

## Class X Science

### CBSE Board Set – 3

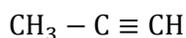
- (i) The question paper comprises two sections, A and B. You are to attempt both the sections.
- (ii) All questions are compulsory.
- (iii) There is no choice in any of the question.
- (iv) All questions of Section – A and all questions of Section – B are to be attempted by separately.
- (v) Question numbers 1 to 3 in Section – A are two marks question. These are to be answered in about 30 words each.
- (vi) Question numbers 4 to 6 in Section – A are two marks question. These are to be answered in about 30 words each.
- (vii) Question numbers 7 to 18 in Section – A are three marks question. There are to be answered in about 50 words each.
- (viii) Question numbers 19 to 24 in Section – A are five marks question. 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 practical skills. These are to be answered in brief.

**Q.1** Write the name and formula of the 2<sup>nd</sup> member of homologous series having general formula  $C_nH_{2n-2}$ .

**Sol.1**  $C_nH_{2n-2}$  is general formula of alkynes.

Name of 2<sup>nd</sup> member of alkynes: Propyne

Formula of 2<sup>nd</sup> member of alkynes:  $C_3H_4$



**Q.2** What is speciation?

**Sol.2** The origin of new species from the existing one due to reproductive isolation of a part of its population is called speciation.

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

**Sol.3** For proper disposal, biodegradable & non-biodegradable wastes should be discarded in two separate dustbins.

**Q.4** List four specific characteristics of the images of the objects formed by convex mirrors.

- Sol.4**
1. Image formed is always virtual.
  2. The image formed by the convex mirror is always erect.
  3. The virtual image is formed always between the pole and the focus, no matter where the object is placed.
  4. It has a wide field of view compared to other types of mirror because of its shape.

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

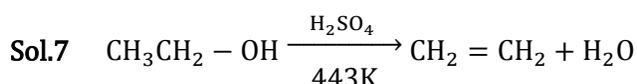
**Sol.5** The advantages are:-

- (i) The stored water can be used for human consumption, irrigation etc.
- (ii) It can be channelized through a drain pipe into a well to raise the water table.

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

- Sol.6**
- (a) Reduce use of things like water and energy
  - (b) Durable goods like washers, dryers etc. should be repaired & reused
  - (c) Buy toilet paper, paper towel & stationary made from recycled paper.
  - (d) Refuse store bags.

**Q.7** Write the name and structural formula of the compound obtained when ethanol is heated at 443 K with excess of conc.  $\text{H}_2\text{SO}_4$ . Also write chemical equation for the reaction stating the role of conc.  $\text{H}_2\text{SO}_4$  in it.



Ethanol

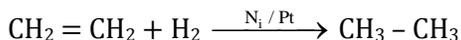
Ethene

The compound formed when ethanol is heated with  $\text{H}_2\text{SO}_4$  is ethene ( $\text{CH}_2=\text{CH}_2$ ). Conc.  $\text{H}_2\text{SO}_4$  acts as a dehydrating agent here and removes a water molecules.

**Q.8** With the help of an example, explain the process of hydrogenation. Mention the essential condition for the reaction and state the change in physical property with the formation of the product.

**Sol.8** Hydrogenation is the chemical process in which hydrogen molecule is added to an unsaturated hydrocarbon to make a saturated one.

**Example.** Hydrogenation of Ethene.



Ethene

Ethane

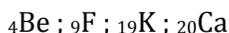
**Conditions Required:**

This reaction requires catalyst like Ni or Pt.

**Change in Physical Properties :-**

- (1) **Physical State:** Liquid to Solid
- (2) **Density:** Increases
- (3) **Melting Point:** Increases

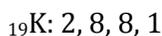
**Q.9** From in the following elements :



- (i) Select the elements having one electron in the outmost shell.
- (ii) two elements of the same group

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

**Sol. 9** (i) "K" has only one electron in the outermost shell



(ii) Be and Ca both are the members of 2<sup>nd</sup> group.

K has only one e<sup>-</sup> in its outermost shell while the element X is only one e<sup>-</sup> short from its octet.

So there would be transfer of one e<sup>-</sup> from K to X.

Formula of compound: KX

Nature of compound: Ionic or Electrovalent.

**Q.10** Write the numbers of periods the Modern Periodic Table has. State the changes in valency and metallic character of elements as well as 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.

**Sol.10** There are 7 periods in the modern periodic table. Valency increases and the metallic character decreases as we move from left to right. Valency remains same and the size increases as we move down the group in periodic table.

**Q.11** List any four methods of contraception used by humans. How does their use have a direct effect on the health and prosperity of a family.

**Sol. 11** Methods of contraception used by humans

(1) Mechanical barrier: It restricts the sperm from reaching the egg. For example, condoms on the penis or similar covering worn in the vagina can be used for this purpose.

(2) By changing the hormonal balance: Eggs are not released as a result of change in hormonal balance & fertilization does not occur. Certain drugs are taken orally as pills which changes the hormonal balance.

(3) Surgical Method: If the vas deferens in male is blocked, sperm transfer will be prevented & if the fallopian tube in the female is blocked, the egg will not be able to reach the uterus. In both cases, fertilization will not occur.

(4) Other contraceptive devices: It includes loops or the copper - T which is placed in uterus & pregnancy can be prevented.

Effect on health & prosperity of a family:

1) Surgery can cause infection & other problems, if not used properly.

2) Loop & copper - T can cause side effect due to irritation of the uterus.

3) Drugs; if not taken in required amount can cause serious health problem.

4) With the use of condom, there is always the risk of unplanned pregnancy.

**Q.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

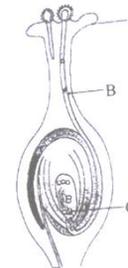
(b) Explain how these structures protect themselves and what is the function of the structure released from the 'blobs' in Rhizopus.

**Sol.12** (a) (1) Hyphae

(2) Sporangia

(b) The 'blobs' in Rhizopus contain cells or spores that can eventually develop into new Rhizopus individuals. The spores are covered by thick walls that protect them until they come into contact with another moist surface and can begin to grow.

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



**Sol.13** A ⇒ Stigma → Acts as a platform for the landing of pollen grains.

B ⇒ Pollen tube → discharge the male gametes in the vicinity of the female gamete, egg.

C ⇒ Egg → It is the female gamete. Male gamete fuses with to form a zygote.

**Q.14** (i) Planaria, insects, octopus and vertebrates all have eyes. Can we group eyes of these animal together to establish a common evolutionary origin? Justify your answer.

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

**Sol.14** (i) Yes, we can. The earliest eyes were photo receptors that sense light called eyespots. Eyespots can only sense brightness & distinguish light from dark. They are not involved in vision.

(1) **Planaria** :- Eyespot gradually evolved & formed a depression in the eyespot, that can slightly distinguish light direction.

(2) **Insects**: - Insects have ommatidia which evolved from eyespots.

(3) **Octopus**: - Octopus have eyes resembling a pin-hole camera. Blind spot is absent in the octopus eye.

(4) **Vertebrates**: - They also have eyes resembling a pin-hole camera. The only difference is that there is a blind spot.

(ii) Archaeopteryx is the connecting link between reptiles and birds. Archaeopteryx has toothed beak, long tail with many vertebrae and winged claws which are reptilian characters and feathered wings which is an avian character.

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

**Sol.15**

Acquired Traits	Inherited Traits
1) The traits develop during lifetime of an individual	1) The traits are obtained from parents
2) They are somatic variations	2) They are genetic variations

**Q.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.

**Sol.16** Image: Inverted, real & magnified.

Ray (1) which falls parallel to the principle axis passes through the focus after reflection from the mirror.

Ray (2) falls at O and gets reflected by the law of reflection, so that  $\angle i = \angle r$

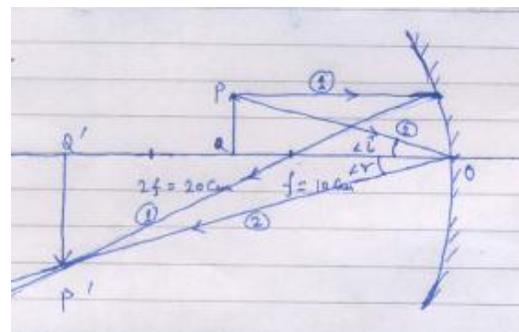
$$u = -8 \text{ cm}$$

$$f = -12 \text{ cm}$$

$$\text{Now, } \frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

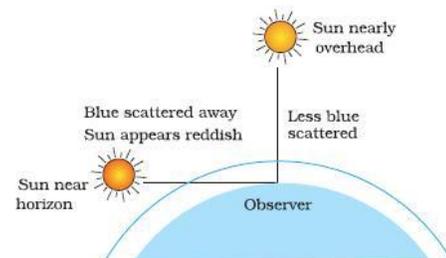
$$\text{So, } \frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-12} - \frac{1}{-8} = -\frac{1}{12} + \frac{1}{8} = \frac{-2+3}{24}$$

$$\Rightarrow v = 24 \text{ cm}$$



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

**Sol. 17** At the time of sun-rise and sun-set, the sun light has to pass through a thicker layer of atmosphere. Blue wavelength is scattered the most. Hence, blue light is scattered away, leaving mainly red color which reaches our eyes. Hence sky appears reddish.



**Q.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.

(a) In your opinion, is burning plastic an eco-friendly 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?

**Sol. 18 (a)** Burning plastic is not an eco-friendly method of waste disposed because it will create is pollution. By segregating the left-over food & peels of fruits from plastic materials & disposing them off separately in green & red dustbins, management of wastes will be easier & it will not create pollution.

**(b)** We can take following measures:-

- 1) We should keep dustbins in parks & at road sides.
- 2) Trees should be planted. Small height plants should be planted at road sides.
- 3) We should not throw wastes from eatables etc. anywhere.

**Q.19** “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.

**Sol.19 (A)** A convex lens can form a magnified, erect image when the object is place between the pole and the focus.

A convex lens gives a magnified & inverted image of an object when it is placed between the radius of curvature and focal length. Also, magnification is more for convex lenses having shorter focal length.

**(B)**  $u = -20$  cm

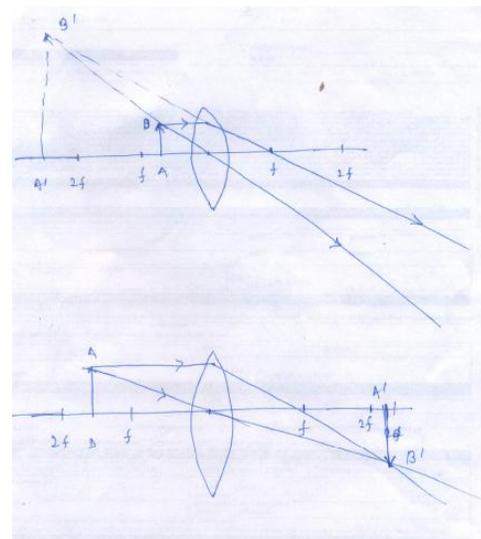
$f = -10$  cm

Now,

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

$$\Rightarrow \frac{1}{v} = \frac{1}{f} + \frac{1}{u} = -\frac{1}{10} - \frac{1}{20} = \frac{-3}{20}$$

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



**Q.20 (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  $2 \times 10^8$  m/s, calculate the speed of light in:

- (i) vacuum,
- (ii) medium 'A'.

**Sol. 20** Laws of refraction

(i) Incident, refracted and normal lies in the same plane to the interface of given two transparent media.

(i) The ratio of sine of angle of incidence and sine of angle of refraction is always constant for the light of given colour and for the pair of given media. It is also known as Snell's law of refraction

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

Absolute refractive Index:-

When one medium is taken as vacuum and speed of light is taken in it, then the refractive index of second medium with respect to vacuum is called Absolute Refractive index and generally denoted by

$$\mu = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in given medium}}$$

$$\mu = \frac{c}{v}$$

- (b) Given:-  $\mu_A = 2$   
 $\mu_B = 1.5$   
 $V_B = 2 \times 10^8 \text{ m/s}$

We have to find

(i) Vacuum,

$$\text{Since, } (\mu)_m = \frac{c}{(v)_B} \Rightarrow 1.5 = \frac{c}{2 \times 10^8}$$

$$\Rightarrow c = 3 \times 10^8 \text{ m/s}$$

(ii) In medium 'A'

$$\text{Since, } (\mu)_A = \frac{c}{(v)_A}$$

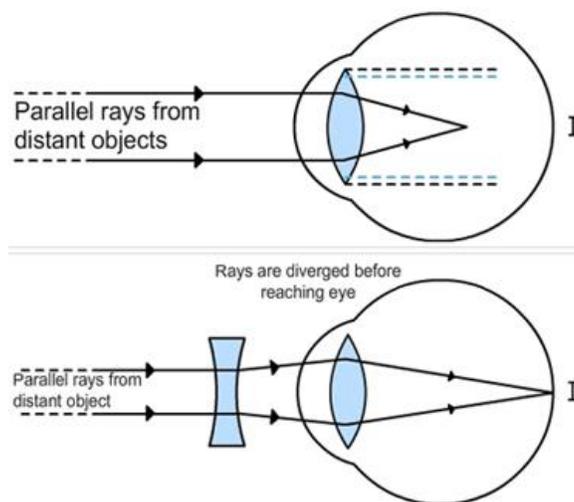
$$\Rightarrow v_A = \frac{c}{\mu_A} = \frac{3 \times 10^8}{2} = 1.5 \times 10^8 \text{ m/s}$$

**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 correction this defect. Draw ray diagram for the:

- (i) defect of vision and also
- (ii) for its correction.

**Sol. 21** (a) Myopia, or short sighted means having good near vision but poor distance vision. As the student is not able to see clearly the words written on the blackboard placed at a distance of 4 m.

(b) The defect is corrected by placing a concave lens before the eye.



**Q.22** Write the function 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.

**Sol.22 Functions:-**

(1) **Ovary:-**The ovaries produce eggs, one at a time, every alternate month.

(2) **Oviduct:** - Oviducts are the sites for fertilization of the eggs by the sperms.

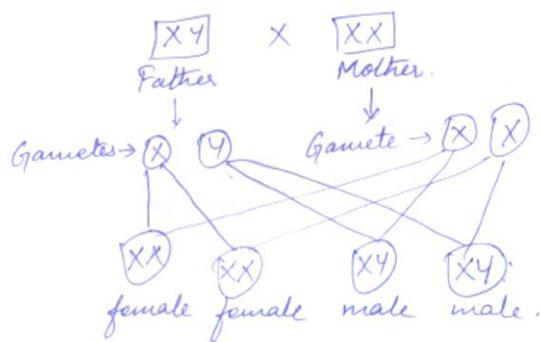
(3) **Uterus:** - Uterus provides the site of implantation of the embryo.

The foetus remains attached to the mother through an umbilical cord which is embedded in a tissue called placenta at one end. The placenta in turn is embedded into the uterine wall & is richly supplied with vessels. The nutrients from the mother's blood pass into the umbilical cord through the placenta.

**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.

**Sol.23** 23 pairs of chromosomes are present in human beings. Out of these only 1 pair is sex chromosomes. These are 2 types of sex chromosomes i.e. X & Y in human beings.



**Q.24** Explain why carbon forms compounds mainly by covalent bond. Explain in brief two main reason for carbon forming a large number of compounds. Why does carbon form strong bonds with most other elements.

**Sol. 24** Electronic configuration of carbon is 2,4. It has 4 electrons in its outer most shell. For stability, the number of electrons in outermost shell must be 8, for this carbon can either gain or lose 4 electrons.

But loosing or gaining 4 electrons, require large amount of energy. Hence, in place of gaining or losing 4 electrons, carbon does sharing of these 4 electrons to form 4 covalent bonds.

**Reason for carbon forming a large number of compounds:**

- (i) **Catenation:** The tendency of carbon to form chains of identical atoms is known as catenation. Carbon forms long chains by combining with other carbon atoms through covalent bonds.
- (ii) **Tetravalency:** It has 4 valence electrons, so it can form 4 covalent bonds with four different atoms, or two double bonds or a single and a triple bond with other atoms. This tendency helps carbon to form a large range of compounds.

Carbon forms strong bonds with most of other elements like H, O, S, N, Cl, Br, I etc. due to its small size which helps it to attract more number of electrons.

**Q.25** 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.

**Sol. 25** (D)

Forelimbs of cow, duck & a lizard are homologous organs because their structure is same but each of them performs different functions.

**Q.26** 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

**Sol.26** (B) II, III, IV

Testa & Tegmen are parts of a seed. Plumule, Radicle & Cotyledon are parts of an embryo.

**Q.27** 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

Sol.27 (B)

An object forms a point image only when the object is at infinity, which implies the image forms at the focal length. So, we need to measure only the distance between the lens and the screen.

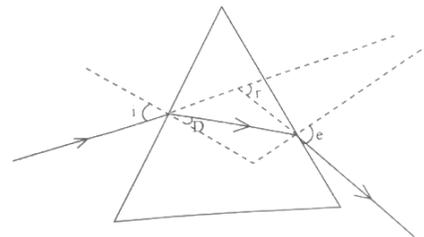
Q.28 Study the following diagram and select the correct statement about the device 'X'

- (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

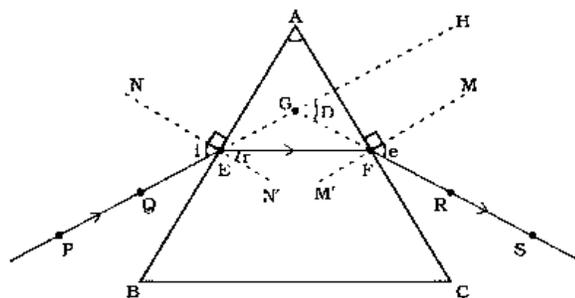
Sol.28 (C)

Explanation A concave mirror forms a real image at the focus when rays are coming from infinity.

Q.29 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:



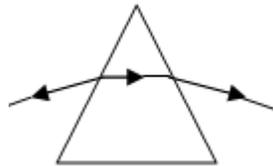
Sol.29



- |                                 |                                  |
|---------------------------------|----------------------------------|
| PE – Incident ray               | $\angle i$ – Angle of incidence  |
| EF – Refracted ray              | $\angle r$ – Angle of refraction |
| FS – Emergent ray               | $\angle e$ – Angle of emergence  |
| $\angle A$ – Angle of the prism | $\angle D$ – Angle of deviation  |

**Q.30** 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  $40^\circ$  and measured the angle of refraction. The values as measured them were  $18^\circ$ ;  $22^\circ$ ;  $25^\circ$  and  $30^\circ$  respectively. The student who has performed the experiment methodically is

- (A) P
- (B) Q
- (C) R
- (D) S



**Sol.30** Student Q has traced the path correctly

when light is travelling from a rarer medium to a denser medium, it bends towards the normal to the surface, while the light from a denser medium to a rarer medium bends away from the normal to the surface. Hence, the correct option is B.

**Q.31** 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

**Sol.31** (C)

Explanation:

Hard water is that water which contains salts of calcium and magnesium. Thus the salts which can be used are Calcium Chloride, Calcium Sulphate & Magnesium Sulphate. i.e. III, IV & VI

**Q.32** A student prepared 20% sodium hydroxide solution in a beaker to study saponification reaction. Some observation 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 observation are :

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

**Sol. 32** (D)

Sodium hydroxide is a strong base so it turns red litmus blue. It is ionic in nature so readily dissolves in water to give  $\text{Na}^+$  and  $\text{OH}^-$  ions. The process of dissolution of  $\text{NaOH}$  in water is exothermic so the beaker containing solution appears hot and not cold.

The correct observations are only I & II

**Q.33** 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 colorless solution
- (B) a clear transparent pink solution
- (C) a precipitate setting at the bottom of the test tube
- (D) a layer of water over the layer of acetic acid

Sol.33 (A)

**Explanation:** Acetic acid is soluble in water. Molecules of acetic acid behave like a weak acid and get dissolved in it to give a clear transparent colorless solution.

**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 the 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?

**Sol.34** (a) He moves the screen away from the lens.

(b) Size of image starts to increase and eventually image becomes virtual in character

(c) Virtual image is formed as the same side of the object, is erect & magnified.

**Q.35** List two observations which you make when you add a pinch of sodium hydrogen carbonate to acetic in a test tube. Write chemical equation for the reaction that occurs.

**Sol.35**  $\text{NaHCO}_3 + \text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$

1) Carbon-dioxide gas is evolved.

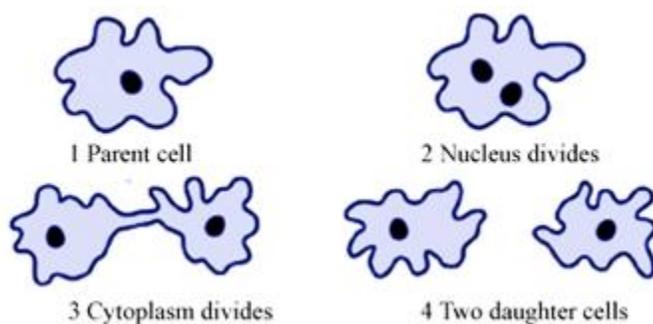
2) White precipitate of sodium acetate is formed.

**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 stars.

**Sol.36** Parental identity is lost in binary fission which is a type of asexual reproduction. Mainly two events occur during reproduction

(1) Karyokinesis ; division of nucleus

(2)



Cytokinesis; division of cytoplasm

**Binary fission**

