Latest Examination Papers, 2015

[Delhi Set-I, II, III]

***General Instructions*:**

(*i*) The question paper comprises of **two** sections, **A** and **B**. You are to attempt both the sections.

(*ii*) All questions are compulsory.

(*iii*) There is no choice in any of the questions.

(*iv*) All questions of section A and all questions of section B are to be attempted separately.

(*v*) Question numbers **1 to 3** in section A are **one-mark** questions. These are to be answered in **one word** or in **one sentence**.

(*vi*) Question numbers **4** to **6** in section A are **two-mark** questions. These are to be answered in about **30 words** each.

(*vii*) Question numbers **7** to **18** in section A are **three-mark** questions. These are to be answered in about **50 words** each.

(*viii*) Question numbers **19** to **24** in section A are **five-mark** questions. These are to be answered in about **70 words** each.

(*ix*) Question numbers **25** to **33** in section B are multiple choice questions based on practical skills. Each question is a **one-mark** question. You are to select one most appropriate response out of the four provided to you.

(*x*) Question numbers **34 to 36** in **Section B** are two marks questions based on partical skills. These are to be answered in brief.

Set-I

SECTION-A

1. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n}.

Ans. C_2H_4 $CH_2 = CH_2$ is first member. Its name is ethene.

C_3H_6 $CH_2 = CH—CH_3$ is second member. Its name is propene.

2. List two functions performed by the testis in human beings.

Ans. Two functions of testes are:

(*i*) to produce sperms

(*ii*) to produce male sex hormone called testosterone.

3. What is the function of ozone in the upper atmosphere?

Ans. Ozone protects the earth from harmful radiations like high energy UV rays.

4. List four characteristics of the images formed by plane mirrors.

Ans. Properties of image formed by a plane mirror

(*i*) It is always virtual and erect.

(*ii*) Size of image is equal to that of the object.

(*iii*) Image is formed at the same distance behind the mirror as the object is in front of the mirror.

(*iv*) Image is laterally inverted.

5. Why are forests considered "biodiversity hot spots"? List two ways in which an individual can contribute effectively to the management of forests and wildlife.

Ans. Biodiversity is measured by the number of different life forms found in an area. In a forest, various species are available which include bacteria, fungi, ferns, plants, nematodes, insects, birds, reptiles and mammals. Forests are therefore, called biodiversity hot spots.

An individual can contribute in management of forest and wildlife by:

(*i*) Avoiding cutting of forest and killing of wildlife.

(*ii*) Educating people about the importance of forest and wildlife in our life.

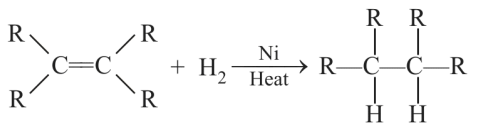
6. What is meant by "sustainable management"? Why is reuse considered better than recycling?

Ans. Natural resources are limited. If it is over exploited for short time gain, future generations will suffer heavily. Sustainable Management of natural resources is therefore necessary so that natural resources lasts for a longer period and future generations can also enjoy the benefits from it.

Out of reuse and recycle, I will suggest people to practice reuse as it does not consume any energy.

7. With the help of an example, explain the process of hydrogenation. Mention the essential conditions for the reaction and state the change in physical property with the formation of the product.

Ans. Hydrogenation is the process in which unsaturated hydrocarbon like alkenes react with hydrogen in presence of nickel as catalyst to form saturated compounds.



(Unsaturated liquid) (Saturated solid)

The liquid reactant change into solid product. Vegetable oils are converted into vegetable ghee by hydrogenation.

8. What is the difference between the molecules of soaps and detergents, chemically? Explain the cleansing action of soaps.

Ans. Soaps are sodium or potassium salts of long chain fatty acids, *e.g.* $C_{17}H_{35}COONa$. (Sodium stearate)

Detergents are sodium or potassium salts of sulphonic acids of benzene or alkene. They have $-SO_3Na$ or $-SO_4Na$ group.

Soaps have hydrocarbon part which is hydrophobic and attracts dirt, greese, oil, etc. whereas –COONa part is hydrophillic which attracts water. Hydrophobic part entrap the dirt and greese which is washed away by water attracted by hydrophillic part.

9. How many groups and periods are there in the modern periodic table? How do the atomic size and metallic character of elements vary as we move:

(*i*) down a group and

(*ii*) from left to right in a period

Ans. There are 18 groups and 7 periods in Modern Periodic Table.

(*i*) Atomic size goes on increasing down the group.

Metallic character goes on increasing down the group.

(*ii*) Atomic size goes on decreasing along a period from left to right.

Metallic character also goes on decreasing along a period from left to right.

10. From the following elements: $_4Be$; $_9F$; $_{19}K$; $_{20}Ca$

(*i*) Select the element having one electron in the outermost shell.

(*ii*) two elements of the same group.

Write the formula of and mention the nature of the compound formed by the union of $_{19}K$ and element X(2, 8, 7).

Ans. (*i*) $_{19}K$ has electronic configuration $\overset{K\ L\ M\ N}{2, 8, 8, 1}$. It has one valence electron.

(*ii*) $_4Be$ and $_{20}Ca$ belong to same group.

$_{19}K \quad 2, 8, 8, 1$

$\underset{2,8,8,1}{K} \longrightarrow \underset{2,8,8}{K^+} + e^-$

$\underset{2,8,7}{Cl} + e^- \longrightarrow \underset{2,8,7}{Cl^-}$

$(K^+)\ (:\ddot{\underset{\cdot\cdot}{C}}:)$ KCl is formula of compound. It is ionic compound.

11. What is DNA copying? State its importance.

Ans. DNA in the cell nucleus is the informal source for making proteins and different proteins lead to different designs. During reproduction, similar copy of DNA is generated and the process is called DNA copying. Importance of DNA copying are-

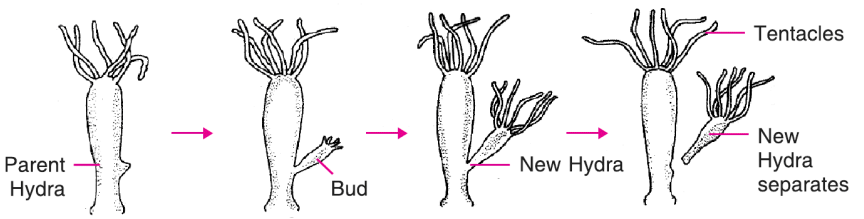
(*i*) DNA copying provides cellular apparatus in the daughter cells.

(*ii*) DNA in daughter cells will be able to control the functioning of the daughter cells.

(*iii*) DNA copies will retain the trait.

12. Explain budding in hydra with the help of labelled diagrams only.

Ans.



Budding in *Hydra*

13. List any four methods of contraceptions used by humans. How does their use have a direct effect on the health and prosperity of a family.

Ans. Four methods of contraception used by humans are:

(*i*) Mechanical barrier such as condom

(*ii*) Surgical method such as vasectomy for male and tubectomy for female.

(*iii*) Chemical method such as oral and vaginal pills.

(*iv*) Copper T

Sexual act always has the potential to pregnancy. Pregnancy makes major demand on the body and mind of the woman and if she is not ready for it, her health will be adversely affected. Contraceptive methods help in avoiding pregnancy and also help in keeping gap between two children so that the woman's body recovers. These methods help in limiting number of children to one or two. If family size is small, the family can save some amount after meeting the day to day expenditure. This will improve the economic condition of the family and the family will prosper.

14. "We cannot pass on to our progeny the experiences and qualifications earned during our life time". Justify the statement giving reason and examples.

Ans. Experiences of life and qualifications we earn donot make any change in the gene of the individual. Changes made in the gene are only passed on from one generation to the next. These qualities are acquired by an individual in his life and are called acquired trait which cannot be passed on to future progeny. For example, if a person reads a book on birds, the knowledge he earns by reading the book does not make any change in the gene. Hence, this knowledge will not get automatically transmitted to his next generation.

15. (*i*) Planaria, insects, octopus and vertebrates all have eyes. Can we group eyes of these animals together to establish a common evolutionary origin? Justify your answer.

(*ii*) "Birds have evolved from reptiles". State evidence to prove the statement.

Ans. (*i*) Yes, eyes can be grouped together, which have evolved over generation from imperfect eyes in *Planaria* to perfect eyes in vertebrates.

(*ii*) Dinosaur is a type of reptile which has wings. Birds also have wings, so it can be opined that birds have evolved from reptiles.

16. To construct a ray diagram we use two rays of light which are so chosen that it is easy to determine their directions after reflection from the mirror. Choose these two rays and state the path of these rays after reflection from a concave mirror. Use these two rays to find the nature and position of the image of an object placed at a distance of 15 cm from a concave mirror of focal length 10 cm.

Ans. (*a*) **Rays which are choose to construct ray diagram for reflection are**

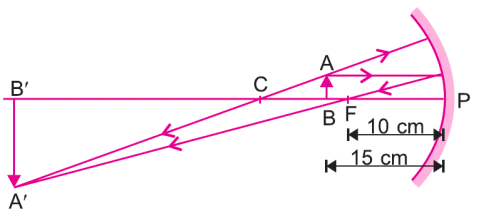
(*i*) A ray parallel to the principal axis and

(*ii*) A ray passing through the centre of curvature of a concave mirror.

Path of these rays after reflection

(*i*) A ray parallel to the principle axis, after reflection, it will pass through the principal focus of a concave mirror.

(*ii*) A ray passing through the centre of curvature, after reflection, it will reflected back along the same path.



For concave mirror

$$f = -10 \text{ cm}, \; u = -15 \text{ cm}, \; v = ?$$

Using, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, we get

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-10} - \frac{1}{-15} = -\frac{1}{10} + \frac{1}{15}$$

or $$\frac{1}{v} = \frac{-3+2}{30} = -\frac{1}{30}$$

or $$v = -30 \text{ cm}$$

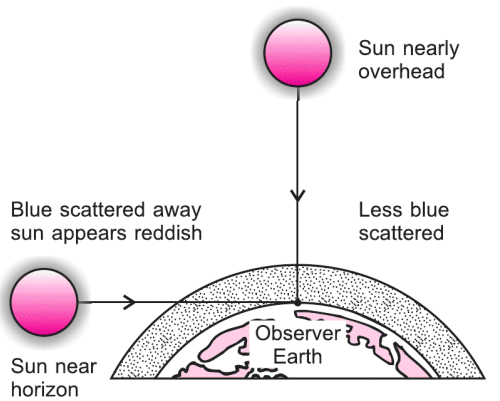
So screen should be placed at a distance of 30 cm on the same side of the object in order to obtain a sharp image.

Nature of image : Real, inverted and enlarge.

17. With the help of a labelled diagram, explain why the sun appears reddish at the sun-rise and the sun-set.

Ans. At sunrise or sunset, the sun looks almost reddish, while at noon, the sun appears white.

Explanation: At the time of sunrise/sunset, sun is near the horizon, so the sun rays have to travel through a larger atmospheric distance. The fine particles of the atmosphere scatter away the blue component and other shorter wavelengths of sunlight. Only red colour having longer wavelength and least scattered, reaches our eyes. Hence, sun appears red at sunrise or sunset.



18. After the examinations Rakesh with his friends went on a picnic to a nearby park. All friends carried cooked food packed in plastic bags or plastic cans. After eating the food some friends collected the leftover food and plastic bags etc and planned to dispose them off by burning. Rakesh immediately checked them and suggested to segregate the leftover food and peels of fruits from the plastic materials and respectively dispose them off separately in the green and red dustbins placed in the corner of the park.

(*i*) In your opinion, is burning plastic an eco-friendly method of waste disposal? Why? State the advantage of method suggested by Rakesh.

(*ii*) How can we contribute in maintaining the parks and roads neat and clean?

Ans. (*i*) Burning plastic is not an eco-friendly method of waste disposal- because it causes air pollution.

If the wastes are disposed as per the method suggested by Rakesh, different treatment can be given to the segregated waste separately. The organic waste can go for compost and the waste like plastic, glass, tin etc can go for recycling.

(*ii*) We should not throw packets, canes, etc on road or parks. The waste material should be thrown in dustbins. If separate dust bins are available for biodegradable and non-biodegradable waste, we should dispose off waste accordingly.

19. Explain why carbon forms compounds mainly by covalent bond. Explain in brief two main reasons for carbon forming a large number of compounds. Why does carbon form strong bonds with most other elements?

Ans. Carbon has atomic number 6. Its electronic configuration is 2, 4. It cannot lose four electrons because very high energy is required to remove four electrons.

It cannot gain four electrons because 6 protons cannot hold 10 electrons.

$\therefore$ Carbon can share four electrons forming four covalent bonds.

(*i*) **Catenation:** Carbon forms maximum number of compounds due to property of catenation (Self linking).

(*ii*) **Tetra valency:** Carbon can form four covalent bonds, therefore, it forms large number of compounds.

Isomerism is also responsible for large number of carbon compounds. Carbon is small in size, therefore it forms strong bonds with most other elements. It can also form double and triple bonds with some of elements which are very strong.

20. Write the functions of the following in human female reproductive system:

Ovary, oviduct, uterus

How does the embryo get nourishment inside the mother's body? Explain in brief.

Ans. (*i*) Ovaries:

(*a*) They produce female gametes

(*b*) They secrete female sex hormones estrogen & progesterone

(*ii*) Fallopian tubes (Oviduct):

(*a*) Carry eggs from ovaries to uterus

(*b*) Allow sperm to travel to meet the egg.

(*iii*) Uterus:

(*a*) Allows implantation of zygote on its wall.

(*b*) Causes menstruation when egg is not fertilized.

The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. This is a disc which is embedded in the uterine wall and transfers glucose and oxygen from the mother to the embryo.

21. How many pairs of chromosomes are present in human beings? Out of these how many are sex chromosomes? How many types of sex chromosomes are found in human beings?

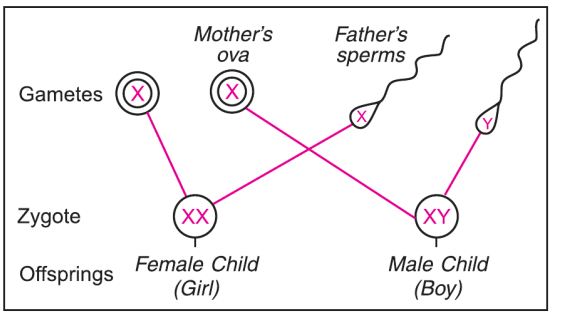
"The sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it". Draw a flow chart showing determination of sex of a newborn to justify this statement.

Ans. There are 23 pairs of chromosomes present in human beings. Out of these 23 pairs, one pair is sex chromosome. There are two type of sex chromosomes found in human being, X and Y. A female has 2 nos of X chromosomes and a male has one X and one Y chromosome.

Sex of a child depends on what happens during fertilization:

(*i*) The female gamete, ova always contributes an X chromosome during fertilization.

(*ii*) The male gamete, sperm contributes either X or Y chromosome during fertilization. But whether sperm will contribute the X chromosome or Y chromosome is a matter of chance and the man does not have any control on it.



Determination of Sex in Human beings

(*iii*) If a sperm carrying X chromosome fertilizes an ova which always carries an X chromosome, then the child born will be a girl. But if a sperm carrying Y chromosome fertilizes an egg which always carries X chromosome, then the child born will be a boy.

(*iv*) Thus, sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it.

22. (*a*) State the laws of refraction of light. Explain the term absolute refractive index of a medium and write an expression to relate it with the speed of light in vacuum.

(*b*) The absolute refractive indices of two media 'A' and 'B' are 2.0 and 1.5 respectively. If the speed of light in medium 'B' is 2×10^8 m/s, calculate the speed of light in:

(*i*) vaccum,

(*ii*) medium 'A'.

Ans. (*a*) **Laws of refraction of light**

(*i*) The incident ray, the normal and the refracted ray at the point of incidence all lies in the same plane for the two given transparent medium.

(*ii*) The ratio of sine of angle of incidence (*i.e.*, sin *i*) to the sine of angle of refraction (*i.e.*, sin *r*) is always constant for the light of given colour and for the given pair of media.

Mathematically,

$$\frac{\sin i}{\sin r} = \text{constant} = n_{21}$$

The constant 'n_{21}' is called refractive index of the second medium with respect to the first medium.

(*b*) Given: $\eta_A = 2.0, \quad \eta_B = 1.5$

From the above relation,

(*i*) $$\eta_B = \frac{c}{v_B}$$

where c = speed of light in vacuum.

and v_B = speed of light in medium '*B*' = 2×10^8 m/s

$$1.5 = \frac{c}{2 \times 10^8}$$

or $$c = 1.5 \times 2 \times 10^8 = 3 \times 10^8 \text{ ms}^{-1}$$

So, speed of light in vacuum = 3×10^8 ms^{-1}.

(*ii*) Again, $$\eta_A = \frac{c}{v_A}$$

where η_A = Absolute refractive index of medium '*A*'

v_A = Speed of light in medium '*A*'.

$$2.0 = \frac{3 \times 10^8}{v_A}$$

or $$v_A = \frac{3 \times 10^8}{2.0} = 1.5 \times 10^8 \text{ ms}^{-1}$$

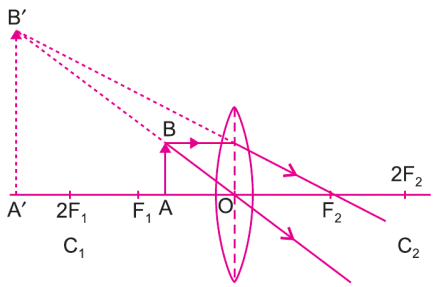
So, speed of light in medium 'A' is 1.5×10^8 ms^{-1}.

23. "A convex lens can form a magnified erect as well as magnified inverted image of an object placed in front of it". Draw ray diagram to justify this statement stating the position of the object with respect to the lens in each case.

An object of height 4 cm is placed at a distance of 20 cm from a concave lens of focal length 10 cm. Use lens formula to determine the position of the image formed.

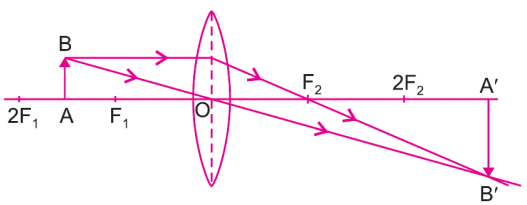
Ans. A convex lens of focal length 'f' can form

(a) a magnified and erect image only when object is placed between its focus 'F' and optical centre 'O' of the lens.

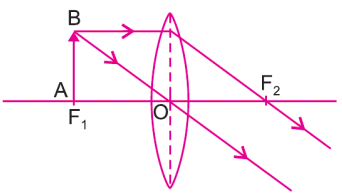


(b) a magnified and inverted image in the following position of an object placed in front of convex lens:

(i) between F and 2F and



(ii) at focus 'F'.



Therefore, for the given positions of the object with respect to convex lens, the given statement is justified.

For concave lens

$h_0 = +4$ cm, $u = -20$ cm, $f = -10$ cm, $v = ?$

Using lens formula,

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

or $$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{-10} + \frac{1}{-20} = -\frac{1}{10} - \frac{1}{20}$$

or $$\frac{1}{v} = \frac{-2-1}{20} = -\frac{3}{20}$$

or $$v = -\frac{20}{3} = -6.67 \text{ cm}$$

So, image is formed on the same side of the object at 6.67 cm from the optical centre of a concave lens.

24. A student is unable to see clearly the words written on the blackboard placed at a distance of approximately 4 m from him. Name the defect of vision the boy is suffering from. Explain the method of correcting this defect. Draw ray diagram for the:

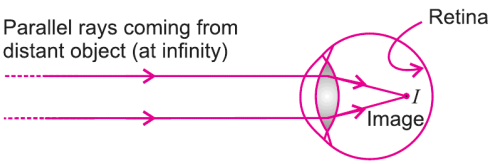
(i) defect of vision and also

(ii) for its correction.

Ans. Defect of vision-Myopia or short-sightedness

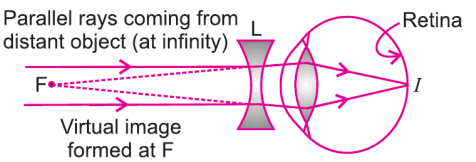
The short-sightedness is corrected by using a concave lens which diverges and shifts the image to the retina.

(*i*) **Defect of vision**



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

(*ii*) **Correction for defect of vision**



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

SECTION-B

25. A student adds 2 mL of acetic acid to a test tube containing 2 mL of distilled water. He then shakes the test well and leaves it to settle for some time. After about 5 minutes he observes that in the test tube there is:

(*a*) a clear transparent colourless solution

(*b*) a clear transparent pink solution

(*c*) a precipitate settling at the bottom of the test tube

(*d*) a layer of water over the layer of acetic acid

Ans. (*a*) Homogeneous, clear, transparent, colourless solution is formed as acetic acid is soluble in water.

26. A student prepared 20% sodium hydroxide solution in a beaker to study saponification reaction. Some observations related to this are given below:

(*i*) Sodium hydroxide solution turns red litmus blue

(*ii*) Sodium hydroxide readily dissolves in water

(*iii*) The beaker containing solution appears cold when touched from outside

(*iv*) The blue litmus paper turns red when dipped into the solution

The correct observations are:

(*a*) I, II and IV

(*b*) I, II and III

(*c*) only III and IV

(*d*) only I and II

Ans. (*d*) NaOH turns red litmus blue and it is soluble in water. The dissolution is exothermic process.

27. Hard water is not available for an experiment. Some salts are given below:

(*i*) Sodium chloride

(*ii*) Sodium sulphate

(*iii*) Calcium chloride

(*iv*) Calcium sulphate

(*v*) Potassium chloride

(*vi*) Magnesium sulphate

Select from the following a group of these salts, each member of which may be dissolved in water to make it hard.

(*a*) I, II, V

(*b*) I, III, V

(*c*) III, IV, VI

(*d*) II, IV, VI

Ans. (*c*) $CaCl_2$, $CaSO_4$ and $MgSO_4$ will make water hard.

28. A student identified the various parts of an embryo of a gram seed and listed them as given below:

(*i*) Testa

(*ii*) Plumule

(*iii*) Radicle

(*iv*) Cotyledon

(*v*) Tegman

Out of these the actual parts of the embryo are:

(*a*) I, II, III

(*b*) II, III, IV

(*c*) III, IV, V

(*d*) II, IV, V

Ans. (*b*) These are the parts of an embryo.

29. Four students A, B, C and D reported the following set of organs to be homologous. Who is correct?

(*a*) Wings of a bat and a butterfly

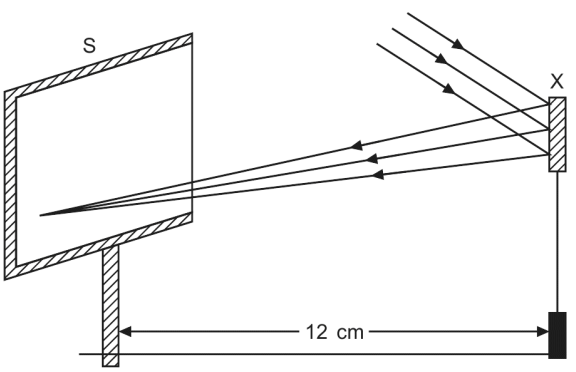
(*b*) Wings of a pigeon and a bat

(*c*) Wings of a pigeon and a butterfly

(*d*) Forelimbs of cow, a duck and a lizard

Ans. (*d*) They have similar structures but different functions.

30. Study the following diagram and select the correct statement about the device 'X':



(*a*) Device 'X' is a concave mirror of radius of curvature 12 cm

(*b*) Device 'X' is a concave mirror of focal length 6 cm

(*c*) Device 'X' is a concave mirror of focal length 12 cm

(*d*) Device 'X' is a convex mirror of focal length 12 cm

Ans. (*c*) Converging nature of the rays indicates that device '*X*' is a concave mirror as shown in the figure. Also, focal length of the mirror is equal to the distance between pole of mirror and screen. So, $f = 12$ cm.

31. A student has obtained a point image of a distant object using the given convex lens. To find the focal length of the lens he should measure the distance between the:

(*a*) lens and the object only

(*b*) lens and the screen only

(*c*) object and the image only

(*d*) lens and the object and also between the object and the image

Ans. (*b*) The difference between the distance from the optical centre of the lens and screen gives the focal length of convex lens.

32. Four students P, Q, R and S traced the path of a ray of light passing through a glass slab for an angle of incidence 40° and measured the angle of refraction. The values as measured them were 18°; 22°; 25° and 30° respectively. The student who has performed the experiment methodically is:

(*a*) P

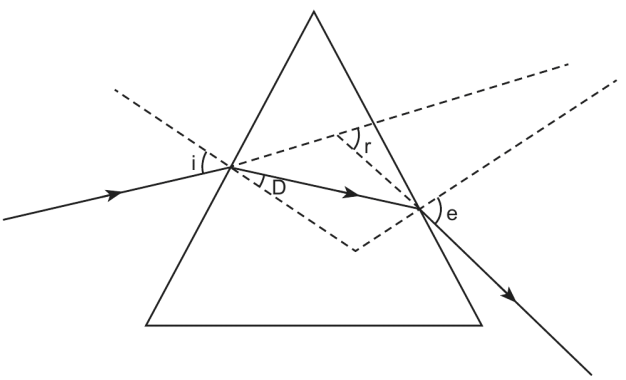
(*b*) Q

(*c*) R

(*d*) S

Ans. (*a*) At the rarer-denser interface, the angle of refraction is always less than the angle of incidence, *i.e.* $\angle r < \angle i$.

33. After tracing the path of a ray of light through a glass prism a student marked the angle of incidence ($\angle i$), angle of refraction ($\angle r$), angle of emergence ($\angle e$) and the angle of deviation ($\angle D$) as shown in the diagram. The correctly marked angles are:



(*a*) $\angle i$ and $\angle r$

(*b*) $\angle i$ and $\angle e$

(*c*) $\angle i$, $\angle e$ and $\angle D$

(*d*) $\angle i$, $\angle r$ and $\angle e$

Ans. (*b*) Angle of incidence ($\angle i$) is the angle between incident ray and normal.

Angle of emergence ($\angle e$) is the angle between normal and emergent ray.

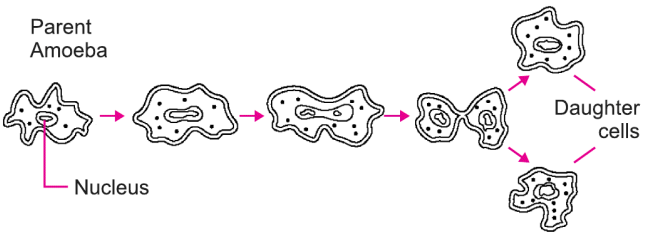
34. List two observations which you make when you add a pinch of sodium hydrogen carbonate to acetic acid in a test tube. Write chemical equation for the reaction that occurs.

Ans. Brisk effervescence due to colourless, odourless CO_2 gas will be observed.

$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$.

35. Name the type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost. Draw the initial and the final stages of this type of reproduction. State the event with which this reproduction starts.

Ans. This type of reproduction is called binary fission.



Binary Fission in *Amoeba*

This type of reproduction starts with elongation of nucleus.

36. To find the image-distance for varying object-distances in case of a convex lens, a student obtains on a screen a sharp image of a bright object placed very far from the lens. After that he gradually moves the object towards the lens and each time focuses its image of the screen.

(*a*) In which direction – towards or away from the lens, does he move the screen to focus the object?

(*b*) What happens to the size of image – does it increase or decrease?

(*c*) What happen when he moves the object very close to the lens?

Ans. (*a*) When an object moves gradually from very far off position *i.e.*, from infinity towards the lens, the image starts from its principal focus on the other side of the lens towards infinity. So, he moves the screen away from the lens to focus the object.

(*b*) Size of image increases.

(*c*) When object lies very close to the lens, *i.e.* object lies in between focus and optical centre, the image is formed on the same side of the object. Virtual and magnified image is formed.

Set-II (*Uncommon Questions to Set-I*)

1. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n+2}.

Ans. C_2H_6 is ethane, second member of homologous series having general formula C_nH_{2n+2}.

2. What is the magnification of the images formed by plane mirrors and why?

Ans. Magnification of images formed by a plane mirrors is +1. This is because the size of image formed by plane mirror is equal to the size of object.

3. What is meant by power of a lens?

Ans. Power of a lens: The ability of a lens to converge or diverge the rays of light is called power of a lens.

4. Write two differences between binary fission and multiple fission in a tabular form.

Ans. **Differences between:**

Binary fission	Multiple fission
(*i*) It is the division of the parent into two nearly equal sized daughter individuals.	(*i*) It is the division of the parent into many small daughter individuals.
(*ii*) Two daughter individuals are formed by a simple division or splitting.	(*ii*) Nucleus of the parent cell divides to form a number of nuclei.

5. (*i*) Why do we need to manage our resources carefully?

(*ii*) Why management of natural resources requires a long term perspective?

Ans. (*i*) Resources are limited and with the human population increasing at a tremendous rate, demand for all resources are increasing at an exponential rate. We therefore need to manage our resources carefully.

(*ii*) Management of natural resources requires a long term perspective, so that these resources last for generations to come and will not merely be exploited for short term gain. Management of natural resources also ensures equitable distribution of resources, so that all get the benefit from development of these resources.

6. List four measures that can be taken to conserve forests.

Ans. (*i*) Vegetative propagation is a cheaper, easier and more rapid method of propagation in plants than growing plants from their seeds.

(*ii*) The traits or characters of the parent plant are preserved by vegetative propagation.

(*iii*) Better quality of the plants can be maintained by this method.

(*iv*) It results in propagation of those plants which do not produce viable seeds or produce seeds with prolonged period of dormancy.

7. Na, Mg and Al are the elements of the same period of Modern Periodic Table having one, two and three valence electrons respectively. Which of these elements (*i*) has the largest atomic radius, (*ii*) is least reactive? Justify your answer stating reason for each case.

Ans. (*i*) Na has largest atomic radius because it has 11 protons and 11 electrons and least effective nuclear charge among these elements.

(*ii*) Al is least reactive because it is smallest in size, therefore, has most effective nuclear charge, least tendency to lose electrons.

9. What is meant by isomers? Draw the structures of two isomers of butane, C_4H_{10}. Explain why we cannot have isomers of first three members of alkane series.

Ans. Isomers are those compounds which have same molecular formula but different structural formula.

$CH_3CH_2CH_2CH_3$ and $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_3$ are two isomers of C_4H_{10}. Isomers are not possible for first three members because branching is not possible.

11. What are sexually transmitted diseases. List two example of each diseases caused due to (*i*) bacterial infection and (*ii*) viral infection. Which device or devices may be used to prevent the spread of such diseases.

Ans. STDs are diseases which are spread by sexual contact from an infected person to a healthy person.

(*i*) Gonorrhoea and Syphilis are STDs caused by bacterial infection.

(*ii*) AIDS and Wart are STDs caused by viral infection.

Spread of STDs can be prevented by-

(*a*) Avoiding sexual contact with infected persons.

(*b*) Using condom for penis during sexual act.

14. What is speciation? List four factors responsible for speciation.

Ans. Speciation: Speciation is the evolution of reproductive isolation among once interbreeding population.

Factors which can lead to speciation are-

(*i*) **Genetic drift:** Over generation, genetic drift may accumulate which lead to speciation.

(*ii*) **Natural selection:** Natural selection may work differently in different location which may give rise to speciation.

(*iii*) Severe DNA change

(*iv*) A variation may occur which does not allow sexual act between two groups.

19. The image of a candle flame placed at a distance of 30 cm from a spherical lens is formed on a screen placed on the other side of the lens at a distance of 60 cm from the optical centre of the lens. Identify the type of lens and calculate its focal length. If the height of the flame is 3 cm, find the height of its image.

Ans. Given: $u = -30$ cm, $v = +60$ cm, $h_0 = +3$ cm

Using lens formula $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{60} - \frac{1}{-30} = \frac{1}{60} + \frac{1}{30} = \frac{3}{60} = \frac{1}{20}$

$\therefore$ $f = +20$ cm

Positive sign of focal length indicates that the given lens is convex in nature whose focal length is 20 cm.

Again, $m = \frac{h_i}{h_0} = \frac{v}{u}$

or $h_i = \frac{v}{u} \times h_0 = \frac{+60}{-30} \times 3 = -6$ cm

So, height of image is 6 cm. Negative sign indicates that it is formed below the principal axis and is real and inverted.

Set-III (*Uncommon Questions to Set-I and Set-II*)

1. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n-2}.

Ans. $HC{\equiv}C{-}CH_3$, Propyne (C_3H_4) is second member of homologous series.

2. What is speciation?

Ans. **Speciation** is the evolution of reproductive isolation among once–interbreeding populations, *i.e.*, the development of one or more species from an existing species.

3. Why should biodegradable and non-biodegradable wastes be discarded in two separate dustbins?

Ans. Biodegradable materials are broken down by micro organisms in nature into simple harmless substances. Non biodegradable materials need a different treatment like heat and temperature and hence should be discarded in a different bin.

4. List four specific characteristics of the images of the object formed by convex mirrors.

Ans. **Properties of image formed by a convex mirror:**

(*i*) It always formed behind the mirror, between the pole and its focus.

(*ii*) The image is always virtual and erect.

(*iii*) The size of image is always smaller than the object.

(*iv*) Magnification is always positive.

5. List two advantages associated with water harvesting at the community level.

Ans. (*i*) Water harvested will percolate down and will increase the ground water level.

(*ii*) Water harvested at community level can be used for drinking and irrigation purpose.

6. Everyone of us can do something to reduce our personal consumption of various natural resources. List four such activities based on 3-R approach.

Ans. The consumption of various natural resources can be reduced in the following ways:

(*i*) Saving electricity by switching off unnecessary lights and fans.

(*ii*) Walking or cycling when possible than using vehicle.

(*iii*) Repairing leaky taps.

(*iv*) Not wasting food.

7. Write the name and structural formula of the compound obtained when ethanol is heated at 443 K with excess of conc. H_2SO_4. Also write chemical equation for the reaction stating the role of conc. H_2SO_4 in it.

Ans. $\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[443\ K]{\text{conc } H_2SO_4} \underset{\text{Ethene}}{CH_2{=}CH_2} + H_2O$

H—C═C—H is structural formula. Its name is ethene.

Conc. H_2SO_4 acts as dehydrating agent.

10. Write the number of periods the Modern Periodic Table has. State the changes in valency and metallic character of elements as we move from left to right in a period. Also state the changes, if any, in the valency and atomic size of elements as we move down a group.

Ans. Modern Periodic Table has 7 periods.

Valency first increases till middle and then decreases along a period from left to right. Metallic character decreases from left to right in a period.

There is no change in valency we move down the group.

Atomic size goes on increasing down the group.

12. (*a*) Name the following:

(*i*) Thread like non-reproductive structures present in Rhizopus.

(*ii*) 'Blobs' that develop at the tips of the non-reproductive threads in Rhizopus.

(*b*) Explain how these structures protect themselves and what is the function of the structures released from the 'blobs' in *Rhizopus*.

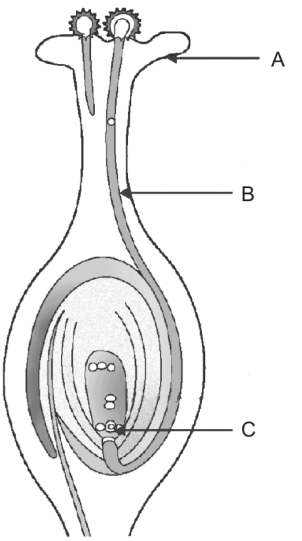
Ans. (*a*) (*i*) Hyphae

(*ii*) Sporangium

(*b*) Spores are enclosed within sporangia which protects the spores.

Spores when released from sporangia Develops into new *Rhizopus*.

13. Name the parts A, B and C shown in the diagram and write their functions.



Ans. A = Stigma. Stigma allows pollens to land on it and then to grow.

B = Pollen tube. It allows male germ cell to travel through it and to reach the female germ cell.

C = Female germ cell. When the male germ cell reaches the female germ cell, fertilization takes place and zygote is formed.

15. List in tabular form, two distinguishing features between the acquired traits and the inherited traits with one example of each.

Ans. **Differences:**

Acquired traits	Inherited traits
(*i*) These traits are the characteristics which are developed during the lifetime of an individual.	(*i*) These are the characteristics transmitted from parent to the offspring.
(*ii*) Acquired traits are not passed on to the next generation. *e.g.*, **Acquired trait:** Less body weight due to starvation.	(*ii*) Inherited trait is genetically determined characteristic that distinguishes a person. *e.g.*, **Inherited trait:** Colour of hair and eye.

16. To construct ray diagrams, two rays of light are generally so chosen that it is easy to determine their directions after reflection from a mirror. Choose two such rays and state the path/direction of these rays after reflection from a concave mirror. Use these two rays to find the position and nature of the image of an object placed at a distance of 8 cm from a concave mirror of focal length 12 cm.

Ans. (*a*) **Rays which are choose to construct ray diagram for reflection are**

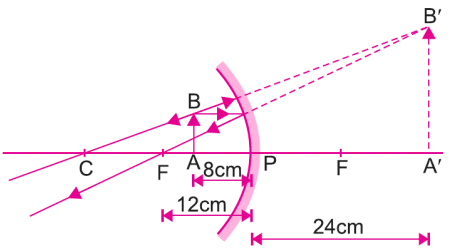
(*i*) A ray parallel to the principal axis and

(*ii*) A ray passing through the centre of curvature of a concave mirror.

Path of there rays after reflection

(*i*) A ray parallel to the principle axis, after reflection, it will pass through the principal focus of a concave mirror.

(*ii*) A ray passing through the centre of curvature, after reflection, it will reflected back along the same path.



For concave mirror

$$f = -12 \text{ cm}, \; u = -8 \text{ cm}, \; v = ?$$

Using mirror formula, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, we get

$$\frac{1}{-12} = \frac{1}{v} + \frac{1}{-8}$$

or $$\frac{1}{v} = \frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{24}$$

or $$v = +24 \text{ cm}$$

So, the image is formed behind the mirror at a distance of 24 cm from its pole and it is virtual, erect and magnified.

Latest Examination Papers, 2015

[All India Set-I, II, III]

Time Allowed : **3 Hours**] [*Maximum Marks* : **70**

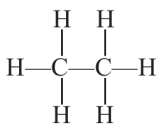
General Instructions : *As given in Examination Paper, Delhi 2015*

Set-I

SECTION-A

1. Write the number of covalent bonds in the molecule of ethane.

Ans.



There are 7 covalent bonds.

2. Name the life process of an organism that helps in the growth of its population.

Ans. Reproduction.

3. What will be the amount of energy available to the organisms of the 2nd trophic level of a food chain, if the energy available at the first trophic level is 10,000 joules?

Ans. 100 Joules of energy will be available to the organism in the 2^{nd} trophic level.

4. The absolute refractive indices of glass and water are 3/2 and 4/3 respectively. If the speed of light in glass is 2×10^8 m/s, calculate the speed of light in (*i*) vacuum, (*ii*) water.

Ans. Given: $n_g = \frac{3}{2}$ and $n_w = \frac{4}{3}$

$v_g = 2 \times 10^8$ m/s

(*i*) We know that $n_g = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in glass}} = \frac{c}{v_g}$

$$\frac{3}{2} = \frac{c}{2\times10^8} \Rightarrow c = 3 \times 10^8 \text{ ms}^{-1}$$

So, speed of light in vacuum = 3×10^8 m/s

(*ii*) Again, $n_w = \frac{c}{v_w}$

$$\frac{4}{3} = \frac{3\times10^8}{v_w}$$

or $v_w = \frac{9}{4}\times10^8 = 2.25 \times 10^8 \text{ ms}^{-1}$

5. List two main causes of the pollution of water of the river Ganga. State how pollution and contamination of river water prove harmful for the health of the people of neighbouring areas.

Ans.
- Largely untreated sewage such as garbage and excreta are dumped into the Ganga.
- Industries also contribute in Ganga's pollution by loading chemical effluents and makes the water toxic, killing aquatic organisms.

Harmful effects:

(*i*) It has made the water unfit for consumption and if consumed without treatment, it causes diarrhoea, skin disease and many other diseases in human being.

(*ii*) It causes death to aquatic animals.

6. What is biodiversity? What will happen if biodiversity of an area is not preserved? Mention one effect of it.

Ans. **Biodiversity** is the existence of a wide variety of species of plants, animals and microorganisms in a natural habitat within a particular environment or of genetic variation within a species. Biodiversity of an area is the number of species or range of different life forms found there. Forests are 'biodiversity hotspots'.

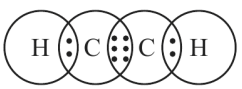
Every living being is dependent on another living being. It is a chain. If biodiversity is not maintained, the links of the chain go missing. If one organism goes missing, this will affect all the living beings who are dependent on it.

7. List two tests for experimentally distinguishing between an alcohol and a carboxylic acid and describe how these tests are performed.

Ans. (*i*) **$NaHCO_3$ test:** Add sodium hydrogen carbonate to alcohol and a carboxylic acid separately. Alcohol will not react, whereas carboxylic acid will give brisk effervescence. Pass the gas through lime water. It will turn milky.

(*ii*) **Blue litmus test:** Add few drops of alcohol and solution of carboxylic acid on blue litmus paper separately. Blue litmus will remain as it is in case of alcohol, whereas it will turn red in carboxylic acid.

8. Draw the electron-dot structure for ethyne. A mixture of ethyne and oxygen is burnt for welding. In your opinion, why cannot we use a mixture of ethyne and air for this purpose?

Ans. 

H—C≡C—H

Ethyne and air will not produce enough heat which can be used for welding purpose. Ethyne and oxygen will produce lot of heat which can be used for welding purposes.

9. Two elements 'P' and 'Q' belong to the same period of the modern periodic table and are in Group-1 and Group-2 respectively. Compare their following characteristics in tabular form:

(*a*) The number of electrons in their atoms

(*b*) The sizes of their atoms

(*c*) Their metallic characters

(*d*) Their tendencies to lose electrons

(*e*) The formula of their oxides

(*f*) The formula of their chlorides

Ans.

Group-1	Group-2
(*a*) They have one valence electron.	(*a*) They have 2 valence electrons.
(*b*) They are larger in size.	(*b*) They are smaller in size.
(*c*) They are more metallic.	(*c*) They are less metallic.
(*d*) They can lose electrons easily.	(*d*) They have less tendency to lose electron than Group-1.
(*e*) P_2O is formula of oxide.	(*e*) QO is formula of their oxides.
(*f*) PCl is formula of chloride.	(*f*) QCl_2 is formula of their chloride.

10. Taking the example of an element of atomic number 16, explain how the electronic configuration of the atom of an element relates to its position in the modern periodic table and how valency of an element is calculated on the basis of its atomic number.

Ans. S(16) has electronic configuration 2, 8, 6. It has 6 valence electrons. It belongs to Group 16. It has three shells, therefore, it belongs to 3^{rd} period. It has 6 valence electrons. It can gain 2 electrons to complete its octet, therefore, its valency is equal to 2.

11. List six specific characteristics of sexual reproduction.

Ans. **Specific Characteristics of Sexual Mode of Reproduction.**

(*i*) Sexual reproduction promotes diversity of characters in the offsprings.

(*ii*) It results in new combinations of genes brought together in the gamete and this reshuffling increases genetic variation.

(*iii*) It plays a prominent role in the origin of new species.

(*iv*) The sexual mode of reproduction incorporates process of combining DNA from two different individuals during reproduction.

(*v*) Sexual reproduction need two parents to produce an offspring.

(*vi*) Sex cells are used in sexual reproduction.

12. What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained.

Ans. 'Chromosomes' are long thread-like structures which contain hereditary information of the individual and are thereby the carriers of genes. Chromosomes are located in the nucleus of a cell.

The parents are diploid (2n) as each of them has two sets of chromosomes. They form haploid (1n) male and female gametes through the process of meiosis. The haploid gametes have one set of chromosomes. These two gametes fuse during fertilisation and the offspring become diploid (2n) which is same as parents chromosome number.

13. List four points of significance of reproductive health in a society. Name any two areas related to reproductive health which have improved over the past 50 years in our country.

Ans. (*i*) The mother carrying a child should be physically matured.

(*ii*) The mother should be mentally fit to take care of the child.

(*iii*) There should be at least 3 years gap between 2 children.

(*iv*) Nutritious food should be available to the mother during pregnancy and during lactation period.

14. Explain with an example for each, how the following provides evidences in favour of evolution in organisms:

(*a*) Homologous organs

(*b*) Analogous organs

(*c*) Fossils

Ans. (*a*) Forelimb of human and bird are homologous organs. They have same structural design and developmental origin but they have different functions and appearance.

Homologous organs help us to understand that the organism have evolved from a common ancestor. The more common characteristics the two species have, the more closely they are related.

(*b*) Analogous organs are those organs which have different basic structural design and developmental origin but have similar appearance and perform similar functions.

Example: The wings of birds and bats look similar but have different design in their structure. They have a common function of flying but their origins are not common. So, birds and bats are not closely related.

(*c*) Fossils and their study is useful in knowing about the species which are no longer alive. They provide evidence and missing links between two classes. They are helpful in forming a sequence of organisms in the pathway of evolution. Thus, fossils have an importance in deciding evolutionary relationship. Archaeopteryx is a fossil bird. It had feathers, fused bones and beak which are exclusively bird structures. It also had some features which are found in reptiles, *e.g.*, teeth in jaw, claws on free fingers and a long tail. This fossil provides a clue that birds have evolved from reptiles.

15. Explain the following:

(*a*) Speciation

(*b*) Natural Selection

Ans. (*a*) **Speciation.** It is the evolution of reproductive isolation among once–interbreeding populations, *i.e.* the development of one or more species from an existing species.

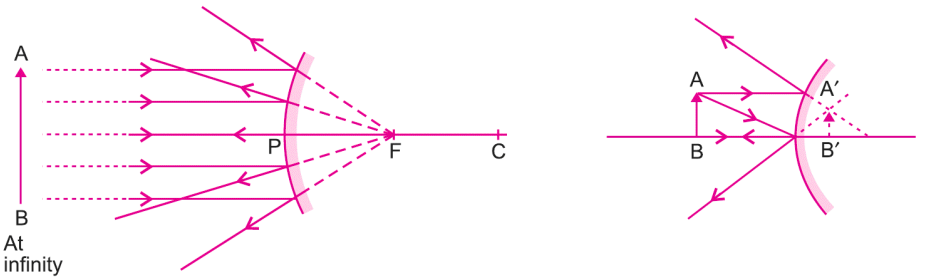
(*b*) **Natural Selection.** It is the process, according to Darwin, which brings about the evolution of new species of animals and plants.

- It was noted that the size of any population tends to remain constant despite the fact that more offsprings are produced than are needed to maintain.
- Darwin found that variations existed between individuals of the population and concluded that disease, competition and other forces acting on the population eliminated those individuals which are less well adapted to their environment.
- The surviving population would pass the hereditary advantageous characteristics to their offsprings.

16. If the image formed by a mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it? Draw a ray diagram to justify your answer. Where and why do we generally use this type of mirror?

Ans. • Convex Mirror

•



• **Rear view mirror of vehicles: Convex mirror**

Convex mirror is used because it always produces a virtual, and erect image. whose size is smaller than the object. Therefore, it enabling the driver to see wide field view of the traffic behind the vehicle in a small mirror.

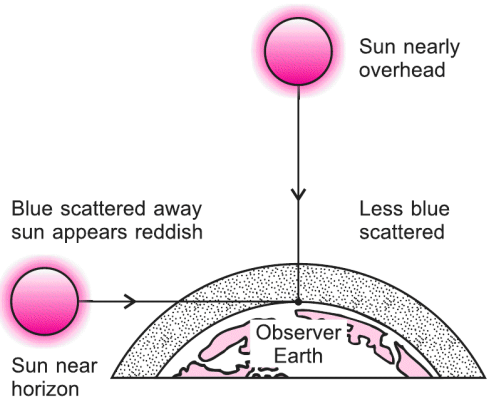
17. What is meant by scattering of light? Use this phenomenon to explain why the clear sky appears blue or the sun appears reddish at sunrise.

Ans. **Scattering of light:** The phenomenon of change of direction of propagation of light caused by a large number of molecules, such as smoke, tiny water droplets, suspended particles of dust and molecules of air present in the earth's atmosphere is called scattering of light.

Blue Colour of Sky: Blue colour has a shorter wavelength than red. So, according to Rayleigh scattering law, blue colour of sunlight scattered much more strongly by the large number of molecules present in the earth's atmosphere. Hence, the sky appears blue.

At Sunset or Sunrise, the Sun looks almost Reddish. The sun rays have to travel through a larger atmospheric distance. As $\lambda_b < \lambda_r$, most of the blue light and shorter wavelengths are removed by scattering. Only red colour, which is least scattered is received by our eye and appears to come from the sun.

Hence, the appearance of sun at sunset or sunrise, full moon near the horizon may look almost reddish.



18. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people must adopt to dispose non-biodegradable waste, for saving the environment.

Ans. Difference between Biodegradable and Non-biodegradable waste.

Biodegradable	Non-biodegradable
These wastes can be broken down into non poisonous substances in nature by the action of microorganisms.	These wastes cannot be broken down in non poisonous substances by the action of microorganisms.
Example : Vegetable peel.	Example : Polythene bags.

Following changes in habit, people should adopt:

(*i*) Disposal of non-biodegradable waste separately from biodegradable waste.

(*ii*) To reuse non-biodegradable waste as much as possible. For example reuse of polythene bags.

19. Both soap and detergent are same type of salts. What is the difference between them? Describe in brief the cleansing action of soap. Why do soaps not form lather in hard water? List two problems that arise due to the use of detergents instead of soaps.

Ans. Soaps are sodium or potassium salts of higher fatty acids. Detergents are sodium or potassium salts of sulphonic acids of benzene or alkene type hydrocarbons.

Soaps have, –COONa group, whereas detergents have $–SO_3Na$ or $–SO_4Na$.

Soap have hydrophobic part which attracts dirt, greese whereas hydrophillic part attracts water. Dirt, greese is washed away by water.

Soaps react with Ca^{2+} and Mg^{2+} ion present in hard water to form scum (calcium and magnesium salt of fatty acids) and soap goes waste.

(*i*) Detergents are more expensive.

(*ii*) Some detergents are not biodegradable and create water pollution.

20. (*a*) Name the human male reproductive organ that produces sperms and also secretes a hormone. Write the functions of the secreted hormone.

(*b*) Name the parts of the human female reproductive system where

(*i*) fertilisation takes place,

(*ii*) implantation of the fertilised egg occurs.

Explain how the embryo gets nourishment inside the mother's body.

Ans. (*a*) Sperms are produced by testes in male reproductive system. Testes also secrete male sex hormone, called testosterone.. Testosterone brings about changes in appearance in boys at the time of puberty.

(*b*) (*i*) Fertilisation occurs in fallopian tubes.

(*ii*) Implantation of fertilized egg takes place in the uterus.

Placenta provides nutrition from the mother's blood to the embryo. It facilitates movement of glucose and oxygen from the mother to the embryo. The developing embryo also generates waste substances which are removed by transferring into the mother's blood through placenta.

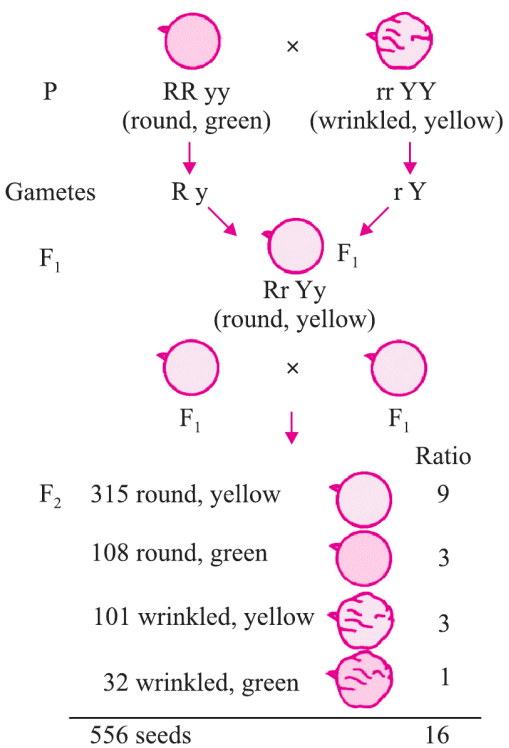
21. How do Mendel's experiments show that the

(*a*) traits may be dominant or recessive,

(*b*) traits are inherited independently?

Ans. Mendel's Experiments on Inheritance of Traits. Mendel used a number of contrasting visible characters of garden peas like round/wrinkled seeds, tall/short plants, white/violet flowers, etc.

Two Visible Contrasting Characters:



- Mendel took pea plants with two different characteristics such as plant with round and green seed and plant with wrinkled and yellow seeds.
- In F_1 progeny, all the plants will have round and yellow seeds. The round and yellow are dominant traits.
- Mendel then allowed F_1 progeny plants for self-pollination to get F_2 progeny.
- F_2 progeny will have plants with round and yellow seeds, round and green seeds, wrinkled and yellow seeds and wrinkled and green seed.
- The ratio of plants with above characteristics will be 9 : 3 : 3 : 1
- Therefore, tall/short trait and round seed/wrinkled seed trait are independently inherited.

(*a*) In F_1 progeny, all the plants will have round and yellow seeds. Wrinkled and green traits were not seen. But wrinkled and green characters appeared in the F_2 progeny . This means that wrinkle and green characters were recessive trait in F_1 progeny whereas round and yellow traits were dominant trait.

(*b*) New mixture of traits are seen in both F_1 and F_2 progeny . This means traits are independently inherited.

22. What is meant by power of a lens? Define its S.I. unit.

You have two lenses A and B of focal lengths +10 cm and –10 cm respectively. State the nature and power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens? Draw a ray diagram to justify your answer.

Ans. • (*a*) **Power of a Lens:** The ability of a lens to converge or diverge the ray of light after refraction is called power (P) of the lens. It is defined as the reciprocal of the focal length (*i.e.*) $P = \frac{1}{f}$.

(*b*) The SI unit of power of a lens is 'dioptre'. A lens of focal length 100 cm has a power of 1 dioptre (*i.e.*) 1 dioptre = $1m^{-1}$.

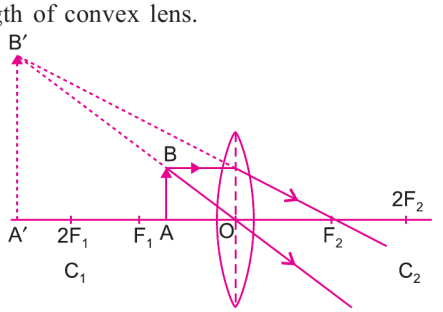
- Given: $f_A = +10$ cm, $f_B = -10$ cm

  So, its nature of lens A – Convex and lens B – Concave

  Power of lens A, $P_A = \frac{100}{f_A} = \frac{100}{10} = +10$ D

  Power of lens B, $P_B = \frac{100}{f_B} = -\frac{100}{10} = -10$ D

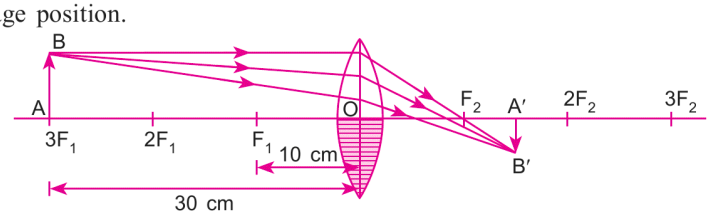
- Convex lens will form a virtual and magnified image of an object placed 8 cm from the lens, because object distance is less than that of the focal length of convex lens.



23. One half of a convex lens of focal length 10 cm is covered with a black paper. Can such a lens produce an image of a complete object placed at a distance of 30 cm from the lens? Draw a ray diagram to justify your answer.

A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 15 cm. Find the nature, position and size of the image.

Ans. • Yes, complete image of an object will be formed but of less intensity, the light falling on the covered portion will not reach at the image position.



- For convex lens, $h_1 = +4$ cm, $f = +20$ cm, $u = -15$ cm

  Using lens formula,

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

$$\frac{1}{20} = \frac{1}{v} - \frac{1}{-15} = \frac{1}{v} + \frac{1}{15}$$

$$\therefore \quad \frac{1}{v} = \frac{1}{20} - \frac{1}{15} = \frac{3-4}{60} = -\frac{1}{60}$$

or $\quad v = -60$ cm

Thus, the image is formed on the same side of the object at a distance of 60 cm from the optical centre of the lens. Negative sign indicates that image is virtual.

Using, $\quad m = \frac{h_2}{h_1} = \frac{v}{u}$

$$\Rightarrow \quad h_2 = \frac{v}{u} \times h_1$$

$$= \frac{-60}{-15} \times 4 = +16 \text{ cm}$$

So, image is four times larger than the size of object *i.e.* 16 cm. Positive sign indicates that the image is erect.

24. Write the importance of ciliary muscles in the human eye. Name the defect of vision that arises due to gradual weakening of the ciliary muscles in old age. What type of lenses are required by the persons suffering from this defect to see the objects clearly?

Akshay, sitting in the last row in his class, could not see clearly the words written on the blackboard. When the teacher noticed it, he announced if any student sitting in the front row could volunteer to exchange his seat with Akshay. Salman immediately agreed to exchange his seat with Akshay. He could now see the words written on the blackboard clearly. The teacher thought it fit to send the message to Akshay's parents advising them to get his eyesight checked.

In the context of the above event, answer the following questions:

(*a*) Which defect of vision is Akshay suffering from? Which type of lens is used to correct this defect?

(*b*) State the values displayed by the teacher and Salman.

(*c*) In your opinion, in what way can Akshay express his gratitude towards the teacher and Salman?

Ans. • **Importance of Ciliary muscles in the Human Eye:**

(*i*) It helps the eye lens to focus the image of an object on the retina by increasing or decreasing the curvature of eye lens.

(*ii*) It holds the eye lens in position.

- Presbyopia is the defect of vision that arises due to gradual weakening of ciliary musles in old age.
- Bifocal lenses are required.
- (*a*) Akshay is suffering from Myopia (short-sightedness). Concave lens is used to correct this defect.

  (*b*) Friendship, concern for others, helping nature.

  (*c*) By expressing his love, thanks and gratitude to the teacher and his friend Salwan, for their dedication, caring attitude and support without which his life would not have been that easy.

SECTION-B

25. What do we observe on pouring acetic acid on red and blue litmus papers?

(*a*) Red litmus remains red and blue litmus turns red.

(*b*) Red litmus turns blue and blue litmus remains blue.

(*c*) Red litmus turns blue and blue litmus turns red.

(*d*) Red litmus becomes colourless and blue litmus remains blue.

Ans. (*a*) Acetic acid turns blue litmus red.

26. While preparing soap a small quantity of common salt is generally added to the reaction mixture of vegetable oil and sodium hydroxide. Which one of the following may be the purpose of adding common salt?

(*a*) To reduce the basic nature of the soap

(*b*) To make the soap neutral

(*c*) To enhance the cleansing power of the soap

(*d*) To favour the precipitation of the soap

Ans. (*d*) NaCl helps in complete precipitation of the soap.

27. A student takes about 4 mL of distilled water in four test tubes marked P, Q, R and S. He then dissolves in each test tube an equal amount of one salt in one test tube, namely sodium sulphate in P, potassium sulphate in Q, calcium sulphate in R and magnesium sulphate in S. Ater that he adds an equal amount of soap solution in each test tube. One shaking each of these test tubes well, he observes a good amount of lather (foam) in the test tubes marked

(*a*) P and Q (*b*) Q and R

(*c*) P, Q and S (*d*) P, R and S

Ans. (*a*) P and Q will have good lather as these contain soft water.

28. A student was asked to observe and identify the various parts of an embryo of a red kidney bean seed. He identified the parts and listed them as under:

I. Tegmen

II. Testa

III. Cotyledon

IV. Radicle

V. Plumule

The correctly identified parts among these are

(*a*) I, II and III (*b*) II, III and IV

(*c*) III, IV and V (*d*) I, III, IV and V

Ans. (*c*) Plumule, Radicle and Cotyledon are the three parts of a germinating seed.

29. Given below is the list of vegetables available in the market. Select from these the two vegetables having homologous structures:

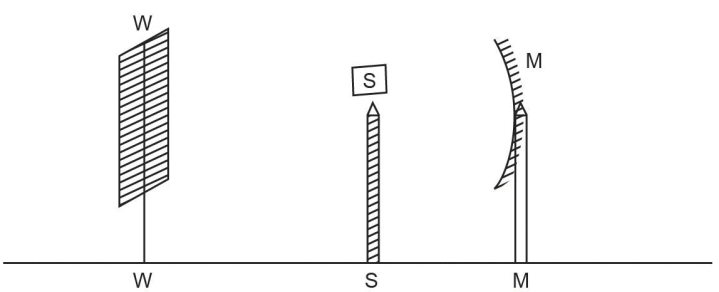
Potato, sweet potato, ginger, radish, tomato, carrot, okra (Lady's finger)

(*a*) Potato and sweet potato (*b*) Radish and carrot

(*c*) Okra and sweet potato (*d*) Potato and tomato

Ans. (*b*) Their structures are similar.

30. A student obtains a sharp image of the distant window (W) of the school laboratory on the screen (S) using the given concave mirror (M) to determine its focal length. Which is the following distances should he measure to get the focal length of the mirror?

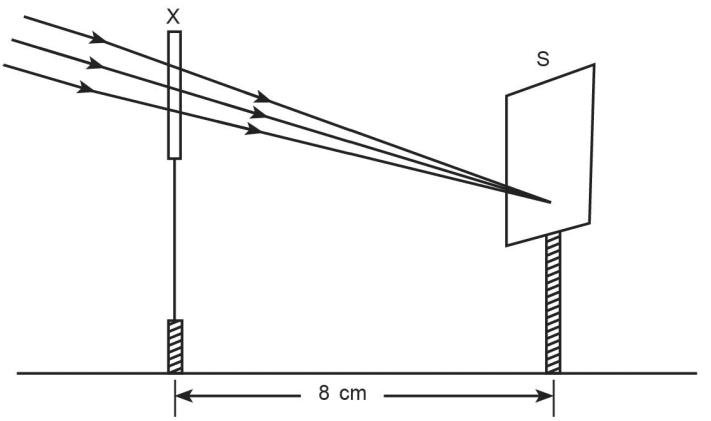


(*a*) MW (*b*) MS

(*c*) SW (*d*) MW – MS

Ans. (*c*) Focal length of concave mirror = Distance between mirror and screen.

31. A student used a device (X) to obtain/focus the image of a well illuminated distant building on a screen (S) as shown below in the diagram. Select the correct statement about the device (X).



(*a*) This device is a concave lens of focal length 8 cm.

(*b*) This device is a convex mirror of focal length 8 cm.

(*c*) This device is a convex lens of focal length 4 cm.

(*d*) This device is a convex lens of focal length 8 cm.

Ans. (*d*) Rays from an object at infinity, on refraction through a convex lens, meet at the second principal focus. The distance of second principal focus of the convex lens from its optical centre is called focal length.

32. A student traces the path of a ray of light through a rectangular glass slab for the different values of angle of incidence. He observes all possible precautions at each step of the experiment. At the end of the experiment, on analysing the measurements, which of the following conclusions is he likely to draw?

(*a*) $\angle i = \angle e < \angle r$ (*b*) $\angle i < \angle e < \angle r$

(*c*) $\angle i > \angle e > \angle r$ (*d*) $\angle i = \angle e > \angle r$

Ans. (*d*) At the rarer-denser interface, the angle of refraction is always less than the angle of incidence, *i.e.* $\angle i > \angle r$ and due to parallel surface, $\angle i = \angle e$.

33. A student traces the path of a ray of light through a triangular glass prism for different values of angle of incidence. On analysing the ray diagrams, which one of the following conclusions is he likely to draw?

(*a*) The emergent ray is parallel to the incident ray.

(*b*) The emergent ray bends at an angle to the direction of the incident ray.

(*c*) The emergent ray and the refracted ray are at right angles to each other.

(*d*) The emergent ray is perpendicular to the incident ray.

Ans. (*b*) The ray that emerges out of the glass prism at the glass air boundary suffers successive refractions and bends towards the base of the prism.

34. When you add sodium hydrogen carbonate to acetic acid in a test tube, a gas liberates immediately with a brisk effervescence. Name this gas. Describe the method of testing this gas.

Ans. Carbon dioxide gas is liberated. Pass the gas through lime water. Lime water turns milky due to formation of calcium carbonate.

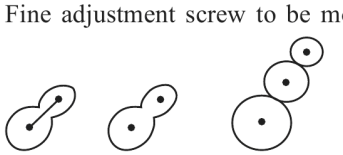
35. Students were asked to observe the permanent slides showing different stages of budding in yeast under high power of a microscope.

(*a*) Which adjustment screw (coarse/fine) were you asked to move to focus the slides?

(*b*) Draw three diagrams in correct sequence showing budding in yeast.

Ans. (*a*) Fine adjustment screw to be moved to focus the slide.

(*b*)



36. A 4 cm tall object is placed on the principal axis of a convex lens. The distance of the object from the optical centre of the lens is 12 cm and its sharp image if formed at a distance of 24 cm from it on a screen on the other side of the lens. If the object is now moved a little away from the lens, in which way (towards the lens or away from the lens) will he have to move the screen to get a sharp image of the object on it again? How will the magnification of the image be affected?

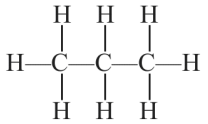
Ans. As the distance of the object increases, the image formed by a convex lens will be more close to its focus. So, he will move the screen towards the lens to get a sharp image of the object on it again with decrease in magnification.

Set-II (*Uncommon Questions to Set-I*)

SECTION-A

1. Write the number of covalent bonds in the molecule of propane, C_3H_8.

Ans.



There are 10 covalent bonds.

2. Where is DNA found in a cell?

Ans. DNA is found in the chromosome.

3. The first trophic level in a food chain is always a green plant. Why?

Ans. Only green plants can make their own food from sunlight. Green plants therefore, always occupy the 1st trophic level in a food chain.

5. We often observe domestic waste decomposing in the bylanes of our homes. List four ways to make the residents aware that the improper disposal of wastes is harmful to the environment and also for their own health.

Ans. Four ways to make the residents aware are:

(*i*) By door to door awareness campaign.

(*ii*) By displaying banner in various locations in the lane.

(*iii*) By organizing street play.

(*iv*) By giving a slip of appreciation or a rose to the people who dispose waste in the dustbins.

6. List any two advantages associated with water stored in the ground.

Ans. Advantages of storing water in the ground are:

(*i*) It does not evaporate.

(*ii*) It is relatively protected from contamination by human and animal waste.

7. What is meant by homologous series of carbon compounds? Classify the following carbon compounds into two homologous series and name them.

$$C_3H_4,\ C_3H_6,\ C_4H_6,\ C_4H_8,\ C_5H_8,\ C_5H_{10}$$

Ans. Homologous series is series of organic compounds which have same functional group, similar chemical properties but gradation in physical properties.

		Alkenes		Alkyne	
C_3H_6	Propene	$CH_3—CH=CH_2$	C_3H_4	$HC\equiv C—CH_3$	Propyne
C_4H_8	1-Butene	$CH_2=CH—CH_2—CH_3$	C_4H_6	$HC\equiv C—CH_2—CH_3$	1-Butyne
C_5H_{10}	1-Pentene	$CH_2=CH—CH_2—CH_2—CH_3$	C_5H_8	$HC\equiv C—CH_2—CH_2—CH_3$	1-Pentyne

9. The elements $_{4}Be$, $_{12}Mg$ and $_{20}Ca$, each having two valence electrons in their valence shells, are in periods 2, 3 and 4 respectively of the modern periodic table. Answer the following questions associated with these elements, giving reason in each case:

(*a*) In which group should they be?

(*b*) Which one of them is least reactive?

(*c*) Which one of them has the largest atomic size?

Ans. (*a*) They belong to group 2.

(*b*) 'Be' is least reactive.

(*c*) 'Ca' has the largest atomic size.

11. List three distinguishing features between sexual and asexual types of reproduction, in tabular form.

Ans. Distinguishing features between sexual and asexual reproduction:

Sexual reproduction	Asexual reproduction
(*i*) Sexual reproduction uses two individuals.	(*i*) Asexual reproduction need only one individual.
(*ii*) Hereditary characters vary from one generation to next generation.	(*ii*) Hereditary characters remain same.
(*iii*) It plays a prominent role in origin of a new species.	(*iii*) Its role in origin of new species is minimum.

14. A pea plant with blue colour flower denoted by BB is cross-bred with a pea plant with white flower denoted by ww.

(*a*) What is the expected colour of the flowers in their F_1 progeny?

(*b*) What will be the percentage of plants bearing white flower in F_2 generation, when the flowers of F_1 plants were selfed?

(*c*) State the expected ratio of the genotype BB and Bw in the F_2 progeny.

Ans.

	BB	×			ww
F_1		Bw	Bw	Bw	Bw
	Bw	×			Bw
F_2		BB	Bw	Bw	ww

(*a*) All flowers in F_1 progeny will be blue.

(*b*) 25% of flowers in F_2 progeny will be white.

(*c*) Ratio of BB and Bw will be 1 : 2.

18. What is an ecosystem? List its two main components. We do not clean natural ponds or lakes but an aquarium needs to be cleaned regularly. Why is it so? Explain.

Ans. **Ecosystem:** It is the structural and functional unit of biosphere, comprising of all the interacting organisms in an area together with the non-living constituents of the environment. Thus, an ecosystem is a self sustaining system where energy and matter are exchanged between living and non-living components.

Main components of ecosystem:

Biotic Component: It means the living organisms of the environment–plants, animals, human beings and microorganisms like bacteria and fungi, which are distinguished on the basis of their nutritional relationship.

Abiotic Component: It means the non-living part of the environment – air, water, soil and minerals. The climatic or physical factors such as sunlight, temperature, rainfall, humidity, pressure and wind are a part of the abiotic environment.

An aquarium is an artificial and incomplete ecosystem compared to pond or lakes which are natural, self-sustaining and complete ecosystem where there is a perfect recycling of materials.

An aquarium therefore needs regular cleaning.

19. What are fossils? How are they formed? Describe in brief two methods of determining the age of fossils. State any one role of fossils in the study of the process of evolution.

Ans. Fossils are the preserved traces or remains of living organisms of geological past.

When organisms die, their bodies decompose due to action of microorganisms. However, sometimes the body or at least some parts of the body may be in such an environment that does not let it decompose completely. All such preserved traces of living organisms are called fossils.

The age of fossil can be estimated by the following two methods:

(*i*) If we dig into the earth and start finding fossils, it can be assumed that the fossils closer to the surface are more recent to those found in deeper layers.

(*ii*) By detecting the ratios of different isotopes of the same element in the fossil material.

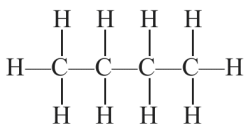
Fossils and their study is useful in knowing about the species which are no longer alive. They provide evidence and missing links between two classes. They are helpful in forming a sequence of organisms in the pathway of evolution. Thus, fossils have an importance in deciding evolutionary relationship.

Set-III (*Uncommon Questions to Set-I and Set-II*)

SECTION-A

1. Write the number of covalent bonds in the molecule of butane, C_4H_{10}.

Ans.



There are 13 covalent bonds.

2. Name two simple organisms having the ability of regeneration.

Ans. *Hydra* and *Planaria*.

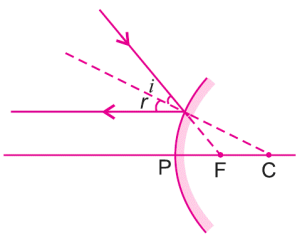
3. Which of the following are always at the second trophic level of food chains?

Carnivores, Autotrophs, Herbivores

Ans. Herbivores are always at the 2^{nd} trophic level.

4. Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray of light parallel to the principal axis of a convex mirror and show the angle of incidence and angle of reflection on it.

Ans.



5. Why is sustainable management of natural resources necessary? Out of the two-reuse and recycle-which, in your opinion, is better to practise? Give reason.

Ans. Natural resources are limited. If it is over exploited for short time gain, future generations will suffer heavily. Sustainable management of natural resources is therefore, necessary so that natural resources lasts for a longer period and future generations can also enjoy the benefits from it.

Out of reuse and recycle, I will suggest people to practice reuse as it does not consume any energy.

6. What is meant by biodiversity? List two advantages of conserving forests and wild life.

Ans. Biodiversity is the existence of a wide variety of species of plants, animals and microorganisms in a natural habitat within a particular environment.

Two reasons each of conserving:

(*a*) Forest

(*i*) It helps in retaining the sub-soil water.

(*ii*) It checks flood.

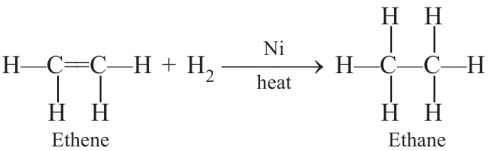
(*b*) Wildlife

(*i*) To maintain ecological equilibrium.

(*ii*) To protect the nature.

7. Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen is possible. State the essential condition for an addition reaction. Stating this condition, write a chemical equation giving the name of the reactant and the product of the reaction.

Ans. C_nH_{2n} and C_nH_{2n-2} are general formula of alkene and alkynes in which addition reaction with hydrogen is possible. Hydrogen is added to unsaturated hydrocarbon (having double or triple bond) in presence of nickel as catalyst.



9. Given below are some elements of the modern periodic table. Atomic number of the element is given in the parentheses:

A(4), B(9), C(14), D(19), E(20)

(*a*) Select the element that has one electron in the outermost shell. Also write the electronic configuration of this element.

(*b*) Which two elements amongst these belong to the same group? Give reason for your answer.

(*c*) Which two elements amongst these belong to the same period? Which one of the two has bigger atomic radius?

Ans. (*a*) D(19) = 2, 8, 8, 1

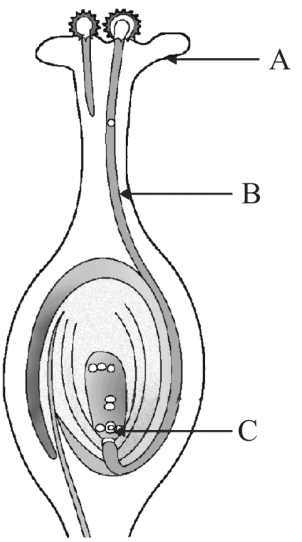
It has one valence electron.

(*b*) 'A' and 'E' belong to same group because they have same number of valence electrons.

(*c*) 'A' and 'B' belong to same period as they have same number of shells.

'A' has bigger atomic size due to less effective nuclear charge.

11. Identify A, B and C in the given diagram and write one function of each.



Ans. A = Stigma

B = Pollen tube

C = Female germ cell

Function of stigma: Stigma helps in receiving the pollen grains from the anther of stamen during pollination.

Function of pollen tube: The pollen tube facilitates movement of male germ cell through it to reach female germ cell.

Function of female germ cell: It meets with the male germ cell to form zygote which divides many times to form an embryo.

12. List four categories of contraceptive methods. State in brief two advantages of adopting such preventive methods.

Ans. Four methods of contraceptives used by humans are:

(*i*) Mechanical barrier such as condom.

(*ii*) Surgical method such as vasectomy or tubectomy.

(*iii*) Chemical method such as oral or vaginal pill.

(*iv*) Copper T.

Advantages of using contraceptives.

(*a*) It helps in avoiding unwanted pregnancy.

(*b*) Condom helps in preventing transmission of STDs.

16. With the help of scattering of light, explain the reason for the difference in colours of the sun as it appears during sunrise/sunset and noon.

Ans. At sunrise or sunset, the sun looks almost reddish, while at noon, the sun appears white.

Explanation: At the time of sunrise/sunset, sun is near the horizon, so the sun rays have to travel through a larger atmospheric distance. The fine particles of the atmosphere scatter away the blue component and other shorter wavelengths of sunlight. Only red colour having longer wavelength and least scattered, reaches our eyes. Hence, sun appears red at sunrise or sunset.

However, the light from the sun, at noon, travels relatively shorter distance. So, blue and violet components of sunlight are less scattered by the particles of atmosphere. Hence, sun appears white at noon.

17. An object of height 5 cm is placed perpendicular to the principal axis of a concave lens of focal length 10 cm. If the distance of the object from the optical centre of the lens is 20 cm, determine the position, nature and size of the image formed using the lens formula.

Ans. For concave lens,

$h_o = +5$ cm, $f = -10$ cm, $u = -20$ cm, $v = ?$, $h_2 = ?$

Using, $$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}, \text{ we get}$$

$$\frac{1}{-10} = \frac{1}{v} - \frac{1}{-20} = \frac{1}{v} + \frac{1}{20}$$

$\therefore$ $$\frac{1}{v} = -\frac{1}{10} - \frac{1}{20} = \frac{-2-1}{20} = -\frac{3}{20}$$

$$v = -\frac{20}{3} = -6.67 \text{ cm}$$

So, image is formed on the same side of the object at a distance of 6.67 cm. Negative sign indicates that image is virtual.

Also $|v| < |u|$, so image is diminished.

As, $$m = \frac{v}{u} = \frac{h_i}{h_o}$$

or $$\frac{-20/3}{-20} = \frac{h_i}{5}$$

or $$h_i = \frac{5}{3} = 1.66 \text{ cm}$$

So, image is virtual, erect diminished and of size 1.66 cm.

Latest Examination Papers, 2015

[Foreign Set-I, II, III]

Time Allowed : **3 Hours**] [*Maximum Marks* : **70**

General Instructions : *As given in Examination Paper, Delhi 2015*

Set-I

SECTION-A

1. Name the process by which unsaturated fats are changed to saturated fats.

Ans. Hydrogenation.

2. Name the causative agent of the disease "Kala-azar" and its mode of asexual reproduction.

Ans. *Leishmania* causes kala-azar. It reproduces by binary fission.

3. The following organisms form a food chain. Which of these will have the highest concentration of non-biodegradable chemicals? Name the phenomenon associated with it.

Insects, Hawk, Grass, Snake, Frog.

Ans. Hawk will have highest concentration of non-biodegradable chemical. The phenomenon is called biomagnification.

4. Why do stars appear to twinkle? Explain.

Ans. **Twinkling of Star:** The physical condition such as temperature, humidity, etc of the atmosphere continuously changing even at the same altitude. When star light passes through such changing atmosphere, the direction of refracted ray due to atmospheric refraction continuously change. The amount of light entering the eye also keeps changing. Some times star appears brighter and at some other time, it appears to be dim. Thus, the fluctuation in the intensity of starlight produces a twinkling effect to us.

5. What is meant by three types of 'R' (3-R's) to save the environment? Explain with examples how would you follow the 3-R's in your school to save the environment.

Ans. The three R-s mean Reduce, Recycle and Reuse to save the environment.

Reduce means to use less. We can switch off unnecessary lights and fans in school.

Recycle means to collect materials like plastic, glass, metal, etc and recycle them to make required items. We can dispose biodegradable and non-biodegradable materials in separate bins in school to facilitate recycle.

Reuse means to use thins again and again. We can use both sides of pages in school. Envelpops used in the school can be reversed and reused.

6. List four advantages of water stored in the ground as "ground water".

Ans. Four advantages of storing water in the ground are:

(*i*) It does not evaporate

(*ii*) It is relatively protected from contamination by human and animal waste

(*iii*) It does not provide breeding ground for mosquitoes

(*iv*) It provides moisture for vegetation.

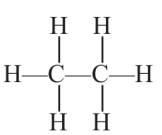
7. Write the molecular formula of the following compounds and draw their electron-dot structures:

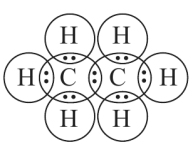
(*i*) Ethane

(*ii*) Ethene

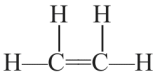
(*iii*) Ethyne

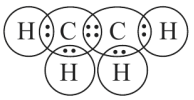
Ans. (*i*) Ethane (C_2H_6)



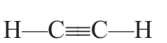


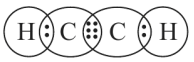
(*ii*) Ethene (C_2H_4)





(*iii*) Ethyne (C_2H_2)



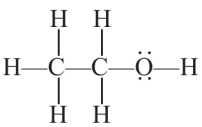
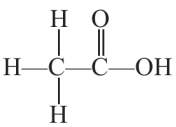
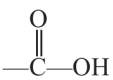


8. What is meant by functional group in carbon compounds? Write in tabular form the structural formula and the functional group present in the following compounds:

(*i*) Ethanol

(*ii*) Ethanoic acid

Ans. **Functional Group:** An atom or group of atoms which determines chemical properties of the organic compounds is called functional group.

(*i*) Ethanol	**(*ii*) Ethanoic acid**
C_2H_5OH 	CH_3COOH 
Functional group —OH	Functional group 

9. Write the main aim of classifying elements. Name the basic property of elements used in the development of Modern Periodic Table. State the Modern Periodic Law. On which side (part) of the Modern Periodic Table do you find metals, metalloids and non-metals?

Ans. The main aim of classification is to study the properties of 118 elements conveniently.

Atomic number is the basic property used in development of periodic table.

Modern Periodic Law: It states 'properties of elements are periodic function of their atomic number'.

Metals are on left hand side and middle of periodic table.

Non-metals are on right hand side of periodic table.

Metalloids are on right hand side in Zig-Zag manner between metals and non-metals.

10. The atomic number of an element 'X' is 20.

(*i*) Determine the position of the element 'X' in the periodic table.

(*ii*) Write the formula of the compound formed when 'X' reacts/combines with another element 'Y' (atomic number 8).

(*iii*) What would be the nature (acidic or basic) of the compound formed? Justify your answer.

Ans. (*i*) The element belongs to Group 2 and 4th period because it has 2 valence electrons and four shells.

(*ii*) X^2 Y^2

XY is the formula of the compound.

X has electronic configuration 2, 8, 8, 2 Valency = 2

Y has electronic configuration 2, 6 Valency = 2.

(*iii*) Basic oxide because 'X' is metal. It can lose 2 electrons to become stable. Metallic oxides are basic in nature.

11. Write one main difference between asexual and sexual mode of reproduction. Which species is likely to have comparatively better chances of survival—the one reproducing asexually or the one reproducing sexually? Justify your answer.

Ans.

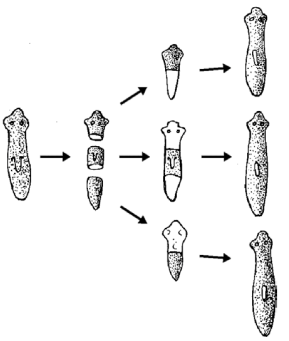
Sexual Reproduction	**Asexual Reproduction**
(*i*) Sexual reproduction needs two parents.	(*i*) Asexual reproduction needs only single parent.
(*ii*) Example : Human	(*ii*) *Amoeba*

In asexual reproduction, organisms raised are exact copies of their parents. They tend to preserve the similarities among all the individuals belonging to a given line of descent. But in sexual reproduction, two parents are involved and there is fusion of gametes. The offsprings show variations from their parents due to crossing over and exchange of gene segment.

In case of adverse environmental changes, the asexually reproducing organisms may not survive. But for sexually reproducing organisms, the change in environment may not be adverse for all the descent as some of the variations it has may have advantages in the changed environment. Hence, sexually reproducing organisms have comparatively better chances of survival.

12. Explain the process of regeneration in *Planaria*. How is this process different from reproduction?

Ans. (*a*) If a *Planaria* is cut into any number of pieces, each piece will grow into a complete organism. Regeneration is carried out by specialised cells which proliferate and make large number of cells of various types and tissues.



(*b*) In regeneration, the organism need to be cut into pieces to get more organisms. In Reproduction, the organism need not to be cut to multiply.

13. What is placenta? Explain its function in humans.

Ans. **Placenta** in human female is a complex double layered spongy vascular tissue formed by the joint activity of maternal and foetal tissues in the wall of uterus that is meant for attachment, nourishment and waste disposal for the foetus.

Through placenta, the foetus gets nutrients and oxygen from mother. Waste products from foetus are also transported to mother through placenta.

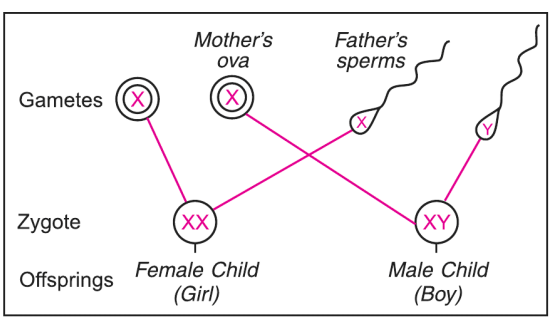
14. "It is a matter of chance whether a couple will have a male or a female child." Justify this statement by drawing a flow chart.

Ans. There are 23 pairs of chromosomes present in human beings. Out of these 23 pairs, one pair is sex chromosome. There are two type of sex chromosomes found in human being, X and Y. A female has 2 nos of X chromosomes and a male has one X and one Y chromosome.

Sex of a child depends on what happens during fertilization:

(*i*) The female gamete, ova always contributes an X chromosome during fertilization.

(*ii*) The male gamete, sperm contributes either X or Y chromosome during fertilization. But whether sperm will contribute the X chromosome or Y chromosome is a matter of chance and the man donot have any control on it.



Determination of Sex in Humans

(*iii*) If a sperm carrying X chromosome fertilizes an ova which always carries an X chromosome, then the child born will be a girl. But if a sperm carrying Y chromosome fertilizes an egg which always carries X chromosome, then the child born will be a boy.

(*iv*) Thus, sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it.

15. "It is possible that a trait is inherited but may not be expressed." Give a suitable example to justify this statement.

Ans. The statement "It is possible that a trait is inherited but may not be expressed" can be explained with the help of Mendel's experiment on Pea plant with one visible contrasting character.

Mendel took pure breed pea plant with one visible contrasting character viz. tall and short plant. The pure breed tall and short plant were crossed and found that all the plants in the F_1 progeny are tall. Mendel then allows the F_1 progeny plants for self pollination. It was found that all the F_2 progeny plants are not tall and some are short. This indicates that both tallness and shortness traits were inherited separately in the F_1 progeny but shortness trait was not expressed in the F_1 progeny.

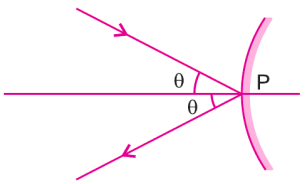
16. Draw a ray diagram to show the path of the reflected ray in each of the following cases. A ray of light incident on a convex mirror.

(*a*) strikes at its pole making an angle θ from the principal axis.

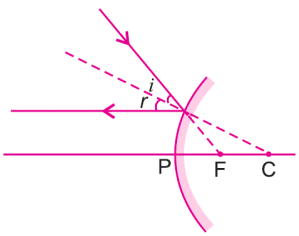
(*b*) is directed towards its principal focus.

(*c*) is parallel to its principal axis.

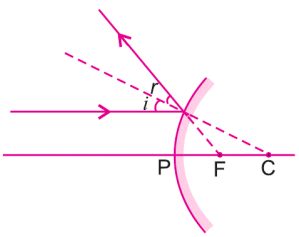
Ans. (*a*)



(*b*)



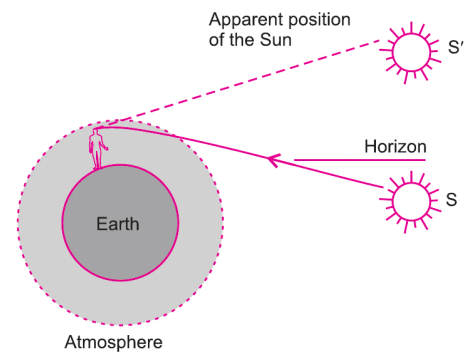
(*c*)



17. What is meant by advance sunrise and delayed sunset? Draw a labelled diagram to explain these phenomena.

Ans. Sun is visible 2 minutes before sunrise and 2 minutes after sunset because of atmospheric refraction. This can be explained as below:

Figure shows the actual position of sun S at the time of sunrise or sunset, just below the horizon and apparent position S′, above the horizon as appear to us.



Atmospheric refraction effects at sunset or sunrise

The sunrays coming from the sun, when it is slightly below the horizon passes through varying refractive index of different layers of the air, bends towards the normal and appear to come from S′, which is the apparent position of the sun. That is why sun is visible to us when it has actually set. So, due to the atmospheric refraction, the phenomenon of advance sunrise and delayed sunset is observed.

18. What is ozone? How and where is it formed in the atmosphere? Explain how does it affect ecosystem.

Ans. Ozone is an isotope of oxygen, *i.e* it is a molecule formed by 3 atoms of oxygen.

$$O_2 \longrightarrow O + O$$

$$O_2 + O \longrightarrow O_3 \text{ (Ozone)}$$

Ozone exists in the ozone layer of stratosphere. At higher level of atmosphere, O_2 molecule breaks down to 2 oxygen atom. The oxygen atom then combines with the oxygen molecule to form ozone.

Ozone layer in the atmosphere prevents UV rays from reaching earth. Exposure to excess UV rays causes skin cancer, cataract and damages eye and immune system. It also decreases crop yield and reduces population of phytoplankton, zooplankton and certain fish larvae which are an important constituent of aquatic food chain. It also disturbs rainfall, causing ecological disturbance and reduces global food production.

Thus, it affect the ecosystem.

19. Elements forming ionic compounds attain noble gas electronic configuration by either gaining or losing electrons from their valence shells. Explain giving reason why carbon cannot attain such a configuration in this manner to form its compounds. Name the type of bonds formed in ionic compounds and in the compounds formed by carbon. Also explain with reason why carbon compounds are generally poor conductors of electricity.

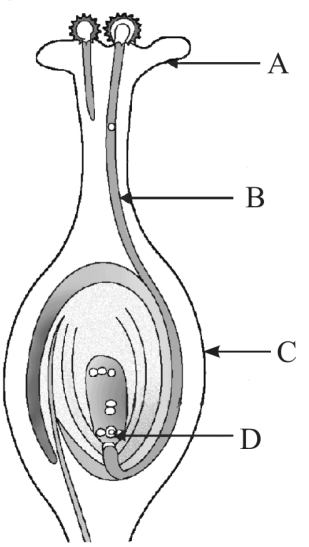
Ans. Carbon cannot lose four electrons because very high amount of energy is required to remove four electrons.

Carbon cannot gain four electrons easily because 6 protons cannot hold 10 electrons.

Carbon can share four electrons to form covalent bonds.

Carbon compounds are poor conductor of electricity because they do not form ions in aqueous solution.

20. (*a*) Identify A, B, C and D in the given diagram and write their names.



(*b*) What is pollination? Explain its significance.

(*c*) Explain the process of fertilisation in flowers. Name the parts of the flower that develop after fertilisation into

(*i*) seed,

(*ii*) fruit.

Ans. (*a*) A = Stigma

B = Pollen tube

C = Ovary

D = Embryo Sac

(*b*) It is the transfer of pollen grain from the anther of a flower to the stigma of a carpel.

Significance of pollination:

(*i*) It is necessary for seed formation and thus, perpetuation of species.

(*ii*) It stimulates the development of fruits.

Cross-pollination brings about genetic recombination of traits.

(*c*)
- After the pollen lands on a suitable stigma, it has to reach the female germ cells in the ovary.
- The pollen tube grows out of the pollen grain through the style to reach the ovary.
- Male germ cell travels through the pollen tube to reach the female germ cell and fertilizes it.
- After fertilisation, the zygote divides several times to form an embryo within the ovule.

(*i*) Ovule becomes seed.

(*ii*) Ovary becomes fruit.

21. What is speciation? List four factors that could lead to speciation. Which of these cannot be a major factor in the speciation of a self-pollinating plant species? Explain.

Ans. Speciation: Speciation is the evolution of reproductive isolation among once interbreeding population.

Factors which can lead to speciation are:

(*i*) **Genetic drift:** Over generation, genetic drift may accumulate which lead to speciation.

(*ii*) **Natural selection:** Natural selection may work differently in different location which may give rise to speciation.

(*iii*) Severe DNA change

(*iv*) A variation may occur which does not allow sexual act between two groups.

Severe DNA change may not occur in self pollinating plant species.

22. A student has focused the image of a candle flame on a white screen using a concave mirror. The situation is as given below:

Length of the flame = 1.5 cm

Focal length of the mirror = 12 cm

Distance of flame from the mirror = 18 cm

If the flame is perpendicular to the principal axis of the mirror, then calculate the following:

(*a*) Distance of the image from the mirror

(*b*) Length of the image.

If the distance between the mirror and the flame is reduced to 10 cm, then what would be observed on the screen? Draw ray diagram to justify your answer for this situation.

Ans. Given: $h_0 = +1.5$ cm, $f = -12$ cm, $u = -18$ cm

(*a*) For concave mirror, using mirror formula

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} \text{ we get}$$

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-12} - \frac{1}{-18} = -\frac{1}{12} + \frac{1}{18} = \frac{-3+2}{36}$$

or $$\frac{1}{v} = -\frac{1}{36}$$

or $$v = -36 \text{ cm}$$

So, distance of image from the mirror = 36 cm, negative sign indicate that image is formed on the same side of object.

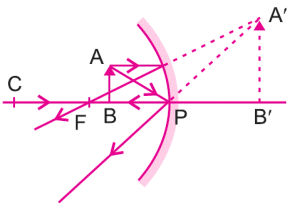
(*b*) Using, $$m = \frac{h_i}{h_0} = -\frac{v}{u}$$

or $$h_i = -\frac{v}{u} \times h_0$$

$$= -\frac{-36}{-18} \times 1.5 = -3.0 \text{ cm}$$

So, length of image is 3.0 cm.

If the distance between the mirror and the flame is reduced to 10 cm, no image is formed on the screen as object lies in between focus and pole of the mirror. So virtual image behind the mirror is obtained as shown in figure.



23. What is meant by the power of a lens? What is its S.I. unit? Name the type of lens whose power is positive.

The image of an object formed by a lens is real, inverted and of the same size as the object. If the image is at a distance of 40 cm from the lens, what is the nature and power of the lens? Draw ray diagram to justify your answer.

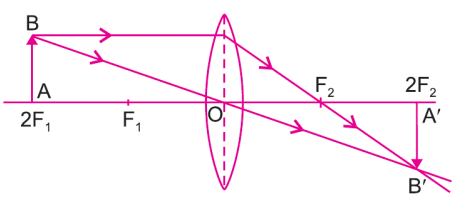
Ans. (*a*) **Power of a Lens:** The ability of a lens to converge or diverge the ray of light after refraction is called power (P) of the lens. It is defined as the reciprocal of the focal length (*i.e.,*) $P = \frac{1}{f}$.

(*b*) The SI unit of power of a lens is 'dioptre'. A lens of focal length 100 cm has a power of 1 dioptre (*i.e.,*) 1 dioptre = 1 m^{-1}.

The power of convex lens is positive as its focal length is positive.

(*c*) The image of an object formed by a lens is real, inverted and of the same size as the object. This indicates that $| v | = | u | = 2f = 40$ cm. So, nature of lens = convex and $f = +20$ cm.

Power of lens, $P = \frac{100}{f(\text{in cm})} = \frac{100}{20} = +5$ D



24. State the function of each of the following parts of the human eye:

(*i*) Cornea

(*ii*) Iris

(*iii*) Pupil

(*iv*) Retina

Millions of people of the developing countries are suffering from corneal blindness. The disease can be cured by replacing the defective cornea with the cornea of a donated eye. Your school has organised a campaign in the school and its neighbourhood in order to create awareness about this fact and motivate people to donate their eyes after death. How can you along with your classmates contribute in this noble cause? State the objectives of organising such campaigns in schools.

Ans. (*i*) Function of Cornea: It provides the refraction of light rays entering the eye and act as a primary lens.

(*ii*) Function of Iris: It control the size of pupil.

(*iii*) Function of pupil: It regulate and control the amount of light entering the eye.

(*iv*) Function of Retina:

- Retina is a delicate film containing rod and cone photoreceptor cells on which real, inverted and diminished image is formed.
- It converts refracted light ray through the eye lens into electrical impulses that are sent to the brain by way of optic nerve for further processing.

We along with our classmates can contribute in the corneal blindness campaign by

- propagating the eye donation among other friends and neighbours.
- motivate the next of kin of deceased person to donate his/her eye.
- making it a family tradition of donating the eye.

The objective of organising corneal blindness campaign in the school are

- Motivate and educating others about eye donation.
- Help removing all the myths about eye donation and explain how one can get opportunity to restore someone's sight.

SECTION-B

25. A student puts a drop of acetic acid first on a blue litmus paper and then on a red litmus paper. He would observe that

(*a*) the red litmus paper turns colourless and there is no change in the blue litmus paper.

(*b*) the red litmus paper turns blue and the blue litmus paper turns red.

(*c*) there is no change in the red litmus paper and the blue litmus paper turns red.

(*d*) there is no change in the blue litmus paper and the red litmus paper turns blue.

Ans. (*c*) Acetic acid turns blue litmus red but does not affect red litmus paper.

26. While studying saponification reactions, the following comments were noted down by the students:

(*i*) Soap is a salt of fatty acids.

(*ii*) The reaction mixture is basic in nature.

(*iii*) In this reaction heat is absorbed.

(*iv*) This reaction is not a neutralisation reaction.

Which of these are the correct comments?

(*a*) I and III only

(*b*) I, II and III

(*c*) II, III and IV

(*d*) I and II only.

Ans. (*d*) Soap is salt of fatty acid and the reaction mixture is basic in nature.

27. A student takes 4 mL of distilled water in each of four test tubes I, II, III and IV, and then dissolves and equal amount of four different salts namely NaCl in I, $CaCl_2$ in II, $MgCl_2$ in III and KCl in IV. He then adds 8 drops of the given soap solution to each test tube and shakes the contents of the test tube 10 times. In which test tubes will enough lather (foam) be formed?

(*a*) I and II

(*b*) II and III

(*c*) I and IV

(*d*) III and IV

Ans. (*c*) NaCl and KCl do not cause hardness of water, therefore soap will form good lather in their presence also.

28. A student is asked to study the different parts of an embryo of pea seeds. Given below are the essential steps for the experiment:

(*i*) Soak the pea seeds in plain water and keep them overnight.

(*ii*) Cut open the soaked seed and observe its different parts.

(*iii*) Take some pea seeds in a petri dish.

(*iv*) Drain the excess water. Cover the seeds with a wet cotton cloth and leave them as it is for a day.

The correct sequence of these steps is

(*a*) III, I, IV, II

(*b*) III, IV, I, II

(*c*) III, I, II, IV

(*d*) III, II, I, IV

Ans. (*a*) This is the correct sequence.

29. In a class, student were asked to observe the models/slides/pictures of the skeletons of forelimbs and wings of different organisms. After the observations the students made the following groups of homologous structures. Select the correct group:

(*a*) Wings of a bird and a butterfly

(*b*) Wings of a pigeon and a bat

(*c*) Wings of a butterfly and bat

(*d*) Forelimbs of a cow, a duck and a lizard

Ans. (*d*) They have the same structure but different functions.

30. A student obtained on a screen the sharp image of a candle flame placed at the farther end of laboratory table using a concave mirror. For getting better value of focal length of the mirror, the teacher suggested to him to focus the sun. What should the student do?

(*a*) Should move the mirror away from the screen.

(*b*) Should move the mirror towards the screen.

(*c*) Should move the mirror and screen both towards the sun.

(*d*) Should move only the screen towards the sun.

Ans. (*b*) When an object is at between centre of curvature and infinity, image is formed between C and F. The sun can be considered at infinity. So, its image is formed at the focus of a concave mirror.

31. While determining the focal length of a convex lens, you try of focus the image of distant object formed by the lens on the screen. The image formed on the screen, as compared to the object, should be

(*a*) erect and highly diminished

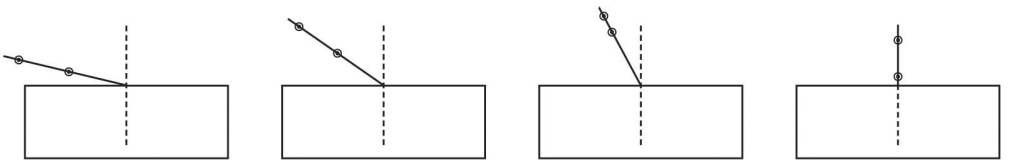
(*b*) erect and enlarged

(*c*) inverted and enlarged

(*d*) inverted and highly diminished.

Ans. (*d*) Parallel rays from a distant object after refraction through a convex lens form a real, inverted and highly diminished, point size image at its focus.

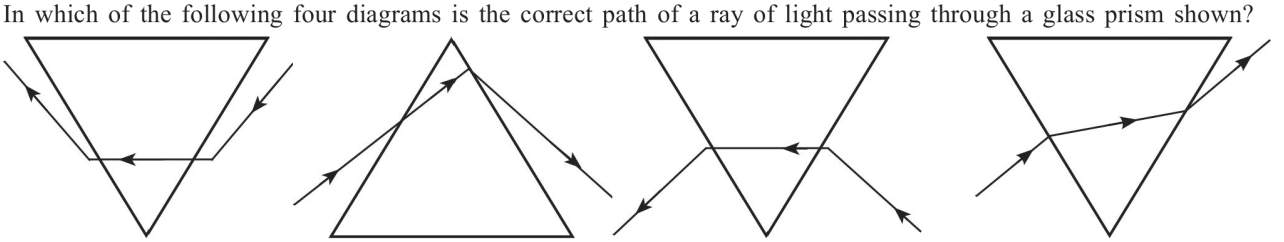
32. Which of the following is the best experimental set-up out of the four shown for tracing the path of a ray of light passing through a rectangular glass slab?



(*a*) (*b*) (*c*) (*d*)

Ans. (*b*) For better result, angle of incidence should be in the range 30° – 60° and larger separation between the pins will give better collinearity of the pins and accuracy of the result.

33. In which of the following four diagrams is the correct path of a ray of light passing through a glass prism shown?



(*a*) (*b*) (*c*) (*d*)

Ans. (*a*) Emergent ray is the ray that emerges out of the glass prism at the glass-air boundary interface and bends towards the base of the prism.

34. A student is studying the properties of acetic acid. List two physical properties of acetic acid he observes. What happens when he adds a pinch of sodium hydrogen carbonate to this acid? write any two observations.

Ans. **Physical properties:**

(*i*) Acetic acid has vinegar like smell.

(*ii*) Acetic acid is soluble in water.

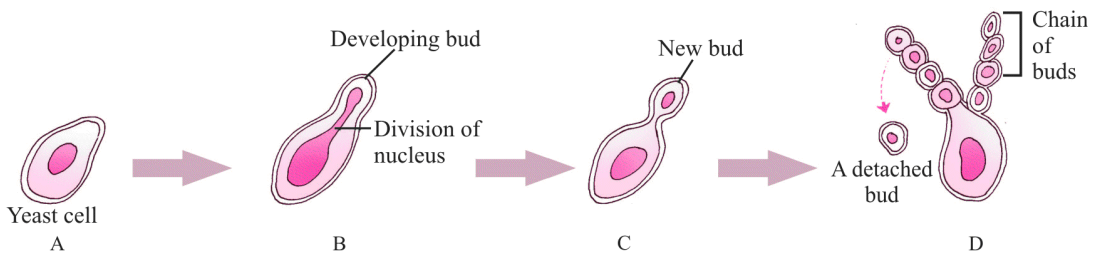
Observations:

(*i*) When sodium hydrogen carbonate is added to acetic acid brisk effervescence due to CO_2 gas are observed.

(*ii*) The gas formed is colourless, odourless and non-supporter of combustion.

35. A student is viewing under a microscope a permanent slide showing various stages of asexual reproduction by budding in yeast. Draw diagrams of what he sees (in proper sequence).

Ans.

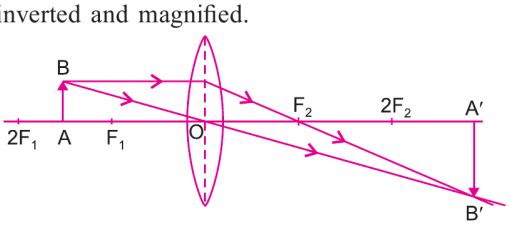


Budding in *yeast*

36. A student places a 8-0 cm tall object perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 30 cm. He obtains a sharp image of the object on a screen placed on the other side of the lens. What will be the nature (inverted, erect, magnified, diminished) of the image he obtains on a screen? Draw ray diagram to justify your answer.

Ans. According to the given condition, object is placed between F_1 and $2F_1$, the image formed by the convex lens is beyond $2F_2$ on other side of convex lens.

Nature of image formed: Real, inverted and magnified.



Set-II (*Uncommon Questions to Set-I*)

1. Write the name of each of the following functional groups:

(*a*) —OH

(*b*) —C(=O)—

Ans. (*a*) —OH is alcohol (*b*) —C(=O)— is ketone

2. Name the parts of a bisexual flower that are not directly involved in reproduction.

Ans. Parts of a bisexual flower which are not directly involved in reproduction are (*i*) Petal, (*ii*) Sepal and (*iii*) Stem.

3. Write the full name of the group of compounds mainly responsible for the depletion of ozone layer.

Ans. CFC → Chloroflurocarbon

4. Explain why the plants do not twinkle.

Ans. **Planets do not twinkle:** The Planets are much nearer to the earth as compared to the star so they can be treated as a collection of large number of point size source of light. Due to varying condition of atmosphere, the darkest part of the twinkling effect from one point source may be overlapped by focussed light from the point source of other region of planet, so total amount of light entering into the eye remains constant. Thus planets look steady and do not appear twinkle.

5. List two problems that may arise by planting trees of single variety over vast tracts of a forest.

Ans. The two problems that may arise are:

(*i*) If a disease occur to that variety, it may affect a vast area.

(*ii*) Different organisms depend on different trees for food. If only one variety is planted, many organisms may not get the food.

6. Building of big dams gives rise to some problems. List three main problems that may arise. Suggest a solution to any one of these problems.

Ans. Three problems that may arise due to building of large dams are:

(*i*) Social problems as they displace large number of people.

(*ii*) Economic problem as they consume huge amount without proportionate benefit.

(*iii*) Environmental problem as they cause deforestation and loss of biodiversity.

One solution to the problem is:

(*i*) Construction of smaller dams than large dams.

7. Why is homologous series of carbon compounds so called? Write the chemical formula of two consecutive members of any homologous series and state the part of these compounds that determines their (*i*) physical and (*ii*) chemical properties.

Ans. Homologous series means members of same family because they have similar chemical properties.

CH_3OH and CH_3CH_2OH are two consecutive members of 'alcohol' homologous series. Alkyl group determines physical properties.

Functional group-OH determines chemical properites.

10. An element 'X' is placed in the 3rd group and 3rd period of the Modern Periodic Table. Answer the following questions starting reason for your answer in each case:

(*a*) Write the electronic configuration of the element 'X'.

(*b*) Write the formula of the compound formed when the element 'X' reacts with another element 'Y' of atomic number 17.

(*c*) Will the oxide of this element be acidic or basic?

Ans. (*a*) 'X' has electronic configuration 2, 8, 3.

(*b*) 'X' has valency equal to 3. 'Y' has electronic configuration 2, 8, 7, so valency = 1.

X^3 Y^1

XY_3 is formula of compound formed.

(*c*) Oxide of this element will be basic.

11. Why is DNA copying an essential part of the process of reproduction? What are the advantage of sexual reproduction over asexual reproduction?

Ans. DNA copying is an essential part of the process of reproduction because:

(*i*) DNA copying provides cellular apparatus in the daughter cells.

(*ii*) DNA in daughter cells will be able to control the functioning of daughter cells.

(*iii*) DNA copies will retain the traits.

Advantages of Sexual Reproduction:

(*i*) Sexual reproduction gives rise to variation.

(*ii*) Offsprings born out of sexual reproduction have better survival chance in case of adverse situation.

12. Draw longitudinal section of a bisexual flower and label the following parts on it:

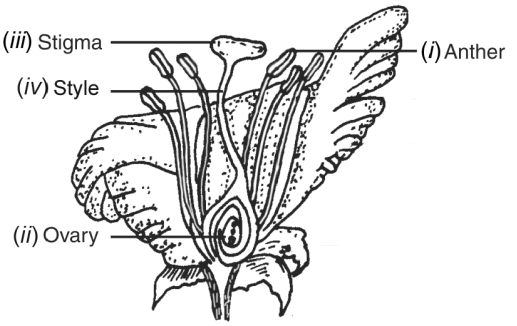
(*i*) Anther

(*ii*) Ovary

(*iii*) Stigma

(*iv*) Style

Ans.



14. (*a*) Cite the evidence on the basis of which it is concluded that birds have evolved from reptiles.

(*b*) Insects, Octopus, Planaria and Vertebrates also possess eyes. Can these animals be grouped together on the basis of the eyes they possess. Why or why not? Give reason to justify your answer.

Ans. (*a*) Dinosaur is a type of reptile which has wings. Birds also have wings, so it can be opined that birds have evolved from reptiles

(*b*) Yes, based on type eyes can be grouped together, which have evolved over generation from imperfect eyes in *Planaria* to perfect eyes in vertebrates.

16. State the laws of refraction of light. If the speed of light in vacuum is 3×10^8 m/s, find the absolute refractive index of a medium in which light travels with a speed of 1.4×10^8 m/s.

Ans. Law of refraction

(*i*) The incident ray, the normal and the refracted ray at the point of incidence all lies in the same plane for the two given transparent medium.

(*ii*) The ratio of sine of angle of incidence (*i.e.*, sin *i*) to the sine of angle of refraction (*i.e.*, sin *r*) is always constant for the light of given colour and for the given pair of media.

Mathematically,

$$\frac{\sin i}{\sin r} = \text{constant} = n_{21}$$

The constant 'n_{21}' is called refractive index of the second medium with respect to the first medium.

Absolute refractive index of the medium is given by

$$n_m = \frac{\text{Speed of light in a vacuum } (c)}{\text{Speed of light in medium } (v)}$$

i.e.,
$$n_m = \frac{c}{v}$$

Given:
$$c = 3 \times 10^8 \text{ m/s}, \; v = 1.4 \times 10^8 \text{ m/s}$$

$\therefore$
$$\eta_m = \frac{c}{v} = \frac{3 \times 10^8}{1.4 \times 10^8} = \frac{3}{1.4} = 2.14$$

17. Explain giving reason why the sky appears blue to an observer from the surface of the Earth. What should the appearance of the sky be during the day for an astronaut staying in the international space station orbiting the Earth? State reason to justify your answer.

Ans. Blue colour has a shorter wavelength than red. So, according to Rayleigh scattering law, blue colour of sunlight is scattered more strongly by the large number of molecules present in the earth's atmosphere. Hence, the sky appears blue.

Sky appears dark.

Reason: In the absence of atmosphere, there would have been no scattering of sunlight at all.

Set-III (*Uncommon Questions to Set-I and Set-II*)

SECTION-A

1. Write the name and molecular formula of the first member of the homologous series of alkynes.

Ans. $HC{\equiv}CH(C_2H_2)$ Ethyne is first member of alkynes.

2. What is DNA.

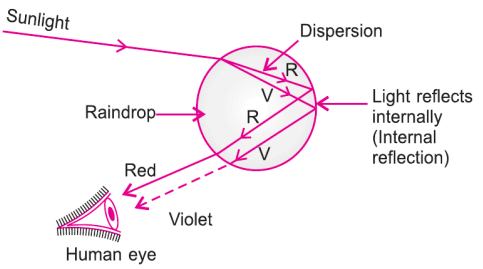
Ans. DNA lies in the cell nucleus which is the information source for making proteins and different proteins lead to different designs.

3. List two examples of natural ecosystem.

Ans. Two examples of natural ecosystem are forest and pond.

4. Draw a labelled diagram to explain the formation of a rainbow in the sky.

Ans.



Formation of primary rainbow

5. Write two advantages of sustainable management of natural resources. Out of the two — reuse and recycle — which is better and why?

Ans. Two advantages of sustainable management of natural resources are:

(*i*) natural Resources can last for longer time.

(*ii*) future generation can also enjoy the benefit from natural resources.

Out of reuse and recycle, reuse is better as it does not consume any energy.

6. List four advantages of conserving water in the form of ground water.

Ans. Four advantages of conserving water at ground level are:

(*i*) It recharges the ground water level.

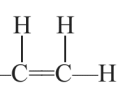
(*ii*) It provides drinking water.

(*iii*) It provides irrigation water.

(*iv*) It reduces storm water discharge.

7. Write the name and structural formula of the compound formed when ethanol is heated at 443 K temperature with excess of conc. H_2SO_4. What is the role of conc. H_2SO_4 in this reaction? Also give the chemical equation for the reaction.

Ans. $\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[443\ K]{\text{conc. } H_2SO_4} \underset{\text{Ethene}}{CH_2{=}CH_2} + H_2O$



H—C═C—H is structural formula and ethene is its name. Conc. H_2SO_4 acts as dehydrating agent.

9. Four elements P, Q, R and S belong to the third period of the Modern Periodic Table and have respectively 1, 3, 5 and 7 electrons in their outermost shells. Write the electronic configuration of Q and R and determine their valences. Write the molecular formula of the compound formed when P and S combine.

Ans. Q (13) 2, 8, 3

R (15) 2, 8, 5

Valency of Q is 3 as it can lose 3 electrons to become stable. Valency of R is also 3 as it can gain 3 electrons to become stable. 'P' has 1 valence electron so its valency is equal to 1 as it can lose 1 electron to become stable. 'S' has 7 valence electrons, it can gain one electron to become stable. So its valency is equal to 1.

P^1 S^1

PS is formula of compound.

10. In the following table, the positions of six elements A, B, C, D, E and F are given as they are in the Modern Periodic Table:

Group → / Period ↓	1	2	3–12	13	14	15	16	17	18
2	A			B		C			D
3					E				F

On the basis of the above table, answer the following questions:

(*i*) Name the element which forms only covalent compounds.

(*ii*) Name the element which is a metal with valency three.

(*iii*) Name the element which is a non-metal with valency three.

(*iv*) Out of B and C, whose atomic radius is bigger and why?

(*v*) Write the common name for the family to which the elements D and F belong.

Ans. (*i*) 'E' forms only covalent bonds.

(*ii*) 'B' is metal with valency three.

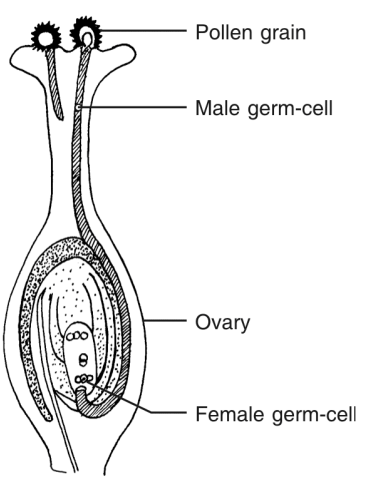
(*iii*) 'C' is non-metal with valency 3.

(*iv*) 'B' is bigger due to less effective nuclear charge.

(*v*) D and F belong to noble gases.

11. Draw a diagram of the longitudinal section of a flower exhibiting germination of pollen on stigma and label (*i*) ovary, (*ii*) male germ-cell, (*iii*) female germ-cell and (*iv*) ovule on it.

Ans.



Fertilisation in a flowering plant

12. Explain any three advantages of vegetative propagation.

Ans. (*i*) Vegetative propagation is a cheaper, easier and more rapid method of propagation in plants than growing plants from their seeds.

(*ii*) The traits or characters of the parent plant are preserved by vegetative propagation.

(*iii*) It results in propagation of those plants which do not produce viable seeds or produce seeds with prolonged period of dormancy.

16. A student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 cm from its pole.

(*i*) Which type of mirror should the student use?

(*ii*) Find the magnification of the image produced.

(*iii*) Find the distance between the object and its image.

(*iv*) Draw a ray diagram to show the image formation in this case and mark the distance between the object and its image.

Ans. (*i*) Concave mirror

(*ii*) Magnification = $m = -\frac{v}{u} = -\frac{-80}{-20} = -4$

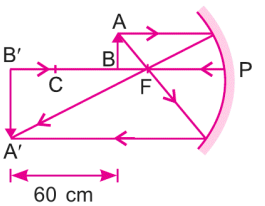
(*iii*) Distance between the object and its image = 80 – 20 = 60 cm.

(*iv*) Focal length of the concave mirror is

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} = \frac{1}{-80} + \frac{1}{-20} = -\frac{5}{80} = -\frac{1}{16}$$

$\therefore$ $f = -16$ cm, $R = 2f = -32$ cm

Since $u = -20$ cm, it implies that object lies in between F and C.



18. "Energy flow in food chains is always unidirectional." Justify this statement. Explain how the pesticides enter a food chain and subsequently get into our body.

Ans. The energy flow through different steps in the food chain is unidirectional. The energy captured by autotrophs does not revert back to the solar system and it passes to the herbivores, *i.e.* it moves progressively through various trophic levels. Thus energy flow from Sun through producers to omnivores is in single direction only.

Pesticides are sprayed to kill pests on food plants. The food plants are eaten by harbivores and alongwith the food, pesticides are also eaten by the harbivores. Harbivores are eaten by carnivores and alongwith the herbivore animal, pesticide also enters the bode of the carnivore. Man eat both plant and animals and pesticide alongwith food enters the body of human. Concentration of pesticides increases as it moves upward in the food chain and the process is called bio magnification.

CBSE Examination Paper (2016)

Time Allowed: 3 Hours] [Maximum Marks: 90

General Instructions: As given in Examination Paper 2015.

Section–A

1. Write the next homologue of each of the following:
(*i*) C_2H_4 (*ii*) C_4H_6

2. Name the part of Bryophyllum where the buds are produced for vegetative propagation.

3. List two natural ecosystems.

4. State two positions in which concave mirror produces a magnified image of a given object. List two differences between the two images.

5. List four advantages of properly managed watershed management.

6. Explain giving example where active involvement of local people lead to efficient management of forest.

7. What are covalent compounds? Why are they different from ionic compounds? List their three characteristic properties.

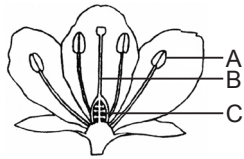
8. When ethanol reacts with ethanoic acid in the presence of conc. H_2SO_4, a substance with fruity smell is produced. Answer the following:
(*i*) State the class of compounds to which the fruity smelling compounds belong. Write the chemical equation for the reaction and write the chemical name of the product formed.
(*ii*) State the role of conc. H_2SO_4 in this reaction.

9. Calcium is an element with atomic number 20. Stating reason answer each of the following questions:
(*i*) Is calcium a metal or non-metal?
(*ii*) Will its atomic radius be larger or smaller than that of potassium with atomic number 19?
(*iii*) Write the formula of its oxide.

10. An element 'M' with electronic configuration (2, 8, 2) combines separately with $(NO_3)^-$, $(SO_4)^{2-}$ and $(PO_4)^{3-}$ radicals. Write the formula of the three compounds so formed. To which group and period of the Modern Periodic Table does the element 'M' belong? Will 'M' form covalent or ionic compounds? Give reason to justify your answer.

11. How do organisms, whether reproduced asexually or sexually maintain a constant chromosome number through several generations? Explain with the help of suitable example.

12. Name the parts A, B and C shown in the given diagram and state one function of each.



13. Suggest three contraceptive methods to control the size of human population which is essential for the health and prosperity of a country. State the basic principle involved in each.

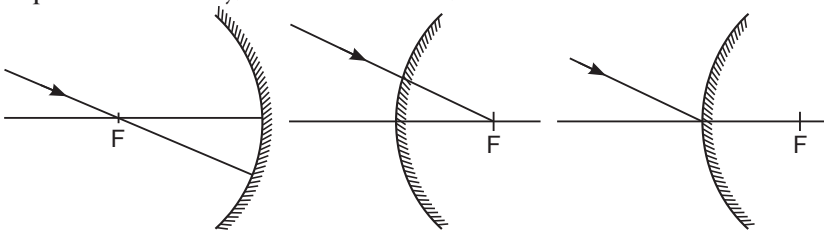
14. In one of his experiments with pea plants Mendel observed that when a pure tall pea plant is crossed with a pure dwarf pea plant, in the first generation, F_1 only tall plants appear.

(*a*) What happens to the traits of the dwarf plants in this case?

(*b*) When the F_1 generation plants were self-fertilised, he observed that in the plants of second generation, F_2 both tall plants and dwarf plants were present. Why it happened? Explain briefly.

15. List three distinguishing features, in tabular form, between acquired traits and the inherited traits.

16. Draw the following diagram, in which a ray of light is incident on a concave/convex mirror, on your answer sheet. Show the path of this ray, after reflection, in each case.



17. Why does the sun appear reddish early in the morning? Will this phenomenon be observed by an observer on the moon? Justify your answer with a reason.

18. Give reason to justify the following:

(*a*) The existence of decomposers is essential in a biosphere.

(*b*) Flow of energy in a food chain is unidirectional.

19. (*a*) Give a chemical test to distinguish between saturated and unsaturated hydrocarbon.

(*b*) Name the products formed when ethane burns in air. Write the balanced chemical equation for the reaction showing the types of energies liberated.

(*c*) Why is reaction between methane and chlorine in the presence of sunlight considered a substitution reaction?

20. (*a*) Write the functions of the following parts in human female reproductive system:

(*i*) Ovary (*ii*) Oviduct (*iii*) Uterus

(*b*) Describe the structure and function of placenta.

21. What is meant by speciation? List four factors that could lead to speciation. Which of these cannot be a major factor in the speciation of a self-pollinating plant species? Give reason to justify your answer.

22. (*a*) Define the following terms in the context of spherical mirrors:

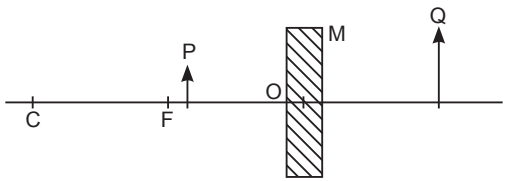
(*i*) Pole (*ii*) Centre curvature

(*iii*) Principal axis (*iv*) Principal focus

(*b*) Draw ray diagrams to show the principal focus of a:

(*i*) Concave mirror (*ii*) Convex mirror

(*c*) Consider the following diagram in which M is a mirror and P is an object and Q is its magnified image formed by the mirror.



23. (*a*) Draw a ray diagram to show the formation of image by a convex lens when an object is placed in front of the lens between its optical centre and principal focus.

(*b*) In the above ray diagram mark the object-distance (u) and the image-distance (v) with their proper signs (+ve or –ve as per the new Cartesian sign convention) and state how these distances are related to the focal length (f) of the convex lens in this case.

(*c*) Find power of a convex lens which forms a real, and inverted image of magnification –1 of an object placed at a distance of 20 cm from its optical centre.

24. (*a*) Write the function of each of the following parts of human eye: Cornea; iris; crystalline lens; ciliary muscles

(*b*) Millions of people of the developing countries of world are suffering from corneal blindness. These persons can be cured by replacing the defective cornea with the cornea of a donated eye. A charitable society of your city has organised a campaign in your neighbourhood in order to create awareness about this fact. If you are asked to participate in this mission how would you contribute in this noble cause?

(*i*) State the objective of organising such campaigns.

(*ii*) List two arguments which you would give to motivate the people to donate their eyes after death.

(*iii*) List two values which are developed in the persons who actively participate and contribute in such programmes.

Section–B

25. Which of the following sets of materials can be used for conducting a saponification reaction for the preparation of soap?

(*a*) $Ca(OH)_2$ and neem oil (*b*) NaOH and neem oil

(*c*) NaOH and mineral oil (*d*) $Ca(OH)_2$ and mineral oil

26. A student takes four test tubes marked P, Q, R and S of 25 mL capacity and fill 10 mL of distilled water in each. He dissolves one spoon full of four different salts in each as – KCl in P, NaCl in Q, $CaCl_2$ in R and $MgCl_2$ in S. He then adds about 2 mL of a sample of soap solution to each of the above test tubes. On shaking the contents of each of the test tubes, he is likely to observe a good amount of lather (foam) in the test tubes marked:

(*a*) P and Q (*b*) R and S

(*c*) P, Q and R (*d*) P, Q and S

27. Consider the following comments about saponification reactions:

I. Heat is evolved in these reactions

II. For quick precipitation of soap sodium chloride is added to the reaction mixture

III. Saponification reactions are special kind of neutralisation reactions

IV. Soaps are basic salts of long chain fatty acids

The correct comments are:

(*a*) I, II and III (*b*) II, III and IV

(*c*) I, II and IV (*d*) Only I and IV

28. A student has to perform the experiment "To identify the different parts of an embryo of a dicot seed." Select from the following an appropriate group of seeds:

(*a*) pea, gram, wheat

(*b*) red kidney bean, maize, gram

(*c*) maize, wheat, red kidney bean

(*d*) red kidney bean, pea, gram

29. Which of the following is a correct set of homologous organs?

(*a*) Forelimbs of frog, bird and lizard

(*b*) Spine of cactus and thorn of bougainvillea

(*c*) Wings of bat and wings of butterfly

(*d*) Wings of a bird and wings of a bat

30. A student obtained sharp image of a candle flame placed at the distance end of the laboratory table on a screen using a concave mirror to determine its focal length. The teacher suggested him to focus a distant building about 1 km far from the laboratory, for getting more correct value of the focal length. In order to focus the distant building on the same screen the student should slightly move the:

(*a*) mirror away from the screen

(*b*) screen away from the mirror

(*c*) screen towards the mirror

(*d*) screen towards the building

31. To determine the approximate focal length of the given convex lens by focussing a distant object (say, a sign board), you try to focus the image of the object on a screen. The image you obtain on the screen is always:

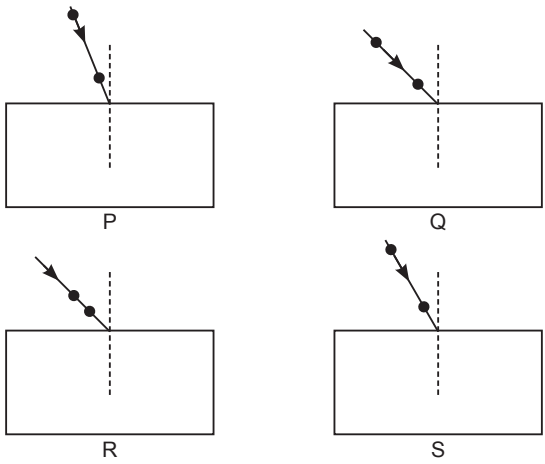
(*a*) erect and laterally inverted

(*b*) erect and diminished

(*c*) inverted and diminished

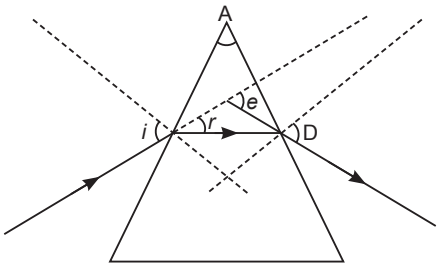
(*d*) virtual, inverted and diminished

32. Select from the following the best experimental set-up for tracing the path of a ray of light passing through a rectangular glass slab:



(*a*) P (*b*) Q (*c*) R (*d*) S

33. Study the following figure in which a student has marked the angle of incidence ($\angle i$), angle of refraction ($\angle r$), angle of emergence ($\angle e$), angle of prism ($\angle$A) and the angle of deviation ($\angle$D). The correctly marked angles are:



(*a*) $\angle$A and $\angle i$ (*b*) $\angle$A, $\angle i$ and $\angle r$

(*c*) $\angle$A, $\angle i$, $\angle e$ and $\angle$D (*d*) $\angle$A, $\angle i$, $\angle r$ and $\angle$D

34. What do you observe when you drop a few drops of acetic acid to a test tube containing

(*i*) phenolphthalein

(*ii*) distilled water

(*iii*) universal indicator

(*iv*) sodium hydrogen carbonate powder

35. Draw a labelled diagram to show that particular stage of binary fission in amoeba in which its nucleus elongates and divide into two and a constriction appears in its cell membrane.

36. A student focuses the image of a well illuminated distant object on a screen using a convex lens. After that he gradually moves the object towards the lens and each time focuses its image on the screen by adjusting the lens.

(*i*) In which direction—towards the screen or away from the screen, does he move the lens?

(*ii*) What happens to the size of the image—does it decrease or increase?

(*iii*) What happens to the image on the screen when he moves the object very close to the lens?