

SUMMATIVE ASSESSMENT - II

Class X Science CBSE Board Paper 2015 Delhi

SCIENCE

Set-2

निर्धारित समय : 3 घण्टे

अधिकतम अंक : 90

Time allowed : 3 hours

Maximum Marks : 90

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

Ans: C_nH_{2n+2} is the general formula for the alkane series. So, the second member of the alkane family is ethane

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

Ans: The magnification of the image formed by a plane mirror is 1. This is because the size of the image formed is equal to the height of the object

Q.3. What is meant by power of a lens?

Ans: The power of a lens is the ability of the lens to converge or diverge an incident beam focused on it. $P = 1/f$

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

Ans:

Binary Fission

Only two daughter cells are produced.

Nuclear division is immediately followed by cytoplasmic division.

Multiple Fission

More than two daughter cells are produced.

Nuclear division is not immediately followed

Q.5. (a) Why do we need to manage our resources carefully? (b) Why management of natural resources requires a long term perspective?

Ans:

(a) Since natural resources are limited and its demand is increasing day to day due to growth population

(b) The management of natural resources requires a long-term perspective so that these will last for the future generations

Q6. List four measures that can be taken to conserve forests.

Ans: four measures that can be taken to conserve forests are:

- 1) Indiscriminate deforestation should be prohibited.
- 2) Wastage of timber and fuel wood to be avoided.
- 3) Alternative sources of energy, such as biogas should be used to supplement fuel wood.
- 4) Forest fires should be prevented.

Q.7. Na, Mg and Al are the elements of the same period of Modern Periodic Table having, one, two and three valence electrons res. Which of these elements

(i) has the largest atomic radius, (ii) is least reactive? Justify your answer stating reason Solution:

Ans: (i) sodium has the largest atomic radius. On going from left to right in the periodic table, atomic radius decreases due to increase in nuclear pull due to addition of proton.

(ii) Aluminum is the least reactive element. On going from left to right in the periodic table, the reactivity decreases due to increased nuclear charge require more energy to lose electron.

Q.8. From the following elements: 4Be; 9F; 19K; 20Ca

(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 19K and element X (2, 8, 7)

Ans: Electronic configuration of 4Be ----- 2, 2.

Electronic configuration of 9F is ----- 2, 7

Electronic configuration of 19 K is ----- 2, 8, 8, 1

Electronic configuration of 20Ca is ----- 2, 8, 8, 2.

(i) K (ii) Be and Ca

Electronic configuration of element X is 2, 8, 7.

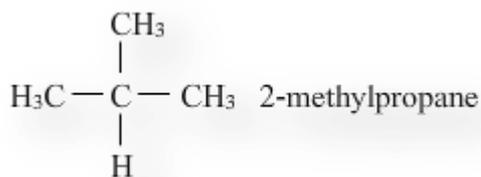
Valency of X = $8 - 7 = 1$ and Valency of K = 1

Therefore, the formula of the compound formed when K and element X combine is KX. The compound KX is ionic compound

Q.9. What is meant by isomers? Draw the structures of two isomers of butane, C₄H₁₀. Explain why we cannot have isomers first three of alkane series.

Ans: Isomers are the compounds that have the same molecular formula but different structural formulae.

Following are the isomers of butane: CH₃CH₂CH₂CH₃ butane



We cannot have isomers first three of alkane series because they cannot be branched.

Q.10. What is the difference between the molecules of soaps and detergents, chemically? Explain the cleansing action of soap?

Ans:

Soaps are sodium salt of long chain carboxylic acid whereas detergents are the ammonium or sulphate of long chain of carboxylic acid.

When dirty clothes are mixed with water and soap, the ionic part of the soap being water attractive, dissolves in water whereas the hydrocarbon part of the soap being water repellent unites with the oil or grease part. When dirty clothes are rinsed with water, the dirt particles attached with the soap molecules, dissolve in water and come out. In this way, clothes become clean.

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

Ans:

Diseases that are transmitted from one person to another through sexual contact are known as sexually transmitted diseases.

Examples of STDs caused by bacterial infection: Gonorrhoea and Syphilis

Examples of STDs caused by viral infection: Herpes and Acquired immunodeficiency syndrome (AIDS)

Use of condoms can prevent the spread of these diseases to a great extent.

Q.12. What is DNA copying? State its importance.

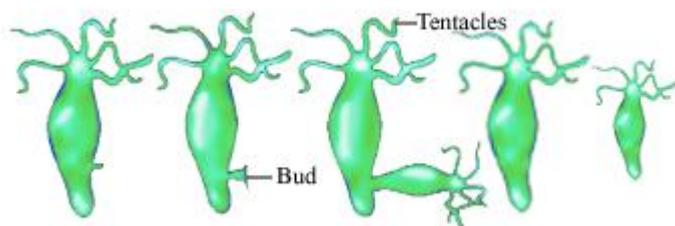
Ans: DNA Copying is the process of production of a new DNA molecule from an already existing DNA molecule through chemical reaction. It is accompanied with the creation of new cellular apparatus so that the daughter DNA and parent DNA are identical. Importance of DNA copying

1. Copying helps in the transmission of characteristics from parents to offspring.
2. Copying ensures that when a cell multiplies, through the mechanisms of mitosis and meiosis, the equal amount of DNA (genetic material) passes on to the new cell.

Q.13. Explain budding in hydra with the help of labeled diagrams only.

Ans: Budding involves the formation of a new individual from a protrusion called the bud. In Hydra, the cells divide rapidly at a specific site and develop as an outgrowth called a bud. These buds, while attached to the parent plant,

develop into small individuals. When this individual becomes large enough, it detaches itself from the parent body to exist as an independent individual



Q.14. what is speciation? List four factors responsible for speciation.

Ans: The formation of a new species by evolution or any genetic modification of the previously existing species is called speciation

Following are the factors responsible for speciation: 1. Genetic drift 2. Natural selection 3. Reproductive isolation 4. Geographical isolation

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

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

Ans: (i) The eyes seen in Planaria, insects, octopus and vertebrates vary greatly in their structure. These organisms can be used for studying evolution of eyes as the eye of Planaria is simple without lens, insects have compound eyes and vertebrates have highly specialized eye however, all of them perform same function, that is, vision. Thus, a common evolutionary origin can be established

(ii) Birds have evolved from reptiles as the connecting link between reptiles and birds is Archaeopteryx, Also there are some similarities in birds and reptiles. Birds have four-chambered heart, which is also a feature of some reptiles. they have separate sexes and internal fertilization occurs in both birds and reptiles.

Q.16. 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.

(a) In your opinion, is burning plastic an ecofriendly method of waste disposal? Why? State the advantage of method suggested by Rakesh.

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

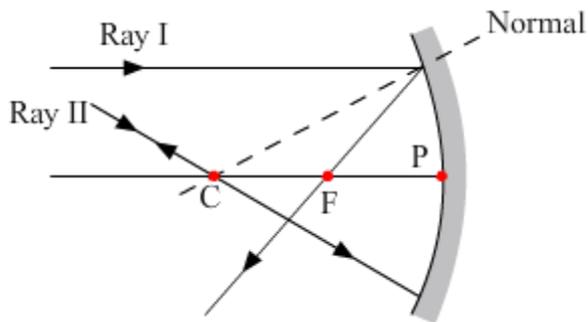
Ans: (a) Burning plastic is not an eco-friendly method of waste disposal because it causes air pollution by producing harmful gases. Rakesh's method of waste disposal is advantageous as the leftover food and peels of fruits are biodegradable material and can serve as manure, whereas plastic bags and cans should be disposed of in blue dustbins as they are non-biodegradable and can be recycled manually; thus, keeping the environment clean.

(b) We can keep the parks and roads clean by throwing the biodegradable waste in green dustbins and the non-biodegradable waste in blue dustbins stopping people from spitting on roads and parks

Q.17. 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.

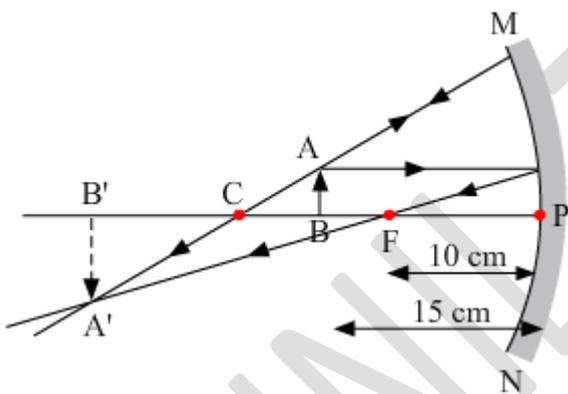
Choose these two rays and state the path of these rays after reflection from a concave mirror. Use these two rays to find the nature and position of the image of an object placed at a distance of 15 cm from a concave mirror of focal length 10 cm.

Ans: The two rays chosen to construct a ray diagram are shown in the ray diagram given below.



(i) Ray I: When the incident ray is parallel to the principal axis, the reflected ray will pass through the focus of concave mirror.

(ii) Ray II: When the incident ray passes through or appears to pass through the centre of curvature, the light, after reflection from the spherical mirror, reflects back along the same path.

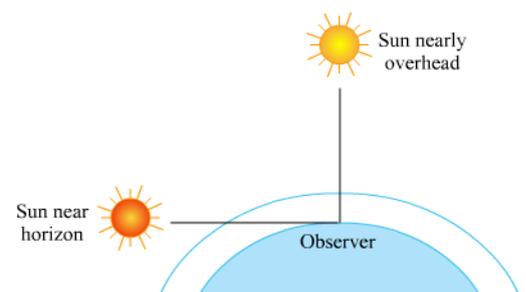


The image formed is real, inverted and magnified. It is formed beyond the centre of curvature.

Q. 18. With the help of a labelled diagram, explain why the sun appears reddish at the sun-rise and the sun-set.

Ans:

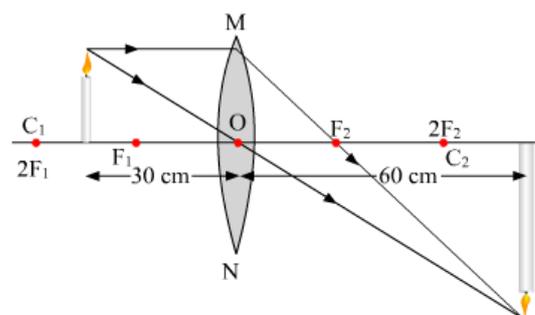
At sunrise and sunset, the Sun is near the horizon and its rays cover a larger part of the atmosphere. As the intensity of the scattered light is inversely proportional to the wavelength of the colour, therefore, most of the blue light and other components of shorter wavelength are scattered away by the particles. The wavelength of the red colour is the longest among all the components of white light; therefore, it is least scattered and appears to come from the sun. Hence, the Sun looks red at the time of sunrise and sunset.



Q.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: Since the image is formed on the screen, the image is real. A concave lens cannot form a real image. Therefore, the lens is convex.

Focal length of the convex lens, $f = ?$ Object distance, $u = 30 \text{ cm}$; Image distance, $v = +60 \text{ cm}$



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

$$\therefore \frac{1}{f} = \frac{1}{60} - \frac{1}{(-30)} \Rightarrow \frac{1}{f} = \frac{1}{60} + \frac{1}{30}$$

$$\Rightarrow 1 = \frac{(1+2)}{60} \Rightarrow \frac{1}{f} = \frac{3}{60} \Rightarrow f = 20$$

The magnification of convex lens, $m = \frac{v}{u}$

$$\Rightarrow m = \frac{60}{-30} \Rightarrow m = -2$$

Magnification, $m = \frac{h_i}{h_o}$ where h_i = Height of image and h_o = Height of object

$$m = \frac{h_i}{3} \Rightarrow h_i = 3 \times m = 3 \times -2 = -6$$

Here, negative sign indicates that the image formed is inverted. Therefore, height of image of candle flame is 6 cm.

Q.19. (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 $2 \times 10^8 \text{ m/s}$, calculate the speed of light in: (i) vacuum, (ii) medium 'A'.

Ans : (a) Laws of Refraction:

(1) The incident ray, the refracted ray and the normal to the interface of two media at the point of incidence all lie in the same plane.

(2) For the light of a given colour and for given pair of media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant. This is also known as Snell's Law.

Mathematically, it can be given as follows: $\sin i / \sin r = \text{constant} = \mu_B^A$

Here, μ_B^A is the relative refractive index of medium B with respect to medium A.

The absolute refractive index is the value of refractive index of a medium with respect to the vacuum.

$$\mu_B = \frac{c}{v} \quad \text{where } c = \text{Speed of light in vacuum and } v = \text{Speed of light in medium B}$$

Here, μ_B is the absolute refractive index of medium B.

(b) μ_A Absolute refractive index of medium 'A',

μ_B Absolute refractive index of medium 'B',

(i) For medium 'B', $1.5 = c / (2 \times 10^8)$

Speed of light in vacuum $c = 3 \times 10^8 \text{ m/s}$

(ii) For medium 'A'

$$v = c / \mu_A = [3 \times 10^8 \text{ m/s}] / 2 = 1.5 \times 10^8 \text{ m/s}$$

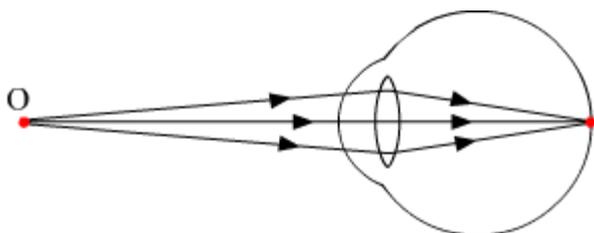
Q. 21. A student is unable to see clearly the words written on the blackboard placed at a distance of approximately 4 m from him. Name the defect of vision the boy is suffering from. Explain the method of correcting this defect. Draw ray diagram for the: (i) defect of vision and also (ii) for its correction.

Ans: As the student is not able to clearly see the words written on the blackboard that is at a distance of approximately 4 m from him. Thus, the student is suffering from the defect called myopia or near-sightedness.

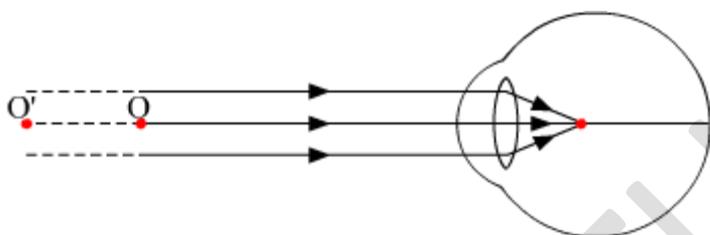
A myopic eye has its far point nearer than infinity. It forms the image of a distant object in front of its retina.

To correct a myopic eye, concave lens of a suitable focal length is used. The image is allowed to form at the retina by using a concave lens of suitable power.

(i) A myopic eye

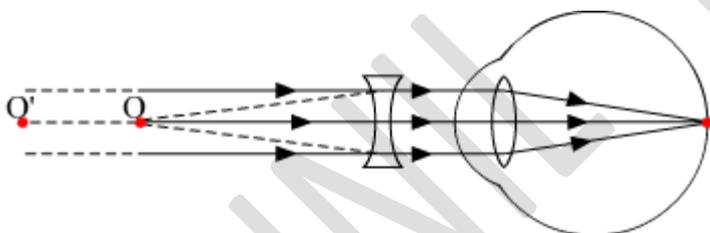


Far Point of Myopic Eye



Distant Vision of Myopic Eye

(ii) Correction of Myopia using Concave lens



Correction of Myopic Eye

Q. 22. 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 4 electrons in its outermost shell and requires 4 more electrons to attain a noble gas electronic configuration. It cannot form a C^{4+} ion, as the removal of 4 valence electrons requires a huge amount of energy. The C^{4+} ion thus formed will have 6 protons and 2 electrons, which will make it highly unstable. Carbon cannot form a C^{4-} ion, as its nucleus with 6 protons cannot hold 10 electrons due to inter electronic repulsion. So, carbon achieves a noble gas electronic configuration only by sharing its 4 valence electrons with other elements. Thus, it forms compounds mainly by covalent bonds.

The two main reasons for carbon forming a large number of compounds are as follows:

(a) Catenation: It is the ability of carbon to form bonds with other carbon atoms; this results in compounds having long branched chains and rings.

(b) Tetravalency: Carbon has 4 valence electrons, so it is capable of forming covalent bonds with 4 other atoms. Carbon forms strong bonds with most other elements. This is because the small atomic size of carbon enables its nucleus to strongly hold on to the shared pairs of electrons.

Q. 23. 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.

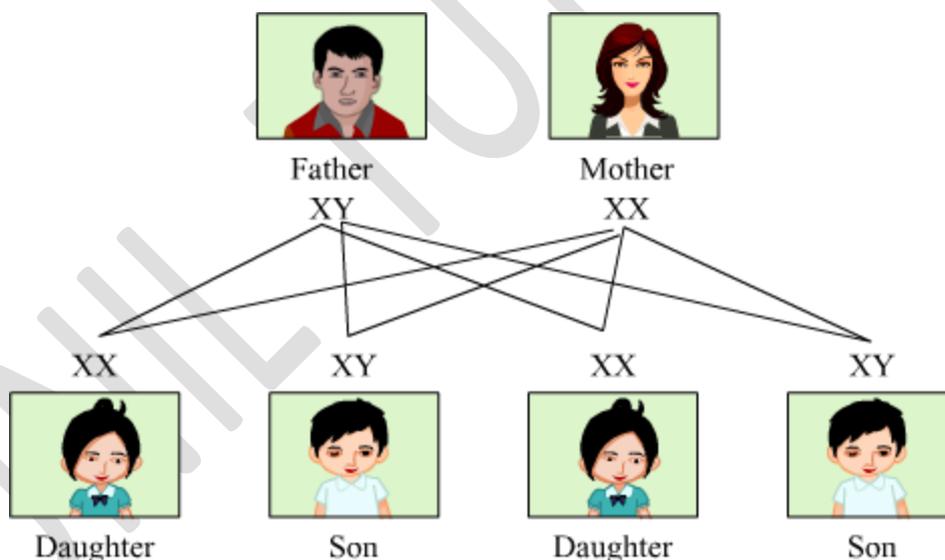
Ans: Twenty-three pairs of chromosomes are present in human beings. Out of these, one pair is of sex chromosomes.

Two types of sex chromosomes are found in human beings: X and Y. Males contain one X chromosome and one Y chromosome (XY), while females contain two copies of X chromosomes (XX).

The sperm has either X or Y chromosome, while the egg has only X chromosome. So, if the sperm carrying Y chromosome fuses with the egg, it results in the formation of a male child; and if the sperm carrying X chromosome fuses with the egg, it results in the formation of a female child.

Thus, there is an equal chance of fusion of either X or Y chromosome with the egg. Therefore, we can say that the sex of a newborn child is a matter of chance and none of the parents are responsible for it.

Sex determination in humans is shown below:



Q. 24. 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:

1. ovary -- (females have two of these) -- produce female gametes or eggs and the hormone estrogen
2. oviduct (fallopian tube) -- carries the egg away from the uterus -- internal fertilization normally occurs here
3. uterus -- implantation and development of the embryo and fetus before birth occurs here

After fertilization the lining of uterus thickens and is richly supplied with blood to nourish the growing embryo. The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. It is embedded in the uterine wall. Placenta contains Villi on the embryo's side of the tissue and blood spaces on mother's side

surrounding the villi. This provides a large surface from mother to the embryo and waste products from embryo to mother.

Q.25. 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 :

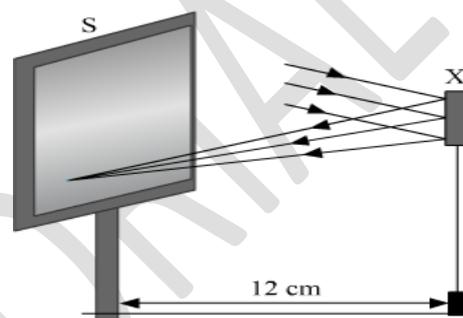
- (A) lens and the object only (B) lens and the screen only
 (C) object and the image only (D) lens and the object and also between the object and the image

Ans: (B) lens and the screen only

Q. 26. 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

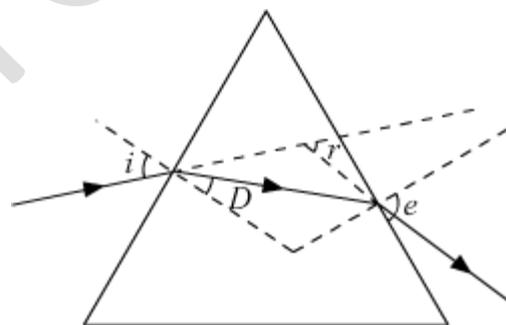
Ans: (C) Device 'X' is a concave mirror of focal length 12 cm



Q.27. 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) $\angle i$ and $\angle e$



Q.28. 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 by 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: (C) R

Q.29. 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 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

Solution:

Hard water contains sulphates, chlorides and bicarbonates of calcium and magnesium. To make water hard, calcium chloride, calcium sulphate and magnesium sulphate should be added to it. Hence, the correct option is (C) III, IV, VI

Q.30. 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) only I and II

Q.31. A student adds 2 mL of acetic acid to a test tube containing 2 mL of distilled water. He then shakes the test tube 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 the layer of acetic acid

Solution: (A) a clear transparent colourless solution

Q.32. 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) Forelimbs of cow, a duck and a lizard

Q.33. 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) Tegmen

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) II, III, IV

Q.34. 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) As the student moves the object towards the lens, the position of the image shifts away from the lens. To obtain a sharp image, he should move the screen away from the lens.
 (b) The size of the image increases when the object is moved near the lens.
 (c) When the object is placed very close to the lens, it can be considered to be placed between the focus and the optical centre. In this case, the image formed is virtual, erect and enlarged.

Q35 .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:
 When a pinch of sodium hydrogen carbonate is added to acetic acid in a test tube, a brisk effervescence is observed due to colourless and odourless gas, which is CO₂.

Chemical equation for the reaction:



Q.36. 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:
 Binary fission is the type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost.

Initial and Final Stages of Binary Fission



This reproduction starts with karyokinesis (division of nucleus).