

CBSE
Class X Science
Sample Paper 11

Time: 3 hrs

Total Marks: 80

General Instructions:

- (i) The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.
- (ii) Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each.
- (iii) These questions contain multiple choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.
- (iv) Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should be in the range of 30 to 50 words.
- (v) Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should be in the range of 50 to 80 words.
- (vi) Section–D - question no. 34 to 36 are long answer type questions carrying 5 marks each. Answer to these questions should be in the range of 80 to 120 words.
- (vii) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- (viii) Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. Define one coulomb charge. (1)
- OR**
- What is meant by insulators?
2. The potential difference across the wire having fixed resistance is tripled. By how much does the electric power increase? (1)
 3. Why does a compass needle show deflection when brought near a current carrying conductor? (1)
 4. Name the hormone which is responsible for reabsorption of water in nephron. (1)
 5. What will happen if deer is missing in this food chain? (1)
Grass → Deer → Tiger
 6. How do woody plants carry out gaseous exchange? (1)

OR



Name the excretory organ in Amoeba.

7. Construct a food chain comprising of a snake, hawk, rat and plant. (1)
8. Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F₁ progeny that have round, yellow (RrYy) seeds. When F₁ plants are selfed, what will be the ratio of the F₂ progeny? (1)
9. Why does bread mold grow profusely on a moist slice of bread rather than on a dry slice of bread? (1)

OR

Why cannot fertilisation take place in flowers if pollination does not occur?

10. Name the following: (1)
Two metals which are found in the free or native state.
11. Arrange the metals: calcium, iron, magnesium and sodium in order of their reactivity with water placing the most reactive first. (1)

OR

How many valence electrons are present in (a) metals and (b) non- metals?

12. Write balanced equation for the following reactions: (1)
Aluminium powder is warmed with hot and concentrated caustic soda solution.

OR

Write the equations for the reaction of zinc with dilute sulphuric acid.

13. What metallic property is shown by the non-metal graphite? (1)

For question numbers 14, 15 and 16, two statements are given—one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

- a) Both A and R are true, and R is the correct explanation of the assertion.
b) Both A and R are true, but R is not the correct explanation of the assertion.
c) A is true, but R is false.
d) A is false, but R is true.

14. **Assertion:** A stick partly immersed in water appears to be bent. (1)
Reason: Refraction of light when it passes from water into air.

15. **Assertion:** A chemical equation should be balanced. (1)
Reason: A chemical equation should satisfy the law of conservation of chemical reactions.

OR

Assertion: The colour of copper sulphate solution changes when iron nail is kept immersed in it. (1)

Reason: A combination reaction taking place between iron and copper.

16. Assertion: Aluminium vessels should not be cleaned with powders containing alkalis. (1)

Reason: Aluminium reacts with alkalis to form respective aluminate and hydrogen gas.

17. Read the following and answer any four questions from 17 (i) to 17 (v). (1×4)

Mendeleev predicted the existence of certain elements not known at that time and named two of them as eka-aluminium and eka-silicon. Swati has been given an assignment in the class on Mendeleev's periodic table. She has to answer the following questions in the assignment:

(i) Mendeleev's basis for the Periodic Table is

- (a) Atomic number
- (b) Atomic mass number
- (c) Both (a) and (b)
- (d) None of above

(ii) Name the element which has taken the place of eka-aluminium and eka-silicon.

- (a) Gallium and Cerium
- (b) Vanadium and Germanium
- (c) Gallium and Germanium
- (d) Gallium and Armanium

(iii) Choose the correct the period/periods of eka-aluminium and eka-silicon elements in the modern periodic table.

- (a) 4th period
- (b) 3rd period
- (c) 5th period
- (d) 2th period

(iv) Write the group/groups of eka-aluminium and eka-silicon elements in the modern periodic table.

- (a) 13th and 14th
- (b) 12th and 13th
- (c) 13th
- (d) 14th

(v) Classify these elements as metals, non-metals or metalloids.

eka-aluminium and eka-silicon

- (a) Metal and non-metal
- (b) Metal and metalloid
- (c) Metal and metal
- (d) Non-metal and metalloid



18. Read the following and answer any four questions from 18 (i) to 18 (v) (1×4)

A concave mirror has focal length 10 cm. Answer the questions using the following table:

(A) u	-20 cm
(B) u	-15 cm
(C) u	Infinity
(D) u	-5 cm

(i) If object size is 2 cm, what would be the size of the image in case A?

- (a) 2 cm
- (b) 10 cm
- (c) 4 cm
- (d) Less than 2 cm

(ii) Nature of the image when $u = -15$ cm

- (a) Virtual and inverted
- (b) Real and erect
- (c) Virtual and erect
- (d) Real and inverted

(iii) Nature of the image in case (D)

- (a) Virtual and inverted
- (b) Real and erect
- (c) Virtual and erect
- (d) Real and inverted

(iv) Position of the image in case (C)

- (a) At centre of curvature
- (b) At focus
- (c) At infinity
- (d) Between focus and centre of curvature

(v) What is the distance at which the centre of curvature located?

- (a) 5 cm
- (b) 10 cm
- (c) 20 cm
- (d) 15 cm

19. Read the following and answer any four questions from 19 (i) to 19 (v) (1×4)

Plastic bags cause many minor and major ecological and environmental issues. The most general issue with plastic bags is the amount of waste produced. Many plastic bags end up on streets and subsequently pollute major water sources, rivers, and streams. Even when disposed of properly, they take many years to decompose and break down, generating large amounts of garbage over long periods of time. Improperly discarded bags have polluted waterways, clogged sewers and been found in oceans, affecting the ecosystem of marine creatures.



- (i) Which of the following is non-biodegradable?
 - (a) Plastic
 - (b) Tea leaves
 - (c) Spoilt bread
 - (d) Paper
- (ii) Which of the following is likely to cause most pollution?
 - (a) Plastic cups
 - (b) Paper bags
 - (c) Dried leaves
 - (d) Broken glassware
- (iii) What is the most general issue with plastic bags?
 - (a) They are biodegradable.
 - (b) They are heavy.
 - (c) They produce a lot of waste.
 - (d) They are cheaper.
- (iv) Which of the following is the effect of plastic pollution?
 - (a) Clogging of drains
 - (b) Death of marine life
 - (c) Loss of aesthetic beauty
 - (d) All of these
- (v) Which of the following is the most eco-friendly option?
 - (a) Use of paper bags for shopping
 - (b) Use of steel plates for dining
 - (c) Use of kulhads for tea
 - (d) All of these

20. Read the following and answer any four questions from 20 (i) to 20 (v) (1×4)

Mendel experimented on a pea plant and considered 7 main contrasting traits in the plants. In monohybrid experiment, Mendel took two pea plants of opposite traits (one short and one tall) and crossed them. He found the first generation offspring were tall and called it F₁ progeny. Then he crossed F₁ progeny and obtained both tall and short plants in the ratio 3:1. In a dihybrid cross experiment, Mendel considered two traits, each having two alleles. He crossed wrinkled-green seed and round-yellow seeds and observed that all the first generation progeny (F₁ progeny) were round-yellow. This meant that dominant traits were the round shape and yellow colour. He then self-pollinated the F₁ progeny and obtained 4 different traits wrinkled-yellow, round-yellow, wrinkled-green seeds and round-green in the ratio 9:3:3:1.

- (i) Which of the following was not a trait considered by Mendel for his experiments?
 - (a) Flower colour
 - (b) Pod shape
 - (c) Stem height
 - (d) Seed type



- (ii) What is the phenotypic ratio of the F₂ progeny in a dihybrid cross?
(a) 3:1
(b) 1:2:1
(c) 9:3:3:1
(d) 3:4
- (iii) What is the genotypic ratio of the F₂ progeny in a monohybrid cross?
(a) 3:1
(b) 1:2:1
(c) 9:3:3:1
(d) 3:4
- (iv) A cross between tall and dwarf plants will produce which type of plants in the F₁ generation?
(a) Tall
(b) Dwarf
(c) Semi-dwarf
(d) Short
- (v) Because of his contribution to the field of genetics, Mendel is known as the
(a) Father of genetics
(b) Father of botany
(c) Father of medicine
(d) Father of plant physiology

Section B

21. Translate the following statements into chemical equations and then balance the equations: (2)
(a) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
(b) Phosphorus burns in oxygen to give phosphorus pentoxide.

OR

Complete and balance the following equations:

- (a) $\text{NaOH} + \underline{\hspace{2cm}} \longrightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$
(b) $\text{Ca}(\text{OH})_2 + \underline{\hspace{2cm}} \longrightarrow \text{CaCO}_3 + \text{H}_2\text{O}$

22. Give one example in each case: (2)
(a) Basic oxide which is soluble in water
(b) A hydroxide which is highly soluble in water.



23. The image of an object placed at 40 cm in front of a lens is obtained on a screen at a distance of 100 cm from it. Find the focal length of the lens. (2)

OR

A concave mirror produces two times magnified real image of an object placed at 20 cm in front of it. What is the position of the image? (2)



24. Observe the table given below and answer the questions: - (2)

Sr. No.	Symbol used in circuit diagram
1.	
2.	

- i) What does the symbol (1.) in the table given above represents?
- ii) Which electrical component is represented when symbol (2.) is used in circuit diagram?

25. What are the two possible sources of variation? (2)

26. Why has government banned the use of polythene bags? (2)

Section C

27. Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds? (3)

OR

Tooth enamel is one of the hardest substances in our body. How does it undergo damage due to eating chocolates and sweets?

28. What would you observe when (3)
(a) Blue litmus is introduced into a solution of hydrogen chloride gas.
(b) Red litmus paper is introduced into a solution of ammonia in water.
(c) Red litmus paper is introduced in caustic soda solution.

29. What are the three chemicals formed by common salt and how are they formed? (3)

30. State and explain the principle of the electric motor. State the transformation of energy in the electric motor. (3)

31. Define refractive index. If light enters from air to glass having a refractive index 1.5, then calculate the speed of light in glass. (3)

32.
(a) State and explain the heating effect of electric current.

(b) A potential difference of 220 V is applied across a resistance of 400 ohm in an electric heater. Calculate electric current passing through the heater. (3)

33. What is the role of the following in the human digestive system? (3)
- (a) Mucus
 - (b) Bicarbonate
 - (c) Trypsin

Section D

34. What is meant by linear magnification? Write the formula for magnification of spherical mirrors. What is the unit of magnification? Explain.
What is the nature of the image if the magnification is positive and negative? (5)

OR

(a) Define:

- i. Principal focus of a convex lens
- ii. Optical centre

(b) State the lens formula.

Magnification produced by a spherical lens is -1 . What is the nature of the image and lens?

35. Buckminsterfullerene is a spherical molecule in which 60 carbon atoms are arranged in interlocking hexagonal and pentagonal rings of carbon atoms. (5)

(a) How many hexagons of carbon atoms are present in one molecule of buckminsterfullerene?

(b) How many pentagons of carbon atoms are present in one molecule of buckminsterfullerene?

(c) How is it related to diamond and graphite?

(d) Why is diamond used for making cutting tools but graphite is not?

(e) Why is graphite used for making dry cell electrodes but diamond is not?

36. (5)

(a) Write the three main steps which take place in the chloroplast during photosynthesis.

(b) How do stomata open and close?

(c) Which raw material is made available to plants for photosynthesis?

OR

With the help of suitable diagrams, explain the various steps of budding in Hydra.



CBSE
Class X Science
Sample Paper 11 – Solution

Section A

1. One coulomb of charge is that quantity of charge which exerts a force of 9×10^9 Newton on an equal charge is placed at a distance of 1 m from it.

OR

Those substances through which electricity cannot flow are known as insulators.

2. $P = \frac{V^2}{R}; P' = \frac{(3V)^2}{R} \Rightarrow P' = 9P$

3. The magnetic field is produced around the current carrying conductor.
4. Anti-diuretic hormone (ADH) or vasopressin.
5. If deer is missing in the given food chain, the population of tiger will decrease and the population of grass will increase.
6. Woody plants carry out gaseous exchange through the lenticels.

OR

Excretory organ in Amoeba- Cell membrane.

7. Plant → Rat → Snake → Hawk
8. When F_1 plants are selfed, the ratio of the F_2 progeny will be 9:3:3:1.
9. The spores of bread mold need favourable conditions like moist surface to germinate. Moisture is an important, factor for the growth of hyphae of bread mold that contains spores. Therefore, moistened bread slice offers both moisture and nutrients to the bread mold, hence it grows profusely. Dry slice of bread offers nutrients, but not moisture hence, hyphae fail to grow.

OR

In a flower fertilization requires both male and female gametes. If pollination does not occur, male gamete is not available hence fertilization cannot take place.

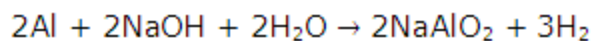
10. Gold and platinum.
11. Reactivity of metals with water: Sodium > Calcium > Magnesium > Iron.



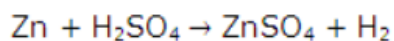
OR

Metals have 1, 2, 3 valence electrons while non-metals have 4, 5, 6 or 7 valence electrons.

12. The balanced equation is as follows:



OR



13. Graphite, like metals is a good conductor of electricity.
14. (a) Both A and R are true, and R is the correct explanation of the assertion.
The stick appears to be bent because of refraction of light when it passes from water into air.
15. (a) Both A and R are true, and R is the correct explanation of the assertion.
A chemical equation should be balanced to satisfy the law of conservation of chemical reactions.

OR

(c) A is true, but R is false.

The colour of copper sulphate solution changes when iron nail is kept immersed in it due to the displacement reaction taking place between iron and copper

16. (a) Both A and R are true, and R is the correct explanation of the assertion.
Aluminium vessels should not be cleaned with powders containing alkalis because aluminium reacts with alkalis to form respective aluminate and hydrogen gas.
- 17.
- (i) (b) Mendeleev's basis for the Periodic Table is **Atomic mass number**.
 - (ii) (c) Gallium and Germanium are the element which has taken the place of eka-aluminium and eka-silicon
 - (iii) (a) Elements eka-aluminium and eka-silicon are belong to 4th period.
 - (iv) (a) Gallium: 13th group; Germanium: 14th group
 - (v) (b) Gallium: Metal; Germanium: Metalloid

18.

- (i) a) 2cm

As the object is placed at C, the size of the image is the same as that of the object, i.e. 2 cm.

- (ii) d) Real and inverted

The object when at 15 cm is between focus and centre of curvature. Thus, image formed is real and inverted



(iii) c) Virtual and erect

When the object is placed at 5 cm in front of this concave mirror it means that it is kept between focus and pole. Thus, image formed is virtual and erect as image is formed behind the concave mirror.

(iv) b) At focus

When object is placed at infinity then image formed by concave mirror is at focus.

(v) c) 20 cm

$$R = 2f$$

$$\text{Thus, } R = 2 \times 10 = 20 \text{ cm}$$

19.

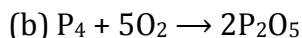
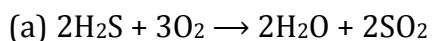
- i) a) Plastic is non-biodegradable as it cannot be broken down by the action of microbes.
- ii) a) Plastic cups are likely to cause most pollution as they may take many years to decompose and break down.
- iii) c) The most general issue with plastic bags is the amount of waste produced.
- iv) d) Plastic pollution results in clogging of drains, death of marine life and loss of aesthetic beauty.
- v) d) Use of paper, steel and mud to replace plastic is an eco-friendly option.

20.

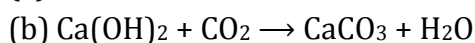
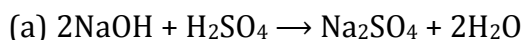
- i) d) Seed type was not studied by Mendel.
- ii) c) The phenotypic ratio of the F₂ progeny in a dihybrid cross is 9:3:3:1.
- iii) c) The genotypic ratio of the F₂ progeny in a monohybrid cross is 1:2:1.
- iv) a) A cross between tall and dwarf plants will produce all tall plants in the F₁ generation.
- v) a) Mendel is known as the Father of Genetics.

Section B

21.



OR



22.

(a) CaO

(b) NaOH



23. Object distance, $u = -40$ cm

Image distance, $v = 100$ cm

From the lens formula,

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

$$\therefore \frac{1}{f} = \frac{1}{100} - \frac{1}{-40} = \frac{1}{100} + \frac{1}{40}$$

$$\therefore \frac{1}{f} = \frac{140}{4000} = 0.035$$

$$\therefore f = 28.57 \text{ cm}$$

OR

Magnification (m) = -2 (image is real)

Object distance (u) = -10 cm (object is to the left of the mirror)

To find: Image distance (v)

Magnification of spherical mirrors is given as

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

$$-2 = \frac{-v}{-10}$$

$$v = -20 \text{ cm}$$

Thus, the image is located at a distance of 20 cm in front of the mirror.

24.

i) Symbol (1.) indicates closed switch or plug key.

ii) Electric bulb is represented by symbol (2.)

25. Two possible sources of variation:

- Errors in DNA copying
- Random fertilisation

26. The government has banned the use of polythene bags because the polythene bags are made out of non-biodegradable plastic materials. The waste material processing of these plastic materials is very difficult. This unprocessed plastic waste materials are becoming a reason for serious land pollution. The plastic bags are waterproof and create a blockage in the drainage system which is ruining our lives in many ways. The innocent animals often eat plastic bags along with the food materials and face serious health problems.



Section C

27. It is necessary to separate oxygenated blood and deoxygenated blood in mammals and birds because such a separation allows a highly efficient supply of oxygen to the body cells which is required for producing a lot of energy needed by them.

OR

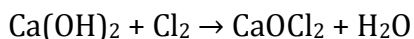
Acid is formed in the mouth after sugary food (chocolates and sweets) has been consumed. This acid lowers the pH in the mouth. Tooth decay starts when the pH of acid formed in the mouth falls below 5.5. This is because the acid becomes strong enough to attack the enamel of our teeth and corrode it.

28.

- (a) Blue litmus changes to red when dipped in a solution of hydrogen chloride gas.
(b) When red litmus is introduced into a solution of ammonia in water, it changes to blue.
(c) Red litmus changes to blue when dipped in caustic soda solution.

29. Common salt is required in the manufacture of sodium hydroxide, baking soda, washing soda, bleaching powder and many other chemicals.

1) Bleaching powder is produced by the action of chlorine [which is produced during the electrolysis of aqueous sodium chloride (brine)] on dry slaked lime $[\text{Ca}(\text{OH})_2]$. Bleaching powder is represented as CaOCl_2 .



2) Baking soda which has the chemical name sodium hydrogen carbonate (NaHCO_3) is produced using sodium chloride as one of the raw materials.



3) Washing soda ($\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$) is another chemical which can be obtained from sodium chloride. Sodium carbonate can be obtained by heating baking soda; recrystallisation of sodium carbonate gives washing soda.

30.

- (i) An electric motor works on the principle of the magnetic effect of electric current.
(ii) When a rectangular coil is placed in the magnetic field and current is passed through it, a force acts on the coil which rotates it continuously.
(iii) The electric motor converts electric current to mechanical energy.

31. The ratio of the speed of light in vacuum to the speed of light in a medium is called the refractive index of the medium.



$$n = \frac{\text{speed of light in air}}{\text{speed of light in glass}}$$

$$1.5 = \frac{3 \times 10^8}{\text{speed of light in glass}}$$

$$\text{speed of light in glass} = \frac{3 \times 10^8}{1.5}$$

Thus, the speed of light in glass is 2.5×10^8 m/s.

32.

(a) According to Joule's law of heating, heat produced in a wire is directly proportional to

- (i) square of current (I^2)
- (ii) resistance of the wire (R)
- (iii) time for which current flows

Heat produced is directly proportional to the square of current:

$$H \propto I^2$$

Heat produced is directly proportional to resistance.

$$H \propto R$$

Heat produced is directly proportional to time for which the current is flowing in the circuit.

$$H \propto t$$

Thus, $H = I^2Rt$... (Joule's law of heating)

(b) Potential difference of 220 V is applied across a resistance of 400 ohm.

Potential difference of the power supply, $V = 220$ V

Resistance = 400 ohm

$$R = V/I$$

Substituting the values in the above equation, we get

$$400 = 220/I$$

$$I = 220/400 = 0.55 \text{ A}$$

33.

(a) Mucus: It protects the inner lining of the stomach from HCl.

(b) Bicarbonate: It makes the acidic food alkaline so that pancreatic enzymes act on it.

(c) Trypsin: It digests proteins into amino acids.

Section D

34. The ratio of the height of the image to the height of the object is known as linear magnification.

$$\text{Magnification} = \frac{\text{height of image}}{\text{height of object}}$$

Magnification does not have a unit. As it is the ratio of the same quantities (image size and object size), it does not have a unit.

If magnification is positive, then the image is virtual and erect.

If magnification is negative, then the image is real and inverted.

OR

(a)

- i. The principal focus of a convex lens is a point on its principal axis to which light rays parallel to the principal axis converge after passing through the lens.
- ii. The centre point of the lens is known as the optical centre.

(b) Lens formula: $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

where f is the focal length of the lens

v is the image distance

u is the object distance

(c) Magnification of the lens = -1

Since magnification is negative, the image formed is real and inverted.

Value 1 indicates that the size of the image is equal to the size of the object.

Such an image can be formed by a convex lens. Hence, it is a convex lens.

35.

- (a) 20 hexagons
- (b) 12 pentagons
- (c) Buckminsterfullerene burns on heating to form carbon dioxide and nothing is left behind. This shows that it is made of carbon only like diamond and graphite.
- (d) Diamond is used for making cutting tools but graphite is not. This is because diamond is a very hard substance and graphite is a soft substance.
- (e) Graphite is used for making dry cell electrodes but diamond is not. This is because graphite is a good conductor of electricity, whereas diamond is a bad conductor of electricity.

36.

(a) Steps which take place inside the chloroplast during photosynthesis:

- i. Absorption of sunlight energy by chlorophyll.
- ii. Conversion of light energy to chemical energy, and splitting of water into hydrogen and oxygen by light energy.



- iii. Reduction of carbon dioxide by hydrogen to form carbohydrates like glucose by utilising chemical energy.
- (b) The opening and closing of stomata is controlled by guard cells. When water flows into the guard cells, they swell, become curved and cause the stomata to open. When the guard cells lose water, they shrink, become straight and the stomata close.
- (c) Carbon dioxide is made available to plants when stomata are open.

OR

In Hydra, a bud develops as an outgrowth due to repeated cell divisions at one specific site. These buds develop into tiny individuals, and when fully mature, they detach from the parent body and become new independent individuals.

