyst.

Q7: What are polar covalent bond and non-polar covalent bonds?

Ans: **Non-polar covalent bond:**

These are the bonds formed between two atoms of the same element.

In this the bonding pair of electrons is shared equally between the two atoms.

Polar covalent bond:

These are the bonds formed between the atoms of two elements having different electronegativity's.

Q8. What is a functional group? Give examples of two functional groups.

Ans. The portion of the organic compound which largely determines its chemical properties is called functional group. For ex. –OH(hydroxyl) and –CHO(aldehyde group).

Q17. What are the characteristics of functional groups?

Ans: **Characteristics of functional group:**

1. Functional group acts as the reactive site in the molecule.

2. All compounds having the same functional group belong to the same family.

For example: All compounds containing $-OH$ (alcohol) group belongs to alcohol series.

3. The chemical properties of the compounds containing the same functional group are similar.

For example:

Functional group $-OH$ (alcohols) attached to an alkyl group shows similar properties of alcohols.

4. Physical and chemical properties of compounds containing different functional groups are different.

For example:

Functional group for alcohol, $-OH$ and for aldehydes, $-CHO$ shows different chemical properties and physical properties.

Q9: Give uses of (a) Ethanol and (b) Ethanoic acid.

Ans: **Uses of ethanol:**

1. Ethanol is used as preservative for biological specimens.

2. Ethanol is used as a substitute of petrol in internal combustion engines.

3. Ethanol is used as solvent for drugs, tinctures, oils perfumes, inks, dyes, varnishes, etc.

Uses of ethanoic acid:

1. Ethanoic acid (5% in water) is used for making vinegar, which is used in pickles, etc.

2. Ethanoic acid is used in the manufacturing of dyes, perfumes and rayon.

3. Ethanoates of aluminium and chromium are used as mordant in dyeing and water proofing of fabrics.

Q10. What are the limitations of detergents?

Ans :

Limitations of detergents:

1. Detergents are non-biodegradable.

2. Detergents are highly basic and are harmful to skin and may cause skin allergies.

3. Detergents when enters in food cycle it causes bio-magnification as it becomes toxic for animals and human life.

4. Detergents containing inorganic phosphates cause eutrophication and decrease the concentration of oxygen when mixed in water bodies. Thus disturbs the aquatic life.

Q11. Explain why detergents are better cleansing agents than soaps in hard water .

Ans. Soaps are effective cleansing agent in hard water because Ca^{2+} and Mg^{2+}ions present in hard water react with soap to give curdy white precipitate of calcium and magnesium salts of fatty acids called scum, which adhere to the surface of cloth. Due to this precipitation lot of soap is wasted. Therefore hard water does not produce lather with soap immediately. Hence after all the Ca^{2+} and Mg^{2+} ions present in hard water have been precipitated by addition of sufficient amount of soap , the resulting water becomes soft and thus readily produces lather with soap . on the other hand calcium and magnesium salts are soluble in water and hence detergents can be used for washing in hard water.

Q12. What is meant by denatured alcohol? What is the need to denature alcohol?

Ans. Ethanol which has been made unfit for drinking purposes by adding poisonous substances like methanol, pyridine etc. is called denatured alcohol . The need to denature alcohol is to refrain people from drinking by adding poisonous substances and to supply cheaper alcohol to industries.

Q13.A mixture of oxygen and ethyne is used for welding. Why do you think a mixture of ethyne and air is not used?

Ans. Ethyne is an unsaturated hydrocarbon, therefore combustion of ethyne in air produces yellow flame with lot of black smoke due to presence of unburnt carbon in it. Due to this incomplete combustion heat produced is also low and high temperature needed for welding cannot be attained. In order to ensure complete combustion to obtain high temperature needed for welding, a mixture of ethyne and oxygen is used.

Q14. Why is the conversion of ethnol to ethanoic acid an oxidation reaction?

Ans.A molecule of ethnol contains one oxygen atom while that of ethanoic acid containd two oxygen atoms. Since oxidation involves addition of oxygen, therefore conversion of ethanol to ethanoic acid is an oxidation reaction.

$CH_3CH_2OH + O_2 \longrightarrow CH_3COOH$

Ethanol Ethnoic acid

Q15. Why does micelle formation takes place when soap is added to water? Will micelle be formed in other solvents like ethanol also?

Ans. A soap molecule has two ends which have different properties one end is polar i.e. hydrophilic and is water soluble while the other end is non- polar i.e. hydrophobic, and hence water insoluble. When soap is added to water, the polar ends dissolve in water while the non polar ends dissolve in each other. As a result spherical ionic micelles are formed. Since soap is soluble in ethanol, therefore, micelle formation does not occur.

Q16. What is saponification? Write the reaction involved in this process?

The alkaline hydrolysis of an ester to give salt of the corresponding acid and the alcohol is called saponification. It is reverse of esterification reaction.

$CH_3COOCH_2CH_3 + NaOH \xrightarrow{\text{heat}} CH_3COONa + CH_3CH_2OH$

Ethyl ethanoate Sodium Sodium Ethanol

Hydroxide ethanoate

Q17. What are the characteristics of functional groups?

Ans: **Characteristics of functional group:**

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For example: All compounds containing $-OH$ (alcohol) group belongs to alcohol series.

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For example:

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For example:

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Q18. Give industrial application of hydrogenation reaction.

Ans. The process of hydrogenation is used in industry to convert vegetable oils to Vanaspati ghee. When H_2 is bubbled through vegetable oils in presence of nickel as catalyst at 473K,the double bonds in unsaturated carbon chains add H_2 to form saturated carbon chains. As a result of this hydrogenation, oils are converted into solid fats.

Vegetable oil + H_2 $\xrightarrow{\text{Ni, 473K}}$ Vanaspati ghee

Q19. Compare the ability of catenation in carbon and silicon.

Ans. Both carbon and silicon have similar valence shell electronic configuration i.e. each has four electrons in the valence shell and hence show the phenomenon of catenation. But carbon being smaller than silicon, forms stronger C-C bond than Si-Si bonds. Thus due to greater strength of C-C over Si-Si bonds, carbon shows catenation to greater extent than silicon.

Q20. Why are carbon and its compounds used as fuels for most applications?

Ans. When carbon is heated in presence of excess of air, it forms carbon dioxide. During its formation, a large amount of heat and light is released. Further, once ignited carbon and its compounds keep on burning without the need of additional heat energy. As a result of these reasons, carbon and its compounds are used as fuels for most applications.

Q21. An organic compound A is a constituent of antifreeze. This compound on heating with oxygen forms another organic compound B which has the molecular formula, $C_2H_4O_2$. Identify the compounds A and B. Write the chemical equations involved.

Ans. i) Compound A is a constituent of antifreeze, it must be ethanol.

ii) Ethanol on oxidation with oxygen gives compound B with molecular formula $C_2H_4O_2$. Therefore the compound B must be ethanoic acid.

$CH_3CH_2OH + 2[O] \xrightarrow{\text{Heat}} CH_3COOH + H_2O$

Q22. An organic compound A is widely used as preservative in pickels and has molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form sweet smelling compound B.

i) **Identify the compound A.**
ii) **Write the chemical equation for its reaction with ethanol to form compound Band name the process.**
iii) **How can we get A from B and name the process.**

Ans. i) Since compound A is widely used as preservative in pickels, it must be vinegar i.e. ethanoic acid.

ii) $CH_3COOH + CH_3CH_2OH \xrightarrow{\text{Conc. sulphuric acid}} CH_3COOCH_2CH_3 + H_2O$

This process is called esterification.

iii)$CH_3COOCH_2CH_3 + H_2O \xrightarrow{\text{Conc. sulphuric acid}} CH_3COOH + CH_3CH_2OH$

This process is called hydrolysis.

Q23. How is ethene prepared from ethanol? Give the reaction involvedin it. What is the role of sulphuric acid in this reaction?

Ans. Ethene is obtained by dehydration of ethanol with conc. H_2SO_4 at 433-443K.

$CH_3CH_2OH \xrightarrow{\text{conc. sulphuric acid}} CH_2=CH_2 + H_2O$

In this reaction sulphuric acid acts as dehydrating agent by removing a molecule of H_2O from ethanol.

Q24. What is a homologous series?

Ans. A homologous series may be defined as a family of organic compounds has same functional group, similar chemical properties and the successive members of which differ by a CH_2 group or 14 mass units.

Q25. How will you differentiate experimentally between an alcohol and a carboxylic acid?

Ans. 1. **Sodium carbonate test**: take small amount of each compound in a test tube and add to it an aqueous solution $NaHCO_3$. The compound which produces brisk effervescence due to the evolution of CO_2 must be carboxylic acid.

2. **Alkaline potassium permanganate test**: take a small amount of each compound in a test tube and add to it few drops of alkaline potassium permanganate test solution and warm. The compound which discharges the pink color of alkaline potassium permanganate must be alcohol.

Chapter-5

Periodic Classification of elements

Q1: Who showed the anomalies in arrangement of elements? Explain.
What is the actual cause of periodicity?
Ans: Henry Moseley.
According to him the orderly arrangement of elements or their periodicity depends upon the atomic number (Z) not on the atomic mass or weight (A).

The actual cause of periodicity is the re-occurrence of similar electronic configuration.

Q2: What were the achievements of Dobereiner's Traids? Also give its limitations or short comings.

Ans: He was the first to classify elements into based on John Dalton's assertions.

According to Dobereiner's law of triads, when elements are arranged in order of increasing atomic mass, the atomic mass of the middle element was nearly equal to the arithmetic mean of the other two and its properties were intermediate between those of the other two.

Element Atomic mass Arithmetic mean	Lithium 7	**Sodium** **23** $\frac{7+39}{2} = 23$	Potassium 39
Element Atomic mass Arithmetic mean	Calcium 40	**Strontium** **87.5** $\frac{40+137}{2} = 87.5$	Barium 137
Element Atomic mass Arithmetic mean	Chlorine 35	**Bromine** **80** $\frac{35+127}{2} = 80$	Iodine 127

Limitations:

1. He identified only three triads from the elements known at that time.
2. He fails to arrange similar elements like iron, manganese, nickel, cobalt, zinc and copper in triads.

Q3: What do you mean by Newland's law of octaves? Also give its limitations.

Ans: According to Newland's law of octave, elements were arranged in the order of increasing atomic masses such that properties of the eighth element was the repetition of the properties of the first element.

In first column, Li is the first element and Na is the eighth element.

Limitations:

1. It is valid upto calcium (lighter elements)not for elements having higher atomic masses.
2. Discovery of noble gases like He, Ne, Ar could not be accommodated in his table.

Q4: What are the achievements, criteria and limitations of Mendeleev's periodic table?

Ans: He arranged the elements on the basis of atomic masses. According to him properties of the elements are periodic function of their atomic masses.

His achievements are:

1. His table accommodated noble gases which were discovered later on without disturbing the existing order.
2. He left some gaps to accommodate elements to be discovered later like eka-boron (scandium), eka-aluminium (gallium) and eka-silicon (germanium).
3. His classification helped in understanding the valency of element by the group number.

Criteria used by Mendeleev in creating his periodic table:

1. At the time of Mendeleev only 63 elements were known and he tried putting the elements in order of their atomic masses.
2. He examined the relationship between the atomic masses of the elements and their physical and chemical properties.
3. He focused on the compounds formed by elements with oxygen and hydrogen as they are very reactive and forms compounds with most element.

4. He classifies elements by writing the formulas of their oxides and hydrides on 63 cards and on each card he wrote down the properties of the elements.
5. At last he selected the elements with similar properties and pinned the cards together on a wall.
6. He observed that most of the elements got a place in a periodic table and were arranged in the order of their increasing atomic masses.

Limitations:

1. His classification could not assign a correct position of hydrogen.
2. Position of isotopes could not be explained.
3. Wrong order or anomalous pair of atomic masses could not be explained. For example:
   (a) Copper was placed in group-I although it did not resemble the elements of this group.
   (b) Argon (40) was placed before Potassium (39)
   (c) Cobalt (58.9) was placed before nickel (58.7)

Q5: How could the Modern Periodic table remove various anomalies of Mendeleev's Periodic table?

Ans: Various anomalies are removed with the adoption of atomic number (Z).

1. Position of hydrogen is in 1^{st} group but due to similar chemical properties with 17^{th} group elements its position still in doubt.
2. An isotope of the element occupies the same place in a modern table.
3. Position of anomalous pair like Ar(40) with Potassium (39)and their arrangement is well decided.

Q6: Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis of your choice?

Ans: Beryllium (Be) and Calcium (Ca) are the two elements which will show chemical reactions similar to magnesium because Be and Ca belongs to the same group-2 of the periodic table.

Our basis of choice is that all of these have same number of valence electrons (2e) in their outer most valence shell.

Q7: (I) Lithium, sodium, potassium are all metals that react with water to liberate hydrogen gas. Is there any similarity in the atoms of these elements?

(II) Helium is an unreactive gas and neon is a gas of extremely low reactivity. What, if anything do their atoms have in common?

Ans: (I) All these metals have one electron in their respective outermost shells.

Also, all these elements of group-1 form basic oxides.

(II) The outermost shells of the atoms of helium and neon are completely filled with electrons. So are unreactive.

Q8: Compare and contrast the arrangement of elements in Mendeleev's Periodic Table and the Modern periodic Table.

Ans:

Mendeleev's P.T	Modern P.T
In this elements have been arranged in order of their increasing atomic masses.	In this elements are arranged in the order of their increasing atomic numbers.
There are only 8 vertical columns called groups	There are 18 vertical columns called groups.
Transition elements are arbitrarily placed.	Transition elements are placed in the middle
The inert gases were not known at the time of Mendeleev's	The inert gases have been placed at the end of the periodic table I

	group 18
Position of isotopes was not assigned	Isotopes of elements are assigned the same place
Many elements have anomalous positions like Ar and K.	Anomalous positions of the elements have been removed.

Q9: (a) Define valency.

(b) Element X forms a chloride with the formula XCl_2, which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as;

(a) Na (b) Mg (c) Al (d) Si

Ans: (a) It is defined as the combining capacity of the element.

(b) Given that element forms a chloride XCl_2, therefore its valency is 2.

So out of the given elements, the element of valency 2 is magnesium (Mg).

Thus X would most likely be in the same group of the periodic table as Mg i.e. group-2.

Q10: An atom has electronic configuration 2, 8, 7.

(a) What is the atomic number of this element?

(b) To which of the following elements would it be chemically similar?
N(7), F(9), P(15), Ar(18)

Ans: (a) The atomic number of this element is obtained by adding all the electrons present in its electronic configuration.

Therefore, Z=2+8+7=17

(b)The electronic configuration of given element is 2, 8, 7.

So its valence electrons are=7

This element will be chemically similar to that element which has the same valence electrons.

N: 2, 5

F: 2, 7

P: 2, 8, 5

Ar: 2, 8, 8

Here we find that Fluorine (F) has the same valence electrons and hence similar chemical properties with element of atomic number 17.

Q11: The position of three elements A, B and C in the Periodic Table are shown below:

Group 16	Group 17
_____	_____
_____	**A**
_____	_____
B	**C**

(a) State whether A is a metal or a non-metal.

(b) State whether C is more reactive or less reactive than A.

(c) Will C be larger or smaller in size than B?

(d) Which type of ion (cation/anion) will be formed by element A?

Ans: (a) A is a non-metal as in periodic table this group lies on the right side of the periodic table.

(b)C is less reactive than A because down the group chemical reactivity decreases.

(c) C is smaller in size than B because along the period atomic size decreases moving from left to right.

(d) Element A forms negatively charged anions as it belongs to group 17 and has 7 valence electrons. So it will gain 1e to complete its octet to achieve inert gas configuration.

Q12: (a) What are metalloids?
(b)Define Atomic size and metallic radii.
Ans: (a) These are the elements which resembles both metals and non-metals.
These are also called semi-metals.
For example: Silicon, Germanium, Arsenic etc.
(b)Atomic size is defined as the distance between the centre of nucleus and the outermost valence shell.
In periods, atomic size and radii decreases from left to right due to increase in electrons in the same shell.
In groups, atomic size and radii increases from top to bottom due increase in number of shells.
Metallic radii is defined as the half of the internuclear distance between the two ions in a metal crystal.
Q13: What would be the nature of oxides formed by the elements on the I) left side and II) right side of periodic table?
Ans: Left side elements form basic oxides and right side elements form acidic oxides.
Q14: (a) Why do you think the noble gases are placed in a separate group? (b) An element X has atomic number 15 and element Y has atomic number 12. Find the group and period to which they belong. Also identify which one is metal and which one is non-metal.
Ans: (a) The noble gases like He, Ne, Ar, Kr are placed in separate group because these are inert gases and do not react with other elements (0 valency). Moreover their properties do not resembles with any other group elements.
(b)Element X has E. conf=2, 8, 5
And Element Y has E. conf=2, 8, 2
So X belongs to 3^{rd} period due to three shells and its group=10+5=15 (due to more than 2 valence electrons)
While Y also belongs to 3^{rd} period due to three shells and its group=2 (2 valence electrons)
X belongs to right side in periodic table so it is a non-metal and Y belongs to left side in periodic table so it a metal.
Q15: Nitrogen (Z=7) and Phosphorus (Z=15) belongs to group 15 of the Periodic Table. Write the electronic configuration of these two elements. Which of these will be more reactive? Why?
Ans:
El. Conf of N(7): 2, 5
El. Conf of P(15): 2, 8, 5
From above two electronic configurations it is clear that number of shell in nitrogen is less than phosphorus so its size is smaller and has grater tendency to attract electrons. Thus N is more electronegative.
Q16: In the Modern periodic table, calcium 'Ca' (Z=20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these have physical and chemical properties resembling calcium?
Ans: We know that elements are having same valence electrons in outermost shell have physical and chemical properties resembling with calcium.
As El. Conf of calcium= 2, 8, 8, 2 and
El. Conf of 12=2, 8, 2
El. Conf of 38=2, 8, 18, 8, 2
Thus elements with atomic number 12 and 38 resembles with calcium.
Q17: Write two reasons responsible for late discovery of noble gases. Also name the elements present in the first period.
Ans: The two basic reasons are:

1. They are very less reactive.
2. They are less abundant in nature.

Hydrogen and Helium present in the first period.

Q18: Why do elements in any group have similar properties? Which period is the longest period in the Modern Periodic Table?

Ans: The chemical properties of an atom are largely determined by its valence electrons. In a given group, the number of valence electrons are same, hence they have similar properties.

Sixth period is the longest period as it has 32 elements.

Q19: Why are the elements of group 18 called zero valent?

Ans: Group 18 elements have their outermost shells completely filled and the atoms of these elements have no tendency to gain or lose electrons. Thus, the elements of this group are called zero valent and almost unreactive.

Q20: Give reason;

(a) Why does atomic radius decreases across a period?

(b) Why does the size of the atom increases down the group?

(c) How does the metallic character changes along the period?

Ans:

(a) The atomic radius decreases across a period because the charge on the nucleus increases by one unit but the additional electron goes to the same shell. As a result, outer electrons are pulled in closer to the nucleus. This causes the decrease of atomic size.

(b) The size of the atom increases down the group because number of shells increases with same number of electrons in outermost shell. This produces screening effect between the outermost electrons with nucleus hence electrostatic pull of electrons decreases with nucleus. This causes the increase in size of atom.

(c) As we go from left to right in a period, the metallic character decreases because of the addition of an electron in the same energy shell each time. So, attraction between the nucleus and the electrons in the outermost shell increases. Thus, the tendency to lose an electron decreases and the metallic character decreases.

Q21: Which is smaller?

(a) $\boldsymbol{Na^+ \; or \; Na}$ **(b)** $\boldsymbol{Cl \; or \; Cl^-}$

Ans:

(a) El. Conf of Na^+=2, 8

El. Conf of Na=2, 8, 1

This shows that Na^+ is smaller as it has smaller number of shells than Na.

(b) El. Conf of Cl^-=2, 8, 8

El. Conf of Cl=2, 8, 7

This shows that Cl is smaller as it has greater effective charge than Cl^-.

Q22: (a) If an element X is placed in group 14, what will be the formula and the nature of bonding of its chloride? (b) Explain why sodium is more reactive than lithium?

Ans:

(a) The formula will be XCl_4. The element X of group 14 will have 4 valence electrons. So, it shares its 4 electrons and forms covalent bond with 4 chlorine atoms.

(b) Sodium is more reactive than lithium because sodium is larger in size. Its outermost electrons are less tightly held in sodium than in lithium. As a result, sodium loses its outermost electrons more easily than lithium.

Q23: The atomic number of an element X is 20.

(a) Determine the position of X in periodic table.

(b) Write the formula of the compound formed with Y (Z=8).

(c) What would be the nature of the compound formed with Y.

Ans: (a) El. Conf of X(20)=2, 8, 8, 2

Four shells shows that it belongs to 4^{th} period and 2 valence electrons shoes that it lies in 2^{nd} group.

(b) X + Y →XY

(2,8,8,2) (2,6)

(d) X is a metal (calcium) and Y is a non-metal (oxygen), so compound formed is CaO, which is basic in nature.

Q24: Mendeleev predicted the existence of certain elements not known at that time and named two of them as Eka-silicon and Eka-sluminium.

(a) Name the elements which have taken the place of these two elements.

(b) Mention the group and the period of these elements in the modern periodic table.

(c) Classify these elements as metals, non-metals or metalloids.

(d) How many valence electrons are present in each one of them?

Ans:

(a) Germanium and Gallium.

(b) Germanium (32) and Gallium (31), so germanium belongs to 4^{th} period and group 14 while Gallium belongs to 4^{th} period and group 13.

(c) Ge is metalloid and Ga is a metal.

(d) Ge has 4 valence electrons while Ga has 3 valence electrons.

Q25: An element X which is a yellow solid at room temperature shows catenation and allotropy. X forms two oxides which are formed during the thermal decomposition of ferrous sulphate crystals and are the major air pollutants.

(a) Identify the element X.

(b) Write the El. Conf of X.

(c) Write the balanced chemical equation for the thermal decomposition of ferrous sulphate crystals.

(d) What would be the nature of oxide formed?

(e) Locate the position of the element in the modern periodic table.

Ans:

(a) Element X is sulphur (Z=16)

(b) El. Conf of S= 2, 8, 6

(c) $2FeSO_4(s) \xrightarrow{\text{heat}} Fe_2O_3(s) + SO_2(g) + SO_3(g)$

(d) Acidic oxides

(e) 3^{rd} period and 16^{th} group.

Q26: The atomic number of an element X is 19.

(a) Write its electronic configuration.

(b) Identify whether it is a metal or non-metal.

(c) If X burns in oxygen to form its oxide, what will be its nature?

(d) Write balanced chemical equation for the reaction when this oxide is dissolved in water.

Ans:

(a) El. Conf of X=2, 8, 8, 1

(b) It is metal as its valency is +1.

(c) It forms basic oxide, X_2O

(d) Reaction with water is, , $X_2O + H_2O \rightarrow 2XOH$

Q27: (a) An element X has mass number 35 and number of neutrons 18. Find its electronic conf and valency.

(b)An element Y(17) reacts with an element Z(20) to form a divalent halide.

(I) Classify Y and Z as metal, non-metal or metalloid?

(II) What will be the nature of oxide of element Z? Identify the nature of bonding in the compound formed.

(III) Draw the electron dot structure of the divalent halide.

Ans: (a) Atomic number =Mass number –No of neutrons=35-18=17, so its El. Conf is=2, 8, 7

Its valency=8-7=1

(b)(I) El. Conf of Y=2, 8, 7 and El. Conf of Z=2, 8, 8,2

Y is non-metal and Z is metal.

(II) Z as metal forms basic oxide and formed by transfer of electrons so bonding is ionic.

(III) $Z^{2+} + 2Y^{-1} \rightarrow ZY_2 (CaCl_2)$

Q28: Compare the radii of two species X and Y. Give reasons for your answer.

(a) X has 12 protons and 12 electrons.

(b) Y has 12 protons and 10 electrons.

Ans:

X has 2 excess electrons and Y is short of two electrons with respect to protons. So force of attraction in case of Y is more than X. Hence the radii of Y is less than X. Moreover Y acts as cation of X.

Q29: The elements of second period of the periodic table are given below;

Li, Be, B, C, N, O, F

Explain why atomic radius decreases from Li to F.

Ans: On moving from left to right along a period atomic number increase and it increase the number of protons and electrons to increase nuclear charge. Hence the electrons are pulled in closer to the nucleus which leads to contraction of the atom and thus atomic radius decreases.

Q30: What are the characteristics of Modern periodic table? Also give its limitations.

Ans:

1. In this elements are arranged in the increasing order of atomic number (Z).
2. All elements are arranged in 7 periods and 18 groups.
3. Its horizontal rows are called periods and vertical rows are called groups.
4. Elements are placed in periods based on the number of shells in their atoms.
5. Its first shortest period consists of two elements, Hydrogen and Helium and its longest period is sixth which has 32 elements. Its seventh period is incomplete.
6. It completely separates metals (left side), non-metals (right side), metalloid and transition metals at the middle.
7. Isotopes have the same position as that of given atom.
8. In this position of an element tells us about its chemical properties.

Limitations:

1. Position of hydrogen is not fixed as it is placed in group 1^{st} but its chemical properties resembles with halogens (group 17 elements)
2. Position of helium is not justified.
3. There is no proper position of lanthanides and actinides.

Q31: Explain the various trends in Modern periodic table? Also define electro negativity.

Ans:

Trends	Across the period	Down the group
Atomic size	Decreases	Increases

Valency	First increase 1 to 4 then decreases to 0	Remains same
Metallic character	Decreases	Increases
Non-metallic character	Increases	Decreases
Electro negativity	Increases	Decreases

It is a measure of the tendency of an atom to attract a bonding pair of electrons.