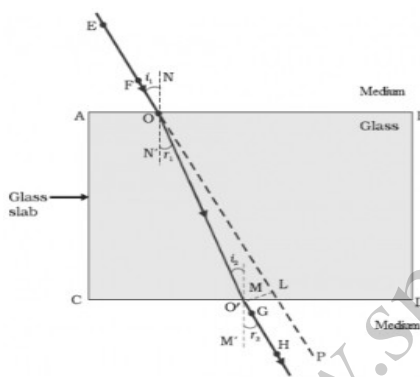


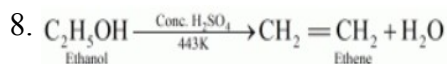
SECTION – A

1. There are 18 vertical columns in the modern periodic table and they are called as ‘Groups’.
2. Speciation may be defined as an evolutionary process, which involves the formation of one or more species from an existing species.
3. Biodegradable wastes can be properly recycled for future use.
If biodegradable and non biodegradable wastes are discarded in the same dustbin, then the non-biodegradable waste will make the biodegradable waste unfit for recycling. It will also interfere in the process of recycling.
4. In sexually reproducing parents, the germ cells have half the number of chromosomes and DNA as compared to the other non reproductive cells of the body. When these germ cells, i.e. sperms and ova combine with each other at the time of sexual reproduction, the original chromosome number is attained in the zygote. This zygote further develops into a complete individual having the same chromosome number as present in the parents.
- 5.

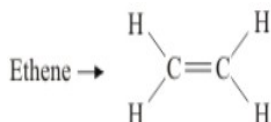


EF is the incident ray and GH is the emergent ray which is parallel to the incident ray.

6. Some of the ways to make people realize that the improper disposal of waste is harmful to the environment are:
 - (a) Improper disposal of waste will serve as a breeding ground for mosquitoes and will create favourable conditions for the spread of various diseases.
 - (b) Improper disposal of waste will release harmful gases in the environment. It will make the environment unclean and unhygienic for normal living of the organisms.
 - (c) The waste will flow to water bodies along with the rain water and become a threat to aquatic organisms.
7. Two advantages associated with water harvesting at community level are:
 - (a) It will reduce the overexploitation of water resources.
 - (b) It also helps in mitigation of droughts and floods.

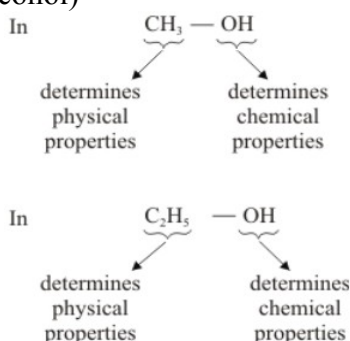


The product formed is:



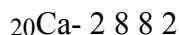
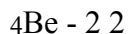
H_2SO_4 is a dehydrating agent. So, ethanol undergoes dehydration i.e., loses a water molecule to form ethene.

9. Homologous series of carbon compounds are so called because in such a series of compounds, the same functional group dictates the properties of the carbon compound regardless of the length of the carbon chain. The two consecutive members of a homologous series are CH_3OH and $\text{C}_2\text{H}_5\text{OH}$ (belong to alcohol)



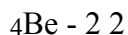
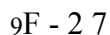
10. (i) ^{19}K has one electron in the outermost shell and its electronic configuration is 2 8 8 1

(ii) ^4Be and ^{20}Ca belongs to same group i.e. Group-2. Electronic configuration:



The number of electrons in the outermost shell of ^4Be and ^{20}Ca is same hence they belong to the same shell.

(iii) ^9F and ^4Be belongs to the same period, Period 2. Electronic configuration:



^4Be has bigger atomic size than ^9F because the atomic radius decreases as we move from left to right due to increase in nuclear charge which tends to pull the electrons closer to the nucleus and hence size of F reduces.

11. In the modern periodic table there are total of 7 periods. The valency of an element is determined by the number of valence electrons present in the outermost shell of its atom. On moving from left to right in a period the valence electrons increase in s and p-blocks. In going from left to right the valency changes from positive to negative.

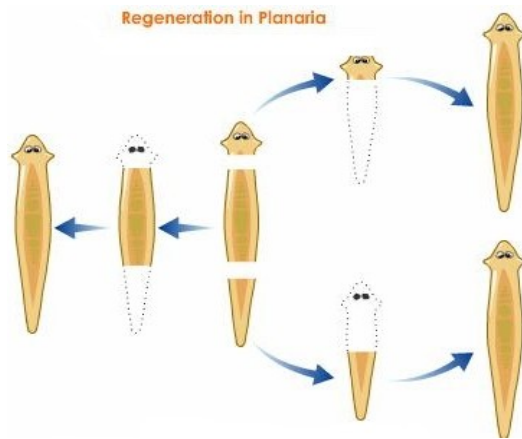
On moving from left to right in a period metallic character decreases as nuclear charge on valence shell electrons increases so, tendency to lose electrons decreases and hence metallic character decreases.

Down the group, valency remains the same as it depends upon valency shell electrons which remain the same on moving down the group and atomic size increases because a new shell is added.

12. (a) Regeneration in planaria

In Planaria, any part of the body which gets cut is capable of regeneration or developing into a

complete organism. Regeneration is carried out by specialized cells. These cells proliferate and make large numbers of cells. From this mass of cells, different cells undergo changes to become various cell types and tissues. These changes take place in an organized sequence referred to as development.



(b)

Regeneration	Reproduction
It is a type of asexual mode of reproduction in which only single parent is involved	It includes both sexual and asexual mode of reproduction in which either single parent or both the parents are involved respectively.
This mode of reproduction is dependent on the cut	This mode of reproduction is independent of cut.
Example - Planaria	Example - Sexual reproduction in humans

13. Sexually transmitted diseases by virus - Genital Herpes by herpes simplex virus and AIDS by HIV. Sexually transmitted diseases by bacteria- Gonorrhoea by Nisseria gonorrhoeae and Syphilis by Trepanoma pallidum

Prevention of transmission of STD's

- Having sex with infected or any unknown person should be avoided.
- Sharing of needles, syringes etc. must be prohibited.
- The surgical and dental instruments should be sterilized properly before use.
- Avoid blood transfusion from infected person. Blood should be tested before transfusion.
- Adequate medical treatment should be provided to the pregnant woman to protect the child from getting infected.

14. Acquired traits : The acquired traits are the traits which are experienced by an individual during his life time. It involves changes in non-reproductive tissues (or somatic cells), which cannot be passed on to the germ cells or progeny. Example learning of dance, cut marks etc

Inherited traits : Inherited traits are distinguishing qualities or characteristics which one acquires from the ancestors. These involve changes in the DNA. Hence, they are transmitted to the progeny. Example: height, eye, skin color etc.

15. In human beings, the females have two X chromosomes and the males have one X and one Y

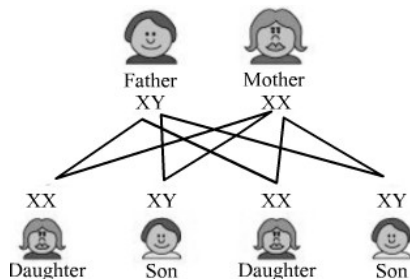
chromosome. Therefore, the females are XX and the males are XY.

At the time of mating, large number of sperms is ejaculated from the male reproductive organ (penis), into the female reproductive organ i.e. vagina. They travel towards the fallopian tubes, where only one sperm meets with the egg.

The process of fusion of the sperm and ovum is called fertilization. The sperm has either X or Y chromosome and egg has only X chromosome. So if sperm carrying Y chromosome fuses with egg the newly born child will be male and if sperm carrying X chromosome fuses with the egg the newly born child will be female.

There is equal chance of fusion of either X or Y chromosome with the egg so we can say that the sex of new born child is a matter of chance and none of the parent is responsible for it.

Sex determination in human is shown below:



16. (i) Rear view mirrors: Convex mirrors

Reason: (a) Image is formed virtual and erect always.

(b) Image formed is always diminished in size, so it covers large view area.

(ii) Shaving mirrors: Concave mirrors

Reason: (a) Image formed is larger in size so as to see clearly details of the object.

(b) Image formed is virtual and erect when object is placed close to the mirror.

17. We have height of object, $h_1 = 6$ cm, focal length of lens, $f = -5$ cm and object distance, $u = -10$ cm

Using lens formula, we have $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$$\Rightarrow \frac{1}{v} - \frac{1}{(-10)} = \frac{1}{(-5)} \Rightarrow \frac{1}{v} + \frac{1}{10} = -\frac{1}{5} \Rightarrow \frac{1}{v} = -\frac{1}{5} - \frac{1}{10}$$

$$\Rightarrow v = -\frac{10}{3} = -3.33 \text{ cm}$$

$$\text{Magnification, } M = \frac{v}{u} = -\frac{10}{3} \times \left(-\frac{1}{10}\right) = \frac{1}{3}$$

$$\text{Again, Magnification, } M = \frac{v}{u} = \frac{h_2}{h_1} \Rightarrow \frac{h_2}{6} = \frac{1}{3} \Rightarrow h_2 = \frac{6}{3} = 2 \text{ cm}$$

Thus the image will be formed in front of the lens at a distance of 3.33 cm from the lens, virtual and erect of size 2 cm.

18. Differences in colours of the sun at sunrise/sunset and at noon are as follows:

(i) Sunrise/ sunset: Reddish in colour

Reason: Sunlight travels longer distance at this time of the day, so the short wavelength colours get scattered away and the sunlight is left with only longer wavelength lights which is reddish or orange. So the sun appears reddish in colour.

(ii) Noon: white in colour

Reason: Sunrays travel shorter distance at noon and contains all the wavelengths of light which combine to form white colour. This makes the colour of sun white.

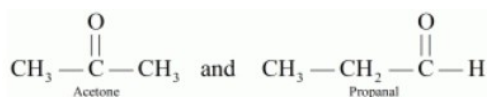
19. Ecosystem is a self sustaining system where the biotic and abiotic organisms of various communities interact with each other.

(a) The two components of the ecosystem are Biotic and Abiotic. Biotic system consists of all the living organisms of particular area like humans, animals etc and the nonliving or abiotic component consists of air, mineral soil, water and sunlight.

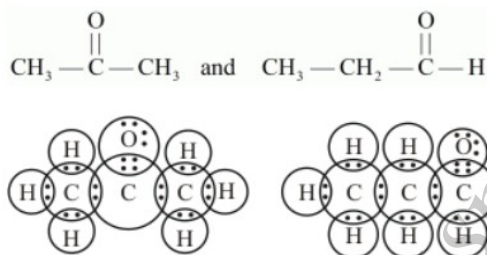
(b) Ponds are the example of natural ecosystem whereas the aquarium is an example of artificial ecosystem. Ponds do not need to be cleaned but aquarium needs to be cleaned. This is because aquarium does not contain soil and decomposing bacteria which helps in degrading complex organic substance into simple inorganic substance. But pond has this facility. Therefore, it does not need to be cleaned.

20. (a) Molecules having same molecular formula but different structural formula are known as isomers.

(b) Two possible isomers of the compound with molecular formula C_3H_6O :



(c) Electron dot structure:



21. (a)

Sexual Reproduction	Asexual Reproduction
It involves both the parent	It involves only a single parent
It involves fusion of male and female gametes	It does not involve fusion of gametes. The gamete of single parent undergoes division and gives rise to new a individual
It results in the introduction of variation in a population as newly formed organisms are not the exact copies of the parent	It does not bring variation in a population as the newly formed organisms are identical to the parents

(b) In case of sexual reproduction, there is marked variation between the parent and offspring due to the following reasons

1. The male and female gametes are formed by meiotic division which allows crossing over and recombination. This generates variation in the genes of offspring.

2. Two parents are involved who are different from each other. The fusion of their gametes would produce a distinct individual.

22. (a) A – Stigma, Function - The stigma is a sticky surface where the pollen lands and later germinates

B - Pollen tube, Function- It carries the pollen to the egg cell for fertilization

C - Egg cell, Function- It fuses with the male gamete and leads to the formation of zygote.

(b) Role of gametes- The gametes play an important role in the sexually reproducing organisms as they carry the entire genetic information of the organism. These gametes upon fusion result in the formation of zygote, which develops into a new individual. Any deformation in the gametes will lead to the deformity in the newly formed offspring.

Role of zygote- Zygote is the diploid cell formed by the fusion of male and female gametes during fertilization in sexual reproduction. Zygote is the first stage in the development process of an organism and it contains all the genetic information of both the parents, essential for the growth of the new organism.

23. (a) Laws of refraction There are two laws of refraction. law of refraction The ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant. This is known as Snell's law.

Mathematically, it can be given as follows:

$$\frac{\sin i}{\sin r} = n_{ab}$$

Here, n_{ab} the relative refractive index of medium a with respect to medium b.

Second law of refraction: The incident ray, the refracted ray, and the normal to the interface of two media at the point of incidence all lie in the same plane.

If the light ray goes from medium 1 to 2 then the refractive index of medium 1 with respect to medium 2 is,

$$n_{12} = \frac{\text{speed of light in medium 2}}{\text{speed of light in medium 1}} = \frac{v_2}{v_1} \quad \text{where } v_1 \text{ and } v_2 \text{ are the speeds of light in medium 1 and 2 respectively.}$$

(b) Given: Refractive index of water, $n_w = 4/3$ and Refractive index of glass, $n_g = 3/2$

Speed of light in glass, $v_g = 2 \times 10^8$ m/s

(i)

$$\frac{n_g}{n_a} = \frac{v_a}{v_g} \text{ where, } n_a = \text{refractive index of air} = 1$$

v_a = speed of light in air

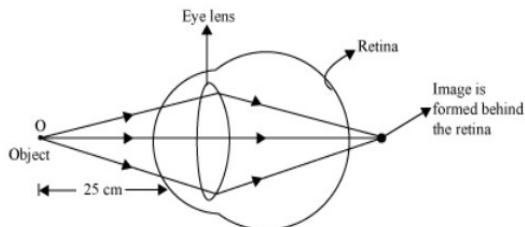
$$\therefore v_a = \frac{n_g}{n_a} \times v_g = \frac{3}{2} \times (2 \times 10^8) = 3 \times 10^8 \text{ m/s}$$

(ii)

$$\frac{n_g}{n_w} = \frac{v_w}{v_g}, \text{ where, } v_w = \text{speed of light in water}$$

$$\therefore v_w = \frac{n_g}{n_w} \times v_g = \frac{3}{4} \times (2 \times 10^8) = 1.5 \times 10^8 \text{ m/s}$$

24. (a) The person is suffering from Hypermetropia i.e., far-sightedness.

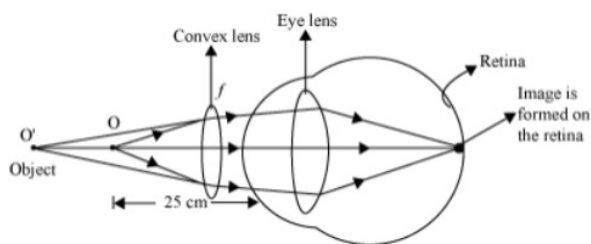


Hypermetropia is caused due to:

(i) The focal length of the eye lens is too long

(ii) Decrease in the length of the eyeball

This defect can be corrected using convex lens of appropriate focal length.



(b) Eye donation: Our eye can live even after our death, so by donating our eyes, we can give vision to any blind person and make him see. By giving such advertisement in newspaper we can aware more people for this noble cause and raise the number of donations for blind people.

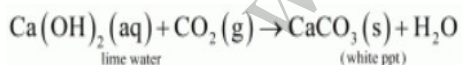
SECTION – B

25. (D)

When 2 mL acetic acid is taken in a dry test tube and a pinch of sodium hydrogen carbonate is added to it, a colourless and odourless gas evolves with a brisk effervescence which is CO₂



When CO₂ is passed through lime water it turns lime water milky.



CO₂ also extinguishes the burning splinter when it is brought near it.

26. (A)

The acetic acid dissolves readily in water.

27. (D)

Sodium hydroxide is in the form of pallets and it readily dissolves in water to form a solution. As it is basic in nature, it turns red litmus paper blue.

28. (A)

The saponification reaction is exothermic and the soap solution is basic in nature so it turns red litmus paper into blue. When a blue litmus paper is dipped, its colour does not change.

29. (B)

Hard water contains Ca^{2+} and Mg^{2+} ions. So the salts that can be added to water to make it hard are calcium sulphate, calcium chloride and magnesium chloride.

30. (D)

As the light rays are passing through the device X and the image formed is real thus the given device is a convex lens. Secondly, we are getting a focused image at the screen so the focus length of the lens is 40 cm.

31. (B)

As the image distance is increased, the object distance would decrease and thus the mirror-screen distance should be decreased. Therefore, the mirror should be moved towards the screen.

32. (D)

For light rays passing through a glass slab, the following conditions should hold true:

(1) $\angle i \approx \angle e$ and $\angle r < \angle i$

(2) Also, with the increase in incident angle, the refracted angle also increases.

Both of these conditions are satisfied in all the three observations.

33. (A)

The best set up is given in figure (I). The incoming light should not fall perpendicularly as the light will emerge straight and refraction cannot be traced. The light rays should not be very close or far from the normal as the emergent rays are difficult to trace.

34. (C)

When light goes from rarer medium to denser medium; it bends towards the normal and vice-versa. This condition is fulfilled in figure (III).

35. (D)

As the light gets refracted two times at different angles, the emergent ray bends at an angle to the direction of incident ray.

36. (C)

Ray diagrams (I), (II) and (III) are correct.

The light rays passing through the optical centre of lens remain undeflected.

The light rays parallel to principal axis passes through the second focus of the lens.

The light rays passing through the first focus become parallel to the principal axis after passing through the lens.

37. (B)

Rays (2), (3) and (4) obey the laws of refraction.

Ray parallel to the principal axis passes through the second focus of the lens.

Ray passing through the optical center goes undeflected.

Ray passing through the first focus of the lens goes parallel to the principal axis.

38. (D)

39. (C)

Yeast reproduces asexually by the process of budding.

Budding is a type of asexual reproduction in which a new organism is formed from a bud of an existing organism. A small bud is formed at a specific position on the parent cell. The nucleus of parent cells splits and a part of it enters inside the newly formed bud. The bud develops into a new cell or daughter organism. The new organism remains attached to the parent organism till it gets matured. After attaining maturity it separates from the parent body.

40. (C)

Analogous organs are those which do not share a common ancestry but perform common function. Hence, wings of insects and wings of bats are analogous organs in animals. Hence, Potato and sweet potato are analogous organs in plants.

41. (D)

Homologous structures are similar in origin but perform different functions. Carrot and radish are underground roots. So, they represent the correct homologous structures.

42. (A)

In the figure, the parts marked A, B, and C are Plumule, Radicle and Cotyledon respectively.

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