

CBSE
Class X Science
Sample Paper – 14 Solution

Section A

1. Kilowatt-hour is the commercial unit of energy.
2. Decomposers break down the waste materials and dead remains of plants and animals and help in the recycling of materials.
3.
 - (a) The conversion of ethanol to ethane is an example of **dehydration**.
 - (b) Converting ethanol to ethene requires the use of **conc. sulphuric acid**.
 - (c) The conversion of ethene to ethane is an example of **hydrogenation**.
 - (d) The catalyst used in the conversion of ethene to ethanol is commonly **nickel**.
4. Disadvantages of a solar cooker:
 - a) $V = IR$; $240 = 0.5 \times R$; $R = 480\Omega$
 - b) $P = VI$; $P = 240 \times 9 = 2160W$
 - c) $240 = 4 \times R$; $R = 60\Omega$; $V = I \times R \Rightarrow 120 = I \times 60 \Rightarrow I = 2A$
 - d) $P = VI$; $P = 240 \times 0.5 = 120W$
5. (c)
 $\angle i = 90^\circ - 30^\circ = 60^\circ$
Since $\angle i = \angle r$
 $\therefore \angle r = 60^\circ$
angle between incident ray and reflected ray
 $\angle i + \angle r \Rightarrow 60^\circ + 60^\circ = 120^\circ$

OR

- (b) The nature of the image formed by a plane mirror is virtual.
6. (c) A generator is used to produce electricity.
7. (b) In a 3-chambered heart, due to the mixing of blood in a single ventricle, the parts of the body do not get blood saturated with oxygen. Therefore, a 3-chambered heart is less efficient as compared to a 4-chambered heart.
8. (b) Ten pollen grains are required. Of the 2 male gametes present in each pollen grain, only one fuses with the egg and the other fuses with the polar nuclei.

OR

(b) *Plasmodium* reproduces through multiple fission, thereby causing malaria in human beings.

9. (d) A food web is more significant than a food chain because producers are usually eaten by many different consumers, and consumers are eaten by more than one predator.
10. (c) The correct order of the reactivity of metals is $\text{Ca} > \text{Al} > \text{Cu} > \text{Ag}$.
11. (d) The compound $\text{CH}_2=\text{CH}_2$ burns with a yellow non-sooty flame.
12. (d) Folding of leaves because of seismonasty protects the mimosa plant from being eaten by herbivores. In the folded leaves, there is less exchange of heat as compared to fully expanded leaves. This offers higher survival value under environmental stress.

OR

- (a) People living in hilly areas suffer from goitre because the soil in these areas is deficient in iodine. This results in less thyroxine production.
13. (A) Both A and R are true, and R is the correct explanation of the assertion. Criticism on the construction of dams focusses on environmental problems because they contribute enormously to deforestation and the loss of biological diversity.
14. (A) Both A and R are true, and R is the correct explanation of the assertion. Fuel oil is a better fuel compared to coal as it does not leave any residue. Coal leaves behind a lot of ash.

Section B

15.

- (i) Metal which exists in the liquid state at room temperature → Mercury
- (ii) Metal which can be easily cut with a knife → Sodium
- (iii) Metal which is the best conductor of heat → Silver
- (iv) Metals which are poor conductors of heat → Mercury and lead

16. Transportation of organic solutes in plants is called translocation. It is necessary because all the cells need food to carry out their vital functions. Translocation occurs in the upward as well as downward directions and in the storage organs of roots, fruits, seeds and growing organs.

OR

Offspring formed due to sexual reproduction have better chances of survival because

- Sexual reproduction introduces genetic variation in the offspring which is essential for evolution and survival of the species.

- Offspring exhibit heterosis or hybrid vigour which enables them to adapt better to the changing environment.
- Enhanced traits allow the offspring to be tolerant and survive under adverse conditions.

However, during sexual reproduction, there is crossing over and random selection due to which the offspring produced may have traits which are inferior to the parents.

Hence, it is not always true that the offspring formed by sexual reproduction have better chances of survival.

17. (a) Most reactive metal: Z

(b) Most reactive non-metal: L

(c) Family of elements represented by L, Q, R and T: Halogen

(d) Mg (Group 2), Al (Group 13), N (Group 15)

18. Power, $P = 1.5 \text{ kW} = 1500 \text{ W}$

$V = 220 \text{ V}$

Current drawn, $P = V \times I$

$$I = \frac{P}{V}$$

$$I = \frac{1500}{220}$$

$$I = 6.81 \text{ A}$$

Current drawn, $I \approx 7 \text{ A}$

The current drawn by the electrical appliance is 7 A which is beyond the fuse rating capacity in the circuit. Hence, when a very high current of 7 A flows through the 5 A fuse, it will melt and break the circuit. Hence, the fuse wire of 5 A rating would not be suitable for this electrical appliance.

19. i) With one eye opened, the human eye gets a horizontal field of view of 150° .

ii) The minimum distance at which an object must be placed so that a normal eye can see the object without strain is called the least distance of distinct vision.

iii) For the normal human eye, the least distance of distinct vision is 25 cm.

20. Object distance, $u = -25 \text{ cm}$

Image distance, $v = -50 \text{ cm}$

From the mirror formula,

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

$$\therefore \frac{1}{f} = \frac{1}{-50} + \frac{1}{-25} = \frac{-25-50}{1250}$$

$$\therefore \frac{1}{f} = -0.06$$

$$\therefore f = -16.66 \text{ cm}$$

Focal length of the mirror is 16.66 cm.

Height of the object, $h = 2 \text{ cm}$

From the magnification formula,

$$m = -\frac{v}{u} = \frac{h_2}{h_1}$$

$$\therefore h_2 = -\frac{v}{u}h_1 = -\left(\frac{-50}{-25}\right) \times 2 = -4 \text{ cm}$$

Height of the image is 4 cm.

OR

Object distance, $u = 8 \text{ cm}$

To find: Image distance (v)

$$\text{Focal length} = f = \frac{R}{2} = 10 \text{ cm}$$

$$\frac{1}{10} = \frac{1}{v} + \frac{1}{-8}$$

$$\therefore \frac{1}{v} = \frac{1}{10} + \frac{1}{8} = \frac{18}{80}$$

$$\therefore \frac{1}{v} = 0.225$$

$$\therefore v = + 4.4 \text{ cm}$$

Thus, the position of the image is 4.4 cm behind the convex mirror. As the image is formed behind the convex mirror, its nature will be virtual and erect.

Magnification of the convex mirror is

$$m = \frac{-v}{u} = -\frac{4.4}{-8} = 0.55$$

$$m = \frac{h_2}{h_1}$$

$$\Rightarrow 0.55 = \frac{h_2}{4}$$

$$\Rightarrow h_2 = 2.2 \text{ cm}$$

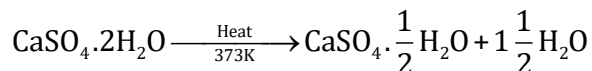
Thus, the size of the image is 2.2 cm.

21.

- a) The given compound X is prepared from gypsum and has the property of hardening when mixed with a proper quantity of water. It is plaster of Paris.

Its chemical name is calcium sulphate hemihydrate, and it has chemical formula $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$.

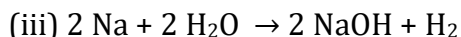
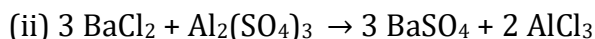
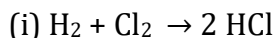
- b) Preparation of plaster of Paris:



- c) Uses of plaster of Paris:

- 1) Plaster for supporting fractured bones
- 2) For making toys, statues and decorative items

OR



22. The following conditions prevailed on primitive Earth:

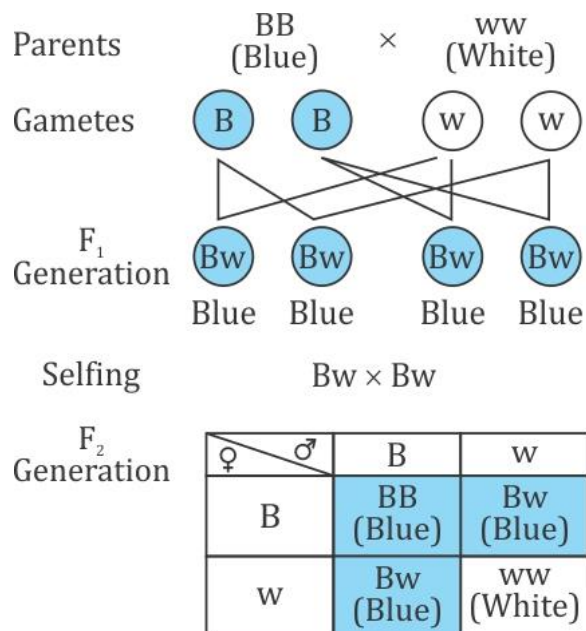
- i) Presence of UV light
- ii) Absence of oxygen
- iii) Lightning, volcanoes, high temperature etc.
- iv) Absence of microorganisms

But these conditions are absent today. So, the conditions on primitive Earth can be recreated only in the laboratory.

23.

- (a) Before birth, the infant's lungs are not involved in its blood circulation. The switch-over takes place just after birth. Blood flow through the umbilical cord, ductus arteriosus and foramen ovale stops, while blood flow through the heart and pulmonary blood vessels begins.
- (b) Before birth, the infant's lungs cannot be involved in respiration because the foetus is lying in the amniotic fluid. But after birth, circulation becomes normal involving all the chambers of the heart and the lungs.

24.



- (a) The F₁ progeny is expected to have plants with blue flowers.
- (b) $\frac{1}{4}$ of the F₂ generation bears white flowers. So, 25% of the F₂ progeny bears white flowers in the F₂ generation when the flowers of F₁ plants are self-pollinated.
- (c) The ratio of the genotype BB and Bw in the F₂ progeny is 1 (BB):2 (Bw).

Section C

25.

- (i) Thyroxine: Controls overall metabolic rate of the body (carbohydrate, protein and fat metabolism)
- (ii) Insulin: Conversion of glucose to glycogen in the liver and muscles, thus decreasing the blood glucose level
- (iii) Adrenalin: Increases heartbeat, blood pressure and blood glucose level
- (iv) Growth hormone: Body growth and development of bones
- (v) Testosterone: Development of male sex organs and secondary sex characteristics like moustache, beard and voice

26. Hypermetropia is a defect of vision due to which a person cannot see nearby objects clearly.

Causes of hypermetropia:

- i) low converging power of the eye lens
- ii) eye ball is too short (the insufficient eye length)

Object distance, $u = -25$ cm (near point of the normal eye)

Image distance, $v = -0.9$ m = -90 cm

From lens formula,

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

$$\frac{1}{f} = \frac{1}{-90} - \frac{1}{-25}$$

$$\frac{1}{f} = \frac{1}{0.028}$$

$$f = 35.7 \text{ cm}$$

$$\text{Power, } P = \frac{1}{f(\text{metres})}$$

$$P = \frac{1}{0.35} = + 2.85 \text{ D}$$

Thus, the lens used is a convex lens and the power of the lens is +2.85 dioptre.

27. Baking powder consists of sodium bicarbonate, tartaric acid and a small amount of starch.

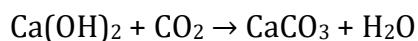
Hence, the compound X of sodium is a constituent of baking powder and is used in antacids. It is sodium bicarbonate or sodium hydrogen carbonate with the chemical formula NaHCO_3 . It is commonly known as baking soda.

On heating, it decomposes to give sodium carbonate, water and carbon dioxide gas (Y).



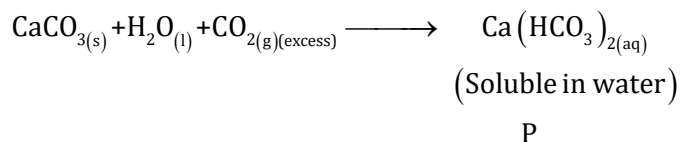
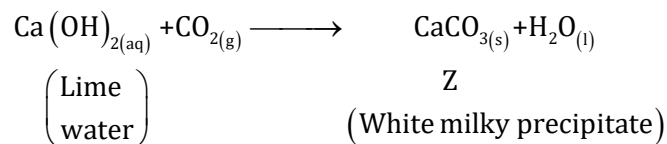
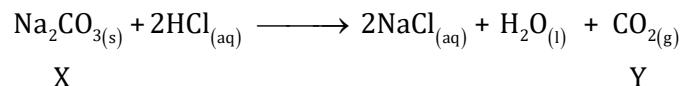
Sodium	Carbon
bicarbonate	dioxide
(X)	(Y)

The CO_2 gas formed when passed through limewater turns it milky due to the formation of calcium carbonate, which is insoluble in water.



Lime	Calcium
water	carbonate

OR



28.

(a)

$$\rho = \frac{R \times A}{\ell}$$

ρ – resistivity of material

R- resistance of conductor

A- Area of cross-section

ℓ = length of conductor

(b) Power rating of the oven, $P = 1.25 \text{ kW} = 1250 \text{ W}$

Potential difference of the power supply, $V = 230 \text{ V}$

(i) Power is

$$P = VI$$

$$\therefore I = \frac{P}{V} = \frac{1250}{230} = 5.43 \text{ A}$$

(ii) Resistance and power are related as

$$P = \frac{V^2}{R}$$

$$\therefore R = \frac{V^2}{P} = \frac{230^2}{1250} = 42.32 \Omega$$

(iii) Energy consumed by the oven is

$$E = Pt$$

$$\therefore E = 1.25 \text{ kW} \times 4\text{h}$$

$$\therefore E = 5 \text{ kWh}$$

OR

Equivalent resistance when the resistors are connected in series is

$$\rightarrow R_s = R_1 + R_2 + R_3$$

$$\rightarrow R_s = 6 + 7 + 10 = 23 \text{ ohm}$$

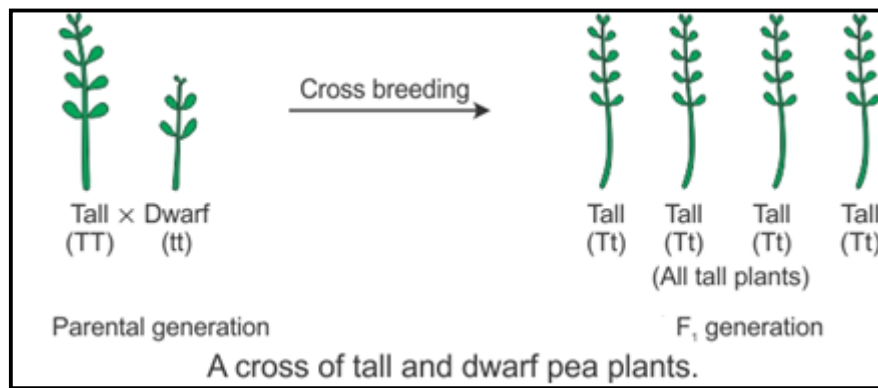
- (i) The potential difference across each resistor will be different in a series combination.
Across resistor R_1 , PD will be V_1 ; for R_2 , PD will be V_2 and for R_3 , PD will be V_3 .
- (ii) The current across the three resistors in a series combination will be the same, i.e. 'I'.
- (iii) No, when the resistors are connected in parallel, the equivalent resistance is less than each of the individual resistors.

29.

- (i) Within any population, there is natural variation. Some individuals have more favourable variations than others.
- (ii) Even though all the species produce a large number of offspring, populations remain fairly constant naturally.
- (iii) This is due to the struggle between members of the same species and different species for food, space and mates.
- (iv) The struggle for survival within a population eliminates unfit individuals. The fit individuals possessing favourable variations survive and reproduce. This is called natural selection.
- (v) The individuals having favourable variations pass on these variations to their progeny from generation to generation.
- (vi) These variations when accumulated over a long period of time lead to the origin of a new species.

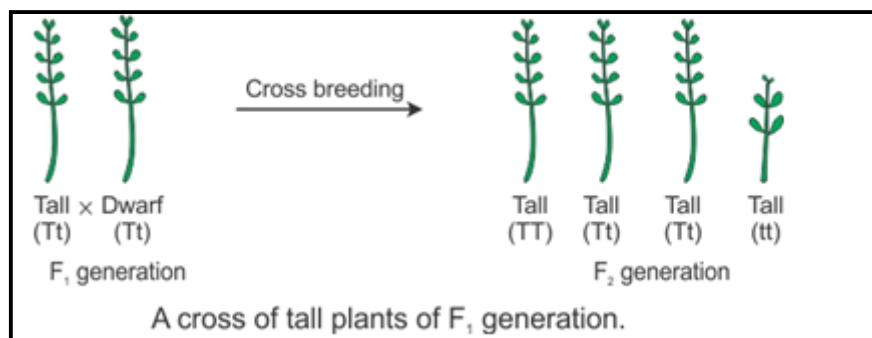
OR

- (a) Mendel crossed pure-bred tall pea plants with pure-bred dwarf pea plants and found that only tall pea plants were produced in the first generation and there were no dwarf pea plants. He concluded that the first generation showed the traits of only one of the parent plants—tallness. The trait of the other parent plant—dwarfness—did not show up in the progeny of the first generation.



He then crossed the tall pea plants obtained in the first generation (F₁ generation) and found that both tall plants and dwarf plants were obtained in the second generation (F₂ generation) in the ratio 3:1. Mendel noted that the dwarf trait of the parent pea plant which disappeared in the first generation progeny reappeared in

the second generation. In this way, Mendel's experiments with tall and dwarf pea plants showed that the traits may be dominant and recessive.



(b) When Mendel crossed pure-bred tall pea plants with pure-bred dwarf pea plants, he found that only tall pea plants were produced in the F₁ generation. When he further crossed the tall pea plants of the F₁ generation, he found that the tall plants and dwarf plants were obtained in the ratio 3:1 in the F₂ generation. Mendel noted that all the pea plants produced in the F₂ generation were either tall or dwarf. There were no plants with intermediate height (or medium height) in between the tall and dwarf plants. In this way, Mendel's experiment showed that the traits (like tallness and dwarfness) are inherited independently. This is because if the traits of tallness and dwarfness had blended (or mixed up), then medium-sized pea plants would have been produced.

30.Compound A must be an alcohol, because an alcohol gives carboxylic acid on oxidation. Since A contains two C atoms, it must be ethanol, B must be ethanoic acid because B is obtained from the oxidation of A. Ethanoic acid and ethanol combine in the presence of conc. H₂SO₄ to give ester. So, C is an ester of ethanoic acid and ethanol; C is thus ethyl ethanoate. Esters are sweet-smelling substances; hence, Z is an ester.

X is ethanol having the chemical formula CH₃CH₂OH.

Y is ethanoic acid having the chemical formula CH₃COOH.

Z is ethyl ethanoate having the chemical formula CH₃COOCH₃.

Ethanol reacts with ethanoic acid to form ethyl ethanoate, which is an ester.

