

# Sample Question Paper

Fully Solved (Questions-Solutions)

## SCIENCE

A Highly Simulated Practice Question Paper for CBSE Class X  
Term II Examination (SA II)

Time : 3 Hours

Max. Marks : 90

### General Instructions

1. The question paper comprises of two sections A and B. You are to attempt both the sections. All questions are compulsory.
2. All questions of section A and all questions of section B are to be attempted separately.
3. Question numbers 1 to 3 in section A are 1 mark questions. These are to be answered in one word or one sentence.
4. Question numbers 4 to 7 are 2 marks questions to be answered in about 30 words.
5. Question numbers 8 to 19 are 3 marks questions to be answered in about 50 words.
6. Question numbers 20 to 24 are 5 marks questions to be answered in about 70 words.
7. In section B, question numbers 25 to 42 are multiple choice questions based on practical skills. Each question is a 1 mark question. You are to select one most appropriate response out of the four provided to you.

### Section A

1. What should be the position of object so that the image formed by a convergent lens is virtual, erect and larger than the object?
2. How is synthetic diamond synthesised in laboratory?
3. Name any four modes of disposal of waste?
4. How are the rays parallel to the principal axis, reflected by a convex mirror?
5. The power of accommodation of the eye usually decreases with age. Name the eye defect and its cause.
6. The prism splits the incident white light into a band of colours. Name the phenomenon. What is the sequence of colours that you see on the screen?
7. What is the number of elements in the following periods?  
(a) 1st period                      (b) 3rd period  
(c) 4th period                      (d) 6th period

STAGE II

8. Once upon a time, a king offered a wonderful prize to the artist who could paint the best picture of peace.

The first was a painting of a beautiful calm lake, with crystal clear water, twinkling of stars, natural spectrum at the sky surrounded by green, leafy forests and majestic mountains towering in the background.

The other painting had mountains too, but they were rugged and bare. Above them, was an angry sky from which heavy rain fell and lightning danced.

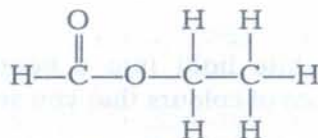
The king chose the second painting as the one showing peace. When asked why, he replied, "Peace does not mean to be in a place where there is no noise, discomfort, trouble or hard work. Peace means to be in the middle of all of these things and yet, to find calm, quiet and gentleness in your heart and to carry on with your life, this is the real meaning of peace."

*Read the above passage and answer the following questions*

- (a) Are you convinced with the king?  
 (b) What natural phenomenon is involved with the twinkling of stars?  
 (c) Name the natural spectrum at the sky. What should be the relative position of sun to observe this phenomenon?
9. What prompted Newton to conclude that the sunlight is made up of seven colours? Draw a neat diagram of this arrangement.
10. What would be the nature of image formed, if an object is placed at infinity in front of divergent lens? Draw the ray diagram showing the image formation.
11. Lithium, sodium and potassium were put in the same group on the basis of similar properties.  
 (a) What is the similarity in their properties?  
 (b) If atomic weight of lithium and potassium are 7 and 39 respectively, what is the atomic weight of sodium?
12. Table given below shows the mass number and the number of neutrons in four elements A, B, C and D

Elements	A	B	C	D
Mass number	19	24	31	39
Number of neutrons	10	12	16	20

- (a) Write down the atomic number of A, B, C and D.  
 (b) Write down the electronic configuration of A, B, C and D.  
 (c) To which group and period A, B, C and D belong?
13. (a) Why are covalent compounds generally poor conductors of electricity?  
 (b) Name the gas evolved when sodium carbonate is added to ethanol.  
 (c) Name the following compound



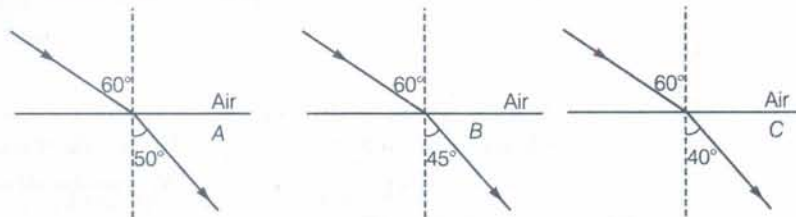
14. How will an organism be benefitted if it is reproduced through spores?



15. Suggest three measures for controlling carbon dioxide level in the atmosphere.
16. (a) What changes are observed in the uterus subsequent to implantation of young embryo?  
 (b) What changes are observed in the uterus if fertilisation does not occur?
17. (a) What is a clone?  
 (b) How do offsprings and parents of organisms reproducing sexually have the same number of chromosomes?
18. Anita had a huge scar on her cheek after she met with an accident during her school days. She is worried if her baby would inherit the scar she had acquired. Her doctor (a sincere medical practitioner) explained and successfully convinced Anita.

*Read the given passage and answer the following questions*

- (a) What are acquired traits?  
 (b) How are they different from inherited traits?  
 (c) Mention the values of the doctors that he shows in the passage.
19. Differentiate between homozygous and heterozygous organisms.
20. The path of light ray, from air to three different media *A*, *B* and *C* for a given angle of incidence, is as shown. Study the diagram carefully and answer the following questions.



- (a) Which of the three media *A*, *B* or *C* has maximum optical density?  
 (b) Through which of the three media, will the speed of light be maximum?  
 (c) Will the refractive index of *B* relative to *C* be more than unity or less than unity?  
 (d) If  $n_a$ ,  $n_b$  and  $n_c$  denote refractive indices of the three media, arrange  $n_a$ ,  $n_b$  and  $n_c$  in descending order?  
 (e) What inference can be drawn about the optical density of the three media from the above diagram?
- or
- (a) Draw ray diagrams showing the image formation by a convex mirror when an object is placed  
 (i) at infinity (ii) at finite distance from the mirror  
 (b) A 10 mm long pin is placed vertically in front of a concave mirror. A 5 mm long image of the pin is formed at 30 cm in front of the mirror. Find the focal length of this mirror.
21. Briefly explain the process of fossil formation. Also give the uses of fossils.

or

What are fossils? Explain its different types.

22. (a) How is the equal genetic contribution of male and female parents ensured in the progeny?  
 (b) In human beings, the statistical probability of getting either a male or female child is 50 : 50. Give a suitable example.

or

Explain JBS Haldane theory of origin of life on Earth.

23. What is speciation? Explain with example the generation of new species.

or

Give reasons for the appearance of new combination of characters in the  $F_2$  progeny.

24. An organic compound *A* on heating with concentrated sulphuric acid forms a compound *B*. Compound *B* on addition of 1 mole of hydrogen in presence of Ni forms a compound *C*. On combustion, 1 mole of compound *C* forms two moles of  $CO_2$  and 3 moles of  $H_2O$ . Identify the compounds *A*, *B* and *C*. Write the chemical equations of the reactions involved.

or

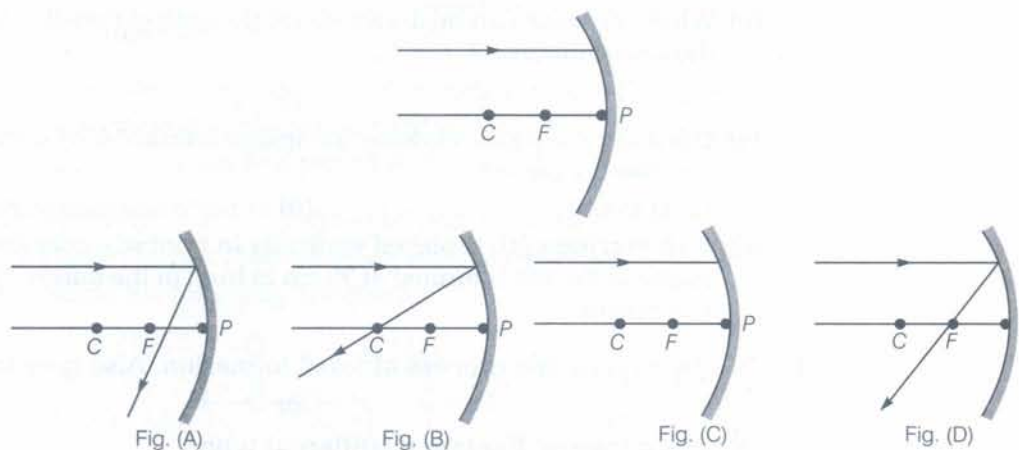
- (a) How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?  
 (b) Why is organic chemistry studied as a separate branch of chemistry?

## Section B

25. A ray of light passing through optical centre of a convex lens  
 I. bends away from normal      II. bends towards normal  
 III. does not bend at all      IV. passes straight without any deviation

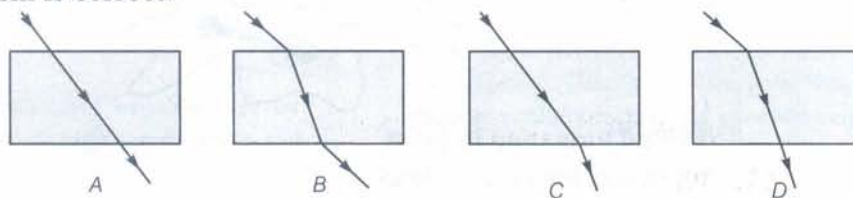
The correct options are

- (a) I and II      (b) II and III  
 (c) III and IV      (d) II and III
26. Which of the following ray diagrams is correct for the ray of light incident on a concave mirror as shown in figure?



- (a) Fig. A      (b) Fig. B  
 (c) Fig. C      (d) Fig. D

27. The path of a ray of light coming from air passing through a rectangular glass slab traced by four students are shown as A, B, C and D in figure. Which one of them is correct?



- (a) A                      (b) B                      (c) C                      (d) D

28. The defects of eyes are

- I. Presbyopia                      II. Cataract  
III. Night blindness              IV. Myopia

The correct options are

- (a) I, II and IV                      (b) I, II and III  
(c) I, III and IV                      (d) I, II, III and IV

29. The change in focal length of an eye lens is caused by the action of the

- (a) pupil                      (b) retina  
(c) blind spot                      (d) ciliary muscles

30. Combining capacity of various elements depends on the number of

- I. protons                      II. valence electrons  
III. neutrons                      IV. outer electronic configuration

The correct options are

- (a) I and II                      (b) I and III  
(c) I, II and IV                      (d) I, II and III

31. Which one of the following statements is incorrect?

- (a) Most carbon compounds are poor conductors of electricity.  
(b) Melting and boiling points of covalent compounds are low.  
(c) Ionic compounds conduct electricity in solution or in molten state.  
(d) In ionic compounds, electrostatic forces between the ions are very weak.

32. 'Lead pencil' contains

- I. PbS                      II. FeS                      II. graphite                      IV. Pb

The correct options are

- (a) I and II                      (b) Only IV                      (c) Only III                      (d) II and IV

33. The heteroatom (s) present in the compound,  $\text{H}-\overset{\text{Br}}{\underset{\text{H}}{\text{C}}}-\overset{\text{H}}{\text{C}}=\text{O}$  is/are

- I. Br                      II. O                      III. H                      IV. C

The correct options are

- (a) I and II                      (b) I and III                      (c) II and IV                      (d) II and III

34. Which one of the following compounds has the highest melting and boiling point?

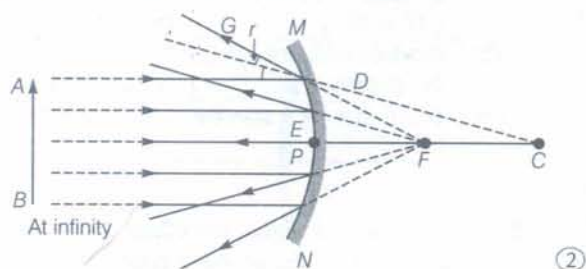
- (a)  $\text{CH}_4$                       (b)  $\text{C}_4\text{H}_{10}$                       (c)  $\text{C}_6\text{H}_{14}$                       (d)  $\text{C}_{12}\text{H}_{26}$





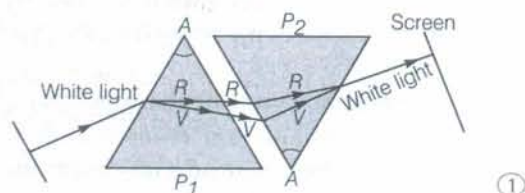
# Solutions

- The object should be placed between optical centre and focus of convex lens. (1)
- Synthetic diamond is synthesised in laboratory by heating pure carbon at a very high temperature and pressure. (1)
- The modes of disposal of waste are as follows  
(i) Recycling (ii) Landfill  
(iii) Incineration (iv) Sewage treatment (1)
- The reflected rays appear to come from a point on the principal axis, as shown in figure. This point is called the principal focus of the convex mirror. (1)

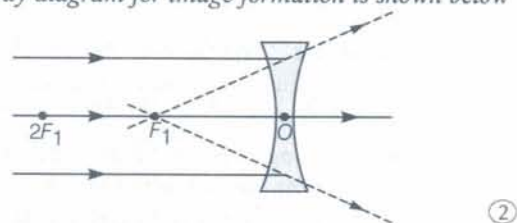


- This defect is called presbyopia. (1)  
It arises due to the gradual weakening of the ciliary muscles and diminishing flexibility of the eye lens. (1)
- The phenomenon is known as dispersion of light. The sequence of various colours from bottom to top are Violet, Indigo, Blue, Green, Yellow, Orange and Red (VIBGYOR). (1+1)
- (a) First period has two elements H and He (shortest period).  
(b) Third period has eight elements having atomic numbers 11 to 18 (short period).  
(c) Fourth period has eighteen elements having atomic numbers 19 to 36 (long period).  
(d) Sixth period has thirty two elements having atomic numbers 55 to 86 (longest period). ( $\frac{1}{2} \times 4$ )
- (a) Yes, I am convinced with the king. The peace can be found inside us even when everything around us seems to be chaotic.  
(b) The atmospheric refraction is involved with the twinkling of stars.  
(c) The natural spectrum at the sky is known as rainbow. A rainbow is always formed in a direction opposite to that of the sun. (1×3)
- Isaac Newton used a glass prism to obtain the spectrum of sunlight. He then placed a second identical prism in an inverted position with respect to

the first prism, as shown in figure. He found a beam of white light emerging from the other side of the second prism. This observation gave Newton the idea that the sunlight is made up of seven colours. (2)



- The nature of image is highly diminished, virtual, erect and point-sized. (1)  
The ray diagram for image formation is shown below (1)



- (a) Lithium, sodium and potassium, all these elements have 1 electron in their valence shell. Hence, show similar properties, like (2)  
(i) They are metals.  
(ii) They form unipositive cations ( $\text{Li}^+$ ,  $\text{Na}^+$  and  $\text{K}^+$ ) by the loss of one electron.  
(iii) They are highly reactive.  
(iv) They form basic oxides. (2)
- (b) Lithium, sodium and potassium are Dobereiner triad. Atomic weight of sodium is the mean of atomic weight of lithium and potassium.  
 $\therefore$  Atomic weight of sodium =  $\frac{7 + 39}{2} = 23$  (1)
- (a) Atomic number = mass number - number of neutrons  
Atomic number of A =  $19 - 10 = 9$   
Atomic number of B =  $24 - 12 = 12$   
Atomic number of C =  $31 - 16 = 15$   
Atomic number of D =  $39 - 20 = 19$  (1)
- (b) Electronic configurations  
A (9) = 2, 7    B (12) = 2, 8, 2  
C (15) = 2, 8, 5    D (19) = 2, 8, 8, 1 (1)
- (c) A = It belongs to group 17 and period 2nd.  
B = It belongs to group 2 and period 3rd.  
C = It belongs to group 15 and period 3rd.  
D = It belongs to group 1 and period 4th. (1)



13. (a) Covalent compounds are generally poor conductors of electricity because they do not produce ions in their solution. (1)
- (b) When sodium carbonate is added to ethanol, no reaction occurs. (1)
- (c) The given compound is ethyl methanoate. (1)
14. If an organism reproduces through spores, following benefits will occur
- (i) It helps in increasing the population of species.
- (ii) Spores formed are covered with thick walls and protect them from adverse conditions.
- (iii) During favourable conditions, thick resistant wall breaks down and new organism grows from it. (1×3)
15. The three measures for controlling carbon dioxide level in atmosphere are
- (i) Increasing vegetation cover The plants will increase the utilisation of atmospheric CO<sub>2</sub> by photosynthesis.
- (ii) Stop burning of litter Litter and crop residue should not be burnt but converted into manure and biogas.
- (iii) Using alternate sources of energy Use renewable sources of energy like solar energy, hydrogen fuel, etc instead of fossil fuel which gives CO<sub>2</sub> in the atmosphere. (1×3)
16. (a) The uterine wall is thick and is richly supplied with blood. A special tissue called placenta is developed which connects embryo to the uterine wall, through which it gets nutrients and oxygen from the mother.
- (b) If fertilisation does not occur, the thick and spongy lining of the uterus called endometrium slowly breaks and comes out through the vagina in the form of blood and mucous, which is termed as menstrual flow. (3)
17. (a) Clones are offsprings of an organism formed by asexual method of reproduction. They possess exact copies of the DNA of their parents, hence they exhibit remarkable similarity.
- (b) During gamete formation, the chromosome number in both male and female gametes is half the number present in the parents due to meiosis (cell division). Since, these two gametes fuse during fertilisation, hence, the original number of chromosomes is restored in the offspring. (3)
18. (a) Acquired traits are those variations which an individual develops during its lifetime due to effect of environmental factors and cannot be passed onto its progeny. (1)

- (b) They are different from inherited traits in a way that these characteristics can be passed from parents to their offspring and cannot be varied by environmental factors. Hence, they are controlled genetically. (1)
- (c) Professional ethics and social responsibility is being showed by the doctor. (1)

19. The differences between homozygous and heterozygous organisms are

S. No.	Homozygous Organisms	Heterozygous Organisms
(i)	Have similar genes for a specific trait ( TT or tt).	Have dissimilar alleles for specific trait (Tt).
(ii)	Produce only one kind of gamete.	Produce two kinds of gametes.
(iii)	Breed true for a specific trait.	Do not breed truly.

(1×3)

20. For a ray of light travelling from air into medium, if  $c$  is the speed of light in the air and  $v$  is the speed of light in the medium, then, the refractive index of the medium,  $n_m$  is given by

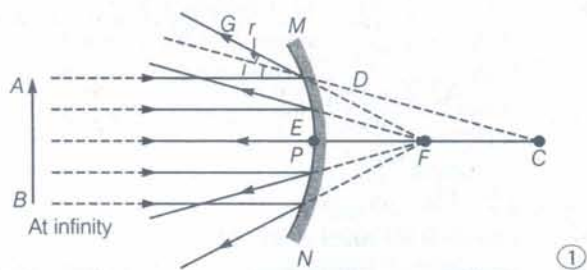
$$n_m = \frac{\text{Speed of light in the air}}{\text{Speed of light in the medium}} = \frac{c}{v}$$

Higher the optical density of the medium, smaller the velocity of light and higher the refractive index of medium which in turn produce smaller angle of refraction.

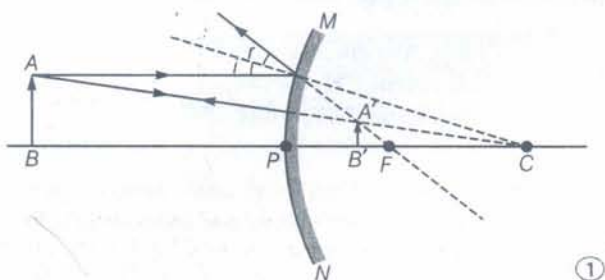
- (a) The maximum optical density is of medium C as minimum angle of refraction is produced among given three media, for given angle of incidence.
- (b) The speed of light is maximum in medium A as maximum angle of refraction occurs in it, which in turn produces minimum refractive index.
- (c) The refractive index of B relative to C is less than unity because  $v_B > v_C$ .
- (d)  $n_c > n_b > n_a$
- (e) Optical density  $\propto 1/\sin r$ , so higher the angle of refraction, smaller the optical density and *vice versa*. Therefore, optical density of medium A is minimum and that of C is maximum. (1×5)



- or
- (a) (i) The virtual, erect and extremely diminished image of the object is formed at the principle focus behind the mirror, as shown below. (1/2)



- (ii) The virtual, erect and diminished image of the object is formed between focus, F and pole, P behind the mirror, as shown below. (1/2)



- (b) Here, Object size,  $h = +10 \text{ mm}$ ,  
 Image distance,  $v = -30 \text{ cm}$ ,  
 Image size,  $h' = 5 \text{ mm}$   
 Magnification,  $m = \frac{h'}{h} = -\frac{v}{u}$   
 $= -5/10 = +30/u$   
 $u = -60 \text{ cm}$ .

Now, by using mirror formula  $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

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

Focal length,  $f = -20 \text{ cm}$

1. Fossils are formed by the formation of layer by layer in the earth's crust.

Invertebrates are buried in the sand, which die around 100-200 million years ago on the sea bed.

The layer of sand, mud, rock tends to get deposited upon them. The pressure of the rocks and pebbles above these organisms and as these organisms died they get deposited and buried and eventually turned into fossils. (3)

Uses of fossils are

- These help us to analyse geologic time.
- These gives us an idea about evolution.
- These also gives us an idea about climatic conditions of Earth in the past.

- (iv) These help in detection of racial history of plants and animals. (2)

or

Fossils are the dead remains of plants and animals which remain buried under the Earth crust for several years. Simply, they are preserved traces of living organisms (2)

Fossils are of several types. They are

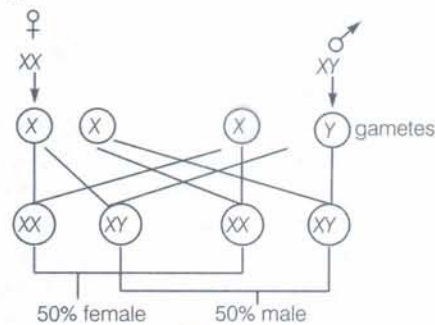
- Unaltered fossils** These are the fossils which do not undergo any change over time.
- Skeletal fossils** These are the fossils of hard and resistant structures like bones, teeth and shells.  
For example, fossil of dinosaur skull.
- Micro fossils** These are fossils of small organisms or small parts of larger animals. (3)

22. (a) The male and female reproductive cells divide by meiosis to form haploid gametes. These gametes have equal genetic material. The zygote is formed by the fusion of male and female gametes, i.e., it has equal genetic contribution from male and female parent.

For example, if a female zygote is formed, she will receive half chromosomes (22+x) from mother and half chromosomes (22+x) from father. (2)

- (b) The sex of a newborn is determined by the type of sex chromosome contributed by the male gamete. Since, the ratio of male gamete containing X-chromosome and those containing Y-chromosome is 50 : 50, the statistical probability of a male or a female child is also 50 : 50.

The sex determination in human being is shown in diagram below



JBS Haldane was a British scientist who gave his theory on origin of life on Earth in 1929. He said that the life must have developed from the simple inorganic molecules which were present on Earth soon after it was formed.

The conditions on Earth, at that time could have given rise to more complex organic molecules that were necessary for life. The first primitive organism would arise from further chemical synthesis. (5)

23. The origin of new species from the existing one is called speciation. When a population of a species splits into two populations which cannot interbreed with each other, they are called two independent species and a new species are generated.

For example, there is a large population of beetles, which feed on bushes spread on a wide mountain range. The population size of beetles becomes large. Beetles tend to feed on nearby bushes forming sub-population. The male and female breed within the sub-population. Accidentally, a crow may pick a beetle from one site and drop it at the other site. This migrant beetle will reproduce with the local population. Over generations, genetic drift will accumulate different changes in each sub-population. Natural selection will also operate differently in different locations.

Genetic drift and natural selection together will result in two isolated sub-population more different from each other. Eventually, members of these two sub-populations will be incapable of reproducing with each other and two different species of beetle are generated. ⑤

or

Two forms of a gene separate and pair, independent of the two forms of other genes during gametogenesis and fertilisation. This causes new combination of characters.

For example,

Parents	♀ Rr Yy	x	♂ Rr Yy	
Gametes	(RY) (Ry) (rY) (ry)	x	(RY) (Ry) (rY) (ry)	
	♂ RY		Ry	
RY	RRYY round yellow	RRYy round yellow	RrYY round yellow	RrYy round yellow
Ry	RRYy round yellow	RRyy round green	RrYy round yellow	Rryy round green
rY	RrYY round yellow	RrYy round yellow	rrYY wrinkled yellow	rrYy wrinkled yellow
ry	RrYy round yellow	Rryy round green	rrYy wrinkled yellow	rryy wrinkled green

Round yellow – 9

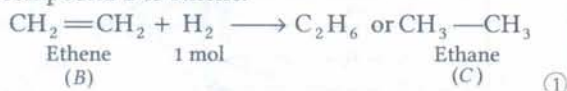
Round green – 3

Wrinkled yellow – 3

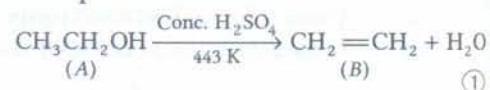
Wrinkled green – 1

This is called 'law of independent assortment'. ⑤

24. Compound B undergoes hydrogenation and it adds 1 mole of H<sub>2</sub>, so it should contain one double bond. Compound C which is obtained after the hydrogenation of compound B, on combustion gives 2 moles of CO<sub>2</sub> and 3 moles of H<sub>2</sub>O, therefore, it should contain 2 atoms of carbon and 6 atoms of hydrogen. Hence, compound C is ethane and compound B is ethene.



Ethene is obtained when ethanol is dehydrated in the presence of concentrated sulphuric acid at 443 K. Therefore compound A is ethanol.



Thus, A ⇒ ethanol, CH<sub>3</sub>CH<sub>2</sub>OH

B ⇒ ethene, CH<sub>2</sub>=CH<sub>2</sub>

C ⇒ ethane, CH<sub>3</sub>-CH<sub>3</sub> ③

or

- (a) On the basis of physical and chemical properties differences between ethanol and ethanoic acid are

S.No.	Ethanol	Ethanoic acid
(i)	It is a colourless liquid having pleasant smell and burning taste.	It is a colourless, pungent smelling liquid having sour taste.
(ii)	It boils at 351 K.	It boils at 391 K.
(iii)	It is neutral.	It is acidic in nature.
(iv)	It does not react with sodium bicarbonate.	It reacts with sodium bicarbonate and produces CO <sub>2</sub> gas.
(v)	It does not react with sodium carbonate.	It reacts with sodium carbonate and produces CO <sub>2</sub> gas.
(vi)	It does not react with sodium hydroxide solution.	It reacts with sodium hydroxide to produce salt and water (neutralisation reaction).

③

- (b) Food, clothes, paper, plastics, rubber, paints, cosmetics, detergents, medicines, kerosene, CNG, biogas, petrol, diesel, etc contain carbon in the combined form with other elements.

Furthermore, all living things are made up of carbon compounds. The compounds of carbon are so large in number and so important that the chemistry of carbon compounds forms a separate branch of chemistry, known as organic chemistry. ②



25. (c) A ray of light passing through optical centre of convex lens passes straight without any deviation.
26. (d) A ray parallel to the principal axis, after reflection, will pass through the principal focus, in case of a concave mirror.
27. (b) In a rectangular glass slab, the emergent rays are parallel to the direction of the incident ray because the extent of bending of the ray of light at the opposite parallel faces air-glass interface and glass-air interface of the rectangular glass slab are equal and opposite.
28. (d) All are the defects of eyes.
29. (d) The action of ciliary muscles holding the eye lens changes the focal length of eye lens enabling the eye to focus the image of objects at varying distances.
30. (c) Combining capacity of elements depends on the number of electrons or protons present in the valence shell (outermost shell).
31. (d) In ionic compounds, electrostatic forces between the oppositely charged ions are very strong.
32. (c) Lead pencil contains graphite.
33. (a) In the given compound, Br and O are heteroatoms. In organic compounds, the element replacing hydrogen is referred to as a heteroatom.
34. (d) Generally, melting and boiling points increases with the increase in molecular masses, therefore,  $C_{12}H_{26}$  has the highest melting and boiling point.
35. (b) Irregular shaped *Amoeba* undergoes binary fission to divide its nucleus into two daughter nuclei.
36. (c) Budding is an asexual method of reproduction which occurs in simple multicellular animals like yeast and *Hydra*.
37. (b) Bean and apple are dicots containing two cotyledons.
38. (b) Potato is a root and grows without seed.
39. (a) Chlorofluorocarbons react with ozone and destroy it gradually.
40. (c) According to ten percent law, only 10% of chemical energy entering a particular trophic level of organisms is available for transfer to the next higher trophic level.
41. (b)  $CH_3CH_2OH \xrightarrow{\text{acidified } K_2Cr_2O_7 + \text{heat}} CH_3COOH$
42. (d)