

# Class X Session 2025-26

## Subject - Science

### Sample Question Paper - 10

Time Allowed: 3 hours

Maximum Marks: 80

#### General Instructions:

1. This question paper consists of 39 questions in 3 sections. Section A is Biology, Section B is Chemistry and Section C is Physics.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

#### Section A

1. As compared to daytime, the amount of carbon dioxide released by the plants during night is more because: [1]  
a) Plants do not respire during daytime.                      b) It is not produced during daytime.  
c) It is stored in the leaves of plants during daytime.                      d) Major amount of carbon dioxide produced is used up for photosynthesis during daytime.

2. In a cross between pure tall pea plants (TT) and pure dwarf pea plants (tt) the offsprings of  $F_1$  generation were all tall. When  $F_1$  generation was self-crossed, the gene combinations of the offsprings of  $F_2$  generation will be: [1]  
a) Tt : tt                      b) TT : tt  
c) TT : Tt : tt                      d) TT : Tt

3. Match the following with correct response. [1]

Column A	Column B
(i) The master gland	(a) Control cell division and cell growth
(ii) Cytokinin	(b) Regulates metabolism
(iii) Insulin	(c) Reduces blood sugar
(iv) Thyroxine	(d) Pituitary gland

- a) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)                      b) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)  
c) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)                      d) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)
4. Progesterone and relaxin bring about changes in the body of a [1]  
a) Old woman                      b) Pregnant woman  
c) Young girl                      d) Teenaged girl
5. Which one of the following is not a natural ecosystem? [1]

- a) Cropland ecosystem
- b) Forest ecosystem
- c) Grassland ecosystem
- d) Pond ecosystem

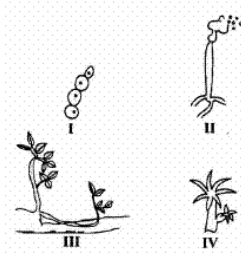
6. Opening and closing of stomata is due to [1]

- a) Diffusion of CO<sub>2</sub> in and out of the guard cells.
- b) High pressure of gases inside the cells.
- c) Stimulus of light in the guard cells.
- d) Movement of water in and out of the guard cells.

7. United Nations Environment Programme forged an agreement to [1]

- a) control water pollution
- b) reduce CFC production
- c) control CO<sub>2</sub> emissions in the environment
- d) conserve biodiversity

8. Two of the following four figures that illustrate budding are [1]



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

9. **Assertion (A):** Variation is useful for the survival of a species over time. [1]

**Reason (R):** The process of DNA copying will have variation each time because biochemical reactions are not reliable.

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

10. Explain the events that take place once a sperm reaches the oviduct till it becomes a foetus. Write the role of placenta in pregnancy. [2]

11. a. Explain the role of UV radiation in producing ozone layer. [2]  
b. Mention the reaction involved.  
c. Why is excessive use of CFCs a cause of concern?

OR

What is an ecosystem? Give one example each of

- i. natural, and
- ii. man-made ecosystem.

12. i. State the function of the following plant hormones [2]  
a. Absciscic acid  
b. Cytokinin

ii. Define chemotropism

13.
  - a. Name the two types of gametes produced by men. [3]
  - b. Does a male child inherit X chromosome from his father? Justify.
  - c. How many types of gametes are produced by a human female?
14.
  - a. Mention one function each of the following organs in human male reproductive system: [3]
    - i. Testis
    - ii. Scrotum
    - iii. Vas deferens
    - iv. Prostate gland
  - b. Name the type of germ cell which (i) is motile, and (ii) stores food.
15. During respiration in an organism A, one molecule of glucose produces 2 ATP molecules whereas in respiration of another organism B, one molecule of glucose produces 38 ATP molecules. [4]
  - i. Which organism is undergoing aerobic respiration?
  - ii. Which organism is undergoing anaerobic respiration?
  - iii. Which type of organism A or B can convert glucose into alcohol?
  - iv. Name one organism which behaves like A.
  - v. Name one organism which behaves like B.
16.
  - a. What is puberty? Write any two changes that occur in boys during early teenage years. [5]
  - b. List two functions performed by testis in human males.  
Mention one role each of (i) Vas deferens, (ii) Seminal Vesicle (iii) Urethra and (iv) Scrotum in human male reproductive system.

OR

- i. Define a reflex arc. Why have reflex arcs evolved in animals? Trace the sequence of events which occur, when you suddenly touch a hot object.
- ii. Name the part of nervous system which helps in communication between the central nervous system and other parts of the body. What are the two components of this system?

## Section B

17. When sodium hydrogen carbonate is added to ethanoic acid a gas evolves. **[1]**  
Consider the following statements about the gas evolved?

- A. It turns lime water milky.  
B. It is evolved with a brisk effervescence.  
C. It has a smell of burning sulphur.  
D. It is also a by-product of respiration.

The correct statements are:

- a) (B) and (D) only                      b) (A) and (B) only
- c) (A), (B) and (D)                     d) (A), (C) and (D)

18. Which of the given statement is correct or wrong: [1]

**Statement A:** Detergent with less branching in the molecule is degraded more easily than branched-chain detergents.

**Statement B:** Soaps are 100% biodegradable.

- a) Both the statements A and B are true.                      b) Neither statement A nor statement B is true.  
c) Statement B is true; Statement A is false.                  d) Statement A is true; Statement B is false.

19. Which of the following statements is true for an amphoteric oxide? [1]

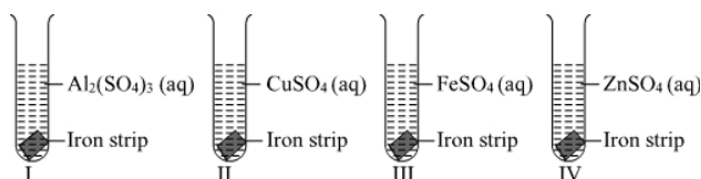
- a) It reacts with acid as well as base to form salt and hydrogen gas.                      b) It reacts only with base and does not form water.  
c) It reacts only with acid and does not form water.                      d) It reacts with both acid as well as base to form salt and water.

20. Match the following with the correct response: [1]

Column A	Column B
(i) Copper is used in electrical appliances	(a) Hydrogen sulphide
(ii) Sodium is very reactive	(b) Good conductor
(iii) Silver is tarnished	(c) Graphite
(iv) A non-metal and a good conductor	(d) Stored in kerosene

- a) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)                      b) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)  
c) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)                      d) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)

21. A student adds one big iron nail each in four test tubes containing solution of zinc sulphate, aluminium sulphate, copper sulphate and iron sulphate. A reddish brown coating was observed only on the surface of iron nail which was added in the solution of: [1]



- a) Aluminium sulphate                      b) Iron sulphate  
c) Zinc sulphate                      d) copper sulphate

22. The number of shells required to write the electronic configuration of Potassium (At. No. 19) [1]

- a) 1                      b) 2  
c) 4                      d) 3

23. If 10 mL of  $\text{H}_2\text{SO}_4$  is mixed with 10 mL of  $\text{Mg}(\text{OH})_2$  of the same concentration, the resultant solution will give the following colour with universal indicator: [1]

- a) Yellow                      b) Red  
c) Blue                      d) Green

24. Reaction between X and Y, forms compound Z. X loses electron and Y gains electron. Which of the following properties is not shown by Z? [1]

- a) Has high melting point                      b) Has low melting point  
c) Occurs as solid                      d) Conducts electricity in molten state

25. Solution X turns universal indicator blue to purple whereas solution Y turns universal indicator orange to red. [2]

- a. What will be the action of solution X on litmus?
- b. What will be action of solution Y on litmus?
- c. Name any two substances which can give solutions like X.
26. What is a displacement reaction? Write balanced chemical equation for a displacement reaction in which iron is a reactant. Name one more element whose behaviour is similar to that of iron in such reactions. Why will this kind of behaviour not be shown by gold? [3]

OR

Translate the following statement into a chemical equation and then balance it :

Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

27. Sample pieces of five metals A, B, C, D and E were added to the tabulated solutions separately. The results observed are shown in the table: [3]

Metal	$FeSO_4$	$CuSO_4$	$ZnSO_4$	$AgNO_3$	$Al_2(SO_4)_3$
A	No Change	No Change	No Change	Coating on metal	No Change
B	Grey Deposit on metal	Brown Coating on metal	No Change	Coating on metal	No Change
C	No Change	No Change	No Change	No Change	No Change
D	No Change	-----	No Change	Coating on metal	No Change
E	-----	Brown Coating	New Coating	New Coating	No Change

Based on the observations recorded in the table, answer the following:

- (1) Which is the most reactive metal?
  - (2) Which is the least reactive metal?
  - (3) What would be observed if metal D were added to a solution of copper (II) sulphate?
  - (4) What would be observed if metal E were added to a solution of iron (II) sulphate?
  - (5) Arrange the metals A, B, C, D and E in decreasing order of their reactivity?
28. Read the following text carefully and answer the questions that follow: [4]

A hydrocarbon (P) has the molecular formula  $C_{10}H_{22}$ . A hydrocarbon (Q) has two carbon atoms less than (P) and belong to the same homologous series. A hydrocarbon (R) has two carbon atoms more than (P) and belong to the same homologous series.

- What is the molecular formula of (Q)? Also write its IUPAC name. (1)
- To which homologous series do the compound (P), (Q) and (R) belong? (1)
- State two characteristics of homologous series? (2)

OR

What can you say about properties of compounds (P), (Q) and (R) (2)

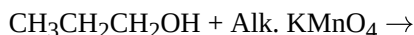
OR

Read the following text carefully and answer the questions that follow:

Carbon compounds can be easily oxidised on combustion. In addition to this complete oxidation, we have reactions in which alcohols are converted to carboxylic acids. We see that some substances are capable of adding oxygen to others. These substances are known as oxidising agents. Also some compounds are capable of adding hydrogen. These substances are known as reducing agents.

- Give any two examples of good oxidising agent. (1)

ii. Complete the reaction: (1)



iii. Give some uses of Alcohol. (2)

**OR**

Why Acidified potassium dichromate is called an oxidising agent? (2)

29. Define water of crystallisation. Give the chemical formula for two compounds as examples. How can it be proved that the water of crystallisation makes a difference in the state and colour of the compounds? [5]

**OR**

Common salt is a very important raw material as many compounds of industrial use can be prepared from it. Explain, giving chemical equations, the method of preparation of washing soda from sodium chloride. List four industrial/domestic uses of washing soda.

### Section C

30. Which of the following statement(s) is/are correct regarding scattering of light? [1]

- i. Scattering is responsible for the bluish appearance of the sky.
- ii. Clouds having droplets of water scatter all wavelengths almost equal and so are generally white.
- iii. Advanced sunrise and delayed sunset are due to atmospheric reflection.

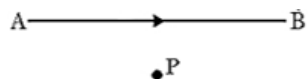
- a) (i), (ii) and (iii)
- b) Only (ii) and (iii)
- c) Only (i) and (ii)
- d) Only (iii)

31. **Assertion (A):** Large concave mirrors are used to concentrate sunlight to produce heat in solar cookers. [1]

**Reason (R):** Concave mirror converges the light rays falling on it to a point.

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

32. The resultant magnetic field at point **P** situated midway between two parallel wires (placed horizontally each carrying a steady current **I** is [1]



- a) in the vertically upward direction.
- b) in the same direction as the current in the wires.
- c) in the vertically downward direction.
- d) zero

33. Draw ray diagram showing the image formation by a convex lens when an object is placed at twice the focal length of the lens. [2]

34. An electric heater rated 1100 W operates at 220 V. Calculate (i) its resistance, and (ii) the current drawn by it. [2]

**OR**

- a. Write the mathematical expression for Joule's law of heating.
- b. Compute the heat generated while transferring 96000 coulomb of charge in two hours through a potential difference of 40 V.

35. What are the common defects of vision that can be corrected by the use of suitable eyeglasses or spectacles? [3]

36. Draw a schematic diagram of a circuit consisting of a battery of three cells of 2 V each, a 5  $\Omega$  resistor, an 8  $\Omega$  [3]

resistor, and a  $12\ \Omega$  resistor and a plug key, all connected in series. Now, connect the ammeter to measure the current through the resistors and a voltmeter to measure the potential difference across the  $12\ \Omega$  resistors. What would be the readings in the ammeter and the voltmeter?

37. a. Draw the pattern of magnetic field lines produced by a current carrying circular loop showing the direction of current in the loop and the direction of the magnetic field lines. [3]  
b. State the rule which can be applied to know the direction of magnetic field lines in the above case.

38. **Read the following text carefully and answer the questions that follow:** [4]

The electrical energy consumed by an electrical appliance is given by the product of its power rating and the time for which it is used. The SI unit of electrical energy is Joule. Actually, Joule represents a very small quantity of energy and therefore it is inconvenient to use where a large quantity of energy is involved. So for commercial purposes, we use a bigger unit of electrical energy which is called kilowatt-hour. 1 kilowatt-hour is equal to  $3.6 \times 10^6$  joules of electrical energy.

- i. The energy dissipated by the heater is E. When the time of operating the heater is doubled, what would be the energy dissipated? (1)  
ii. The power of a lamp is 60 W. What will be the energy consumed in 1 minute? (1)  
iii. The electrical refrigerator rated 400 W operates 8 hours a day. The cost of electrical energy is ₹ 5 per kWh. Find the cost of running the refrigerator for one day. (2)

**OR**

Calculate the energy transformed by a 5 A current flowing through a resistor of  $2\ \Omega$  for 30 minutes. (2)

39. i. Draw a ray diagram to show the path of the reflected ray in each of the following cases: [5]  
A ray of light incident on a convex mirror  
1. parallel to its principal axis, and  
2. is directed towards its principal focus  
ii. A 1.5 cm tall candle flame is placed perpendicular to the principal axis of a concave mirror of focal length 12 cm. If the distance of the flame from the pole of the mirror is 18 cm, use mirror formula to determine the position and size of the image formed.

**OR**

- a. What is a lens? List two main categories of lenses. In which category is a double concave lens placed?  
b. A convex lens of focal length 15 cm forms a real image at a distance of 20 cm from its optical centre. Find the position of the object. Is the image formed by the lens magnified or diminished?

# Solution

## Section A

1.  
(d) Major amount of carbon dioxide produced is used up for photosynthesis during daytime.  
**Explanation:**  
Major amount of carbon dioxide produced is used up for photosynthesis during daytime.
2.  
(c)  $TT : Tt : tt$   
**Explanation:**  
 $TT : Tt : tt$
3. (a) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)  
**Explanation:**
  - The pituitary gland is a master gland that produces growth hormones.
  - Cytokinins are a group of hormones that promote cell division in plant roots and shoots and the growth of buds.
  - The insulin hormone is secreted by the pancreas which maintains blood sugar level in the body.
  - Thyroxine a hormone that is made by the thyroid gland and is one of the most important thyroid hormones and it also maintains metabolism in the body.
4.  
(b) Pregnant woman  
**Explanation:**  
Progesterone levels also are extraordinarily high during pregnancy that causes a laxity and relaxin hormone produced by the ovary it relaxes the mother's muscles, joints and ligaments to make room for the growing baby.
5. (a) Cropland ecosystem  
**Explanation:**  
Cropland ecosystem is man made.
6.  
(d) Movement of water in and out of the guard cells.  
**Explanation:**  
They swell up when enters guard cells due to water movement. The pore at the stomata is now open. The stomata close when they dry out and become flaccid.
7.  
(b) reduce CFC production  
**Explanation:**  
reduce CFC production
8.  
(b) I and IV  
**Explanation:**  
Yeast and Hydra reproduced by budding. A younger growth on the parent organism is seen.
9.  
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).  
**Explanation:**



Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).

10. i. In the oviduct, sperm encounters the egg and fertilisation takes place.  
ii. The fertilized egg (zygote) starts dividing and forms a ball of cells or embryo.  
iii. Embryo is implanted in the lining of the uterus, where it continues to grow and develops organs to become a foetus.  
iv. Role of Placenta:
- Provides a large surface area for glucose and oxygen to pass from the mother to the embryo.
  - Waste generated by the embryo will be removed by transferring them into the mother's blood.
11. a. High energy UV radiations split apart some molecular oxygen into free (O) atoms, these atoms combine with molecular oxygen to form ozone.  
b. The reaction involved.:
- $$\begin{array}{l} \text{O}_2 \xrightarrow{\text{UV}} \text{O} + \text{O} \\ \text{O} + \text{O}_2 \rightarrow \text{O}_3 \\ \text{(Ozone)} \end{array}$$
- c. Depletion of the ozone layer.  
If these UV radiations reach the earth they may cause skin cancer in human beings.

OR

The interaction of living organism with the non-living components in an area of the environment is called as ecosystem.

- i. Natural: forests / deserts / oceans / ponds / lakes  
ii. Man-made: crop field / garden / aquarium / zoo
12. i. a. Absciscic acid
- inhibits growth
  - promotes dormancy in seeds and buds.
  - Promotes closing of stomata.
- b. Cytokinin
- promotes cell division
  - delays aging in leaves
  - promotes fruit growth.
- ii. **Chemotropism** - It is the directional movement or orientation of the plant part in response to chemical stimulus.
13. a. Sperm having X chromosome and sperm having Y chromosome  
b. No, As male child gets only Y chromosome from his father and X chromosome from mother to have XY chromosome.  
c. One type/only ovum/egg
14. a. i. **Testis**: to produce male gametes.  
ii. **Scrotum**: to provide optimal temperature to testis for the formation of sperm.  
iii. **Vas deferens**: to deliver the sperms to the urinary bladder.  
iv. **Prostate glands**: to secrete the fluid which provides nutrition and medium for transport of sperms.  
b. Conventionally, the motile germ-cell is called the male gamete and the germ-cell containing the stored food is called the female gamete.
15. i. Organism B undergoes aerobic respiration. In aerobic respiration more ATP is produced.  
ii. Organism A undergoes anaerobic respiration. In anaerobic respiration less ATP is produced.  
iii. Organism A can convert glucose into alcohol  
iv. Yeast (anaerobic respiration)  
v. Human being (aerobic respiration)
- Anaerobic respiration can be of 2 types one is known as fermentation in which end products are ethyl alcohol and carbon dioxide along with ATP and other one is when pyruvate gets converted to lactic acid and carbon dioxide along with ATP.
16. a. When the rate of general body growth begins to slow down and reproductive tissue begins to mature.  
In boys - New thick hair growth on face, voice begins to crack, penis begins to enlarge and become erect.  
b. Testis - Formation of sperms, Secretion of hormone testosterone
- Role of:
- i. Vas deferens - Delivery of sperms from testes to urethra.
  - ii. Seminal vesicle - Provides nutrition to sperms /makes the transport(movement) of sperms easier.
  - iii. Urethra - Common passage for sperms and urine.

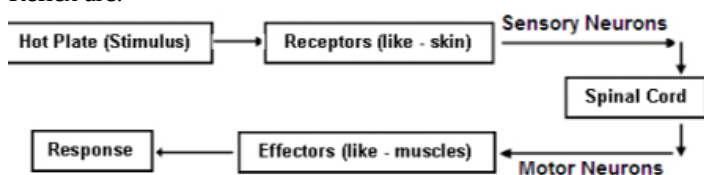
iv. Scrotum - Providing required temperature for sperm formation

OR

i. The pathway in which impulses travel during the reflex action is called a reflex arc.

Because the thinking part of the brain is not fast enough/for quick response to avoid injury.

Reflex arc:



ii. Peripheral Nervous System

Components: Cranial Nerves; Spinal Nerves

### Section B

17.

(c) (A), (B) and (D)

**Explanation:**

(A), (B) and (D)

18. (a) Both the statements A and B are true.

**Explanation:**

All soaps are biodegradable i.e. they can be decomposed by micro-organisms like the bacteria. Branched-chain synthetic detergents are far less degradable than unbranched detergents.

19.

(d) It reacts with both acid as well as base to form salt and water.

**Explanation:**

It reacts with both acid as well as base to form salt and water.

20. (a) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)

**Explanation:**

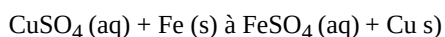
- Copper is a good conductor of electricity and is used in electrical appliances.
- Sodium is very reactive and is stored under kerosene.
- Silver is tarnished by hydrogen sulphide. Tarnish is a thin layer of corrosion that forms over it.
- Graphite is an allotrope of carbon and a good conductor of electricity. It is used for making carbon electrodes and graphite electrodes in dry cells and electric arcs.

21.

(d) copper sulphate

**Explanation:**

The copper sulphate solution will turn green due to the formation of iron sulphate. A reddish brown coating of copper is formed on the nail. Iron is less reactive than aluminium and zinc. It is however, more reactive than copper. It displaces copper from its solution (displacement reaction). The less reactive copper comes out of the solution and more reactive iron goes into the solution.



22.

(c) 4

**Explanation:**

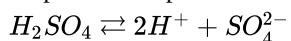
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23.

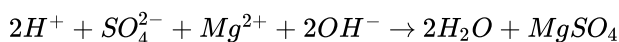
(d) Green

**Explanation:**

Sulphuric acid produces two  $H^+$  ions on dissociation.



When equal volume of both solutions are mixed together they form water and salt by neutralisation reaction as one is acid and other is base.



Therefore, for neutral solution universal indicator shows **green** colour.

24.

**(b)** Has low melting point

**Explanation:**

Given that the compound X and Y form compound Z.

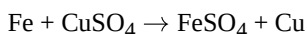
Here, X loses electron and Y gains electron meaning that an ionic or an electrovalent bond is formed. Thus, the compound Z is a crystalline solid, has high melting and boiling point. It conducts electricity in the molten state.

The compound Z cannot have a low melting point.

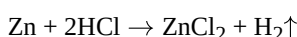
25. a. Solution X will turn red litmus paper to blue as it is basic in nature.  
b. Solution Y will turn blue litmus paper to red as it is acidic in nature.  
c. Milk of Magnesia (saturated  $Mg(OH)_2$ ) and Sodium Hydroxide (NaOH) solution are bases like solution X.

26. Displacement reaction is a type of reaction in which a more reactive element displaces another less reactive element. The reactivity series of metals can be used to find out the displacement reaction.

Chemical equation for a displacement reaction in which Iron is a reactant:



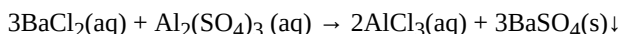
One more element whose behaviour is similar to that of iron in such reaction is Zn.



This is not shown by Gold as it is the least reactive element.

OR

Barium chloride reacts with aluminium sulphate to give aluminium and separates Barium sulfate( $BaSO_4$ ).



27. (1) Metal E is most reactive because it displaces zinc from  $ZnSO_4$  solution.  
(2) Metal C is the least reactive since it has not displaced any of the metals from their respective salt solutions.  
(3) Metal D is more reactive than Ag and less reactive than Fe. It can displace Cu from  $CuSO_4$  solution.  
(4) Since metal E has displaced Zn from  $ZnSO_4$  solution, it is more reactive than Zinc. It is therefore expected to be more reactive than iron as well because iron is placed below zinc in the reactive series. Therefore, metal E displaces Fe from  $FeSO_4$  solution. A grey /black coating of iron will be deposited on the metal E.  
(5) Decreasing order of reactivity  $E > B > D > A > C$
28. i. Molecular formula of (Q) is  $C_8H_{18}$  as it has two carbon atoms less than (P). Its IUPAC name is **octane**  
ii. Compounds (P), (Q) and (R) are alkanes having general formula  $C_nH_{2n+2}$ . alkanes are the compounds having single bond between carbon atoms  
iii. a. All the members of the homologous series can be represented by the same general formula.  
b. Any two adjacent homologues differ by 1 carbon atom and 2 hydrogen atoms in their molecular formulae.

**OR**

They have same chemical properties.

Compound (P), (Q) and (R) belong to same homologous series so they have different physical properties but similar chemical properties. They have same general formula  $C_nH_{2n+2}$ . They differ by 2 carbon atoms and 4 hydrogen atoms.

OR

- i. Alkaline potassium permanganate or acidified potassium dichromate are examples of good oxidising agents.  
ii.  $CH_3CH_2CH_2OH + Alk. KMnO_4 \rightarrow CH_3CH_2COOH$   
iii. Alcohol is used as a solvent, spirit, alcoholic drinks, fuels, etc

**OR**

Acidified potassium permanganate  $K_2Cr_2O_7$  is a good oxidising agent because it can add oxygen to the reactant molecule very easily and convert them to acid.

29. The water of crystallization is the fixed number of water molecules present in one formula unit of a salt.

For example

$CuSO_4 \cdot 5H_2O$  (Copper sulfate Penta hydrate) Blue vitriol.

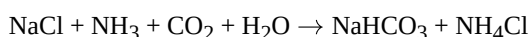
$FeSO_4 \cdot 7H_2O$  (Ferrous sulfate heptahydrate) Green vitriol.

- By heating these salts they lose their water molecules and hence result in a change in state and color taking place.
- Blue vitriol is blue as it contains 5 molecules of water of crystallization.
- When it is heated, it loses water of crystallisation and becomes anhydrous copper sulfate ( $CuSO_4$ ) which is grey-white.
- On heating green vitriol, anhydrous ferrous sulfate ( $FeSO_4$ ) is formed, which is white.
- Anhydrous ferrous sulfate ( $FeSO_4$ ) on further heating, decomposes into ferric oxide ( $Fe_2O_3$ ), Sulfur dioxide ( $SO_2$ ), and sulfur trioxide ( $SO_3$ ) gas is released.

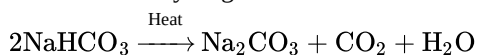
OR

The method of preparation of washing soda from sodium chloride are as follows

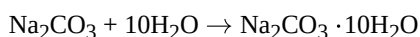
- Concentrated solution of sodium chloride reacts with ammonia and carbon dioxide to obtain sodium hydrogen carbonate and ammonium chloride.



- When sodium hydrogen carbonate is heated strongly, sodium carbonate is obtained.



- Sodium carbonate is dissolved in water to obtain washing soda.



Uses:

- In glass, soap and paper industries.
- Manufacture of borax.
- As cleaning agent for domestic purposes.
- For removing permanent hardness of water.

### Section C

30.

(c) Only (i) and (ii)

**Explanation:**

Advance sunrise and delayed sunset are due to atmospheric refraction.

31. (a) Both A and R are true and R is the correct explanation of A.

**Explanation:**

Concave mirror converges the light rays falling on it to a point. So large concave mirrors are used to concentrate sunlight to produce heat in solar cookers.

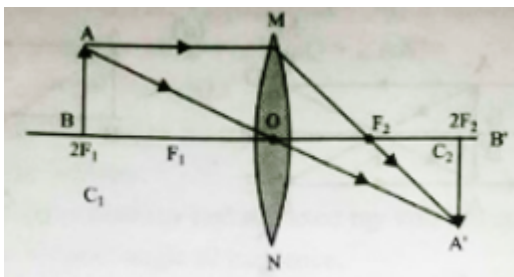
32.

(d) zero

**Explanation:**

When two parallel wires carry equal currents in the same direction and are placed horizontally, the magnetic fields produced by these wires cancel each other out at the midpoint between them. This results in a net magnetic field of zero at point P. This phenomenon is due to the equal and opposite directions of the magnetic fields produced by the two wires, leading to their complete cancellation at the midpoint.

33.



34. i.  $P = \frac{V \times V}{R}$   
 $R = \frac{V \times V}{P}$   
 $R = \frac{220 \times 220}{1100}$   
 $R = \frac{48400}{1100}$   
 $R = 44 \text{ ohm}$   
 ii.  $\frac{V}{I} = R$   
 $I = \frac{V}{R}$   
 $I = \frac{220}{44}$   
 $I = 5 \text{ A}$

OR

a. The mathematical expression of the Joules Law of heating is:  $H = I^2 R t$

Here, H is a heating effect, I is the current flowing through the device and t is the time taken.

b. Given:

Amount of charge transferred = 96000 C

Time taken = 2 hrs =  $2 \times 60 \times 60 \text{ sec} = 7200 \text{ sec}$

Potential difference = 40 V

Heat generated =  $V \times I \times t$

and we know that;  $I = \frac{Q}{t}$

So,  $H = VQ$

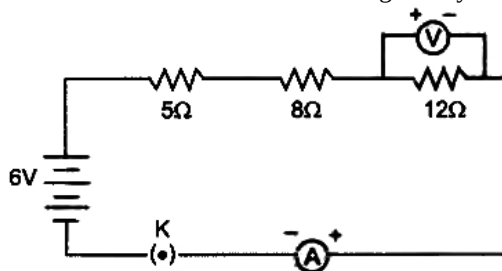
$= 40 \times 96000$

$= 3.84 \times 10^6 \text{ J}$

35. There are mainly four common defect of vision that can be corrected by the use of suitable eyeglasses or spectacles. There are

- i. Myopia or near-sightedness,
- ii. Hypermetropia or far-sightedness,
- iii. Presbyopia, and
- iv. Astigmatism

36. The total resistance of the circuit is given by



$$R = 5 + 8 + 12 = 25\Omega$$

$$\text{We know, } R = \frac{V}{I}$$

$$\text{Hence, } 25 = \frac{6}{I}$$

$$I = \frac{6}{25} = 0.24 \text{ A}$$

Since, resistances are connected in series, thus electric current remains the same through all resistors.

Here we have, Electric current,  $I = 0.24 \text{ A}$

Resistance,  $R = 12\Omega$

Thus, potential difference (V) through the resistor of  $12\Omega$  is given by

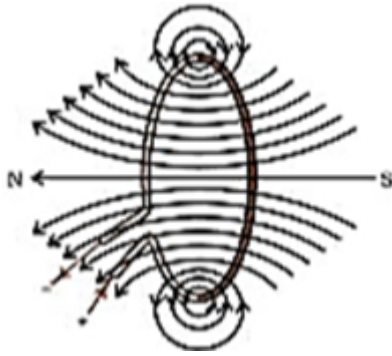
$$V = I \times R$$

$$= 0.24 \times 12 = 2.88 \text{ V}$$

∴ Reading of ammeter = 0.24 A

Reading of voltmeter through resistor of  $12\ \Omega = 2.88\text{ V}$

37. a.



b. Right Hand Thumb Rule:- When a current carrying straight conductor is held in the right hand in such a way that the thumb points towards the direction of the current, then the fingers will wrap around the conductor in the direction of the field lines of the magnetic field

38. i.  $E \propto t$

When the time of operating the heater is doubled, the energy dissipated is doubled.

ii. Given:  $P = 60\text{ W}$ ,  $t = 1\text{ min}$

$$E = 60 \times 1 \times 60 = 3600\text{ J}$$

iii. Given:  $P = 400\text{ W}$ ,  $t = 8\text{ hour}$

$$E = 400 \times 8 = 3200\text{ Wh} = 3.2\text{ kWh}$$

$$\text{Cost} = 3.2 \times 5 = ₹ 16$$

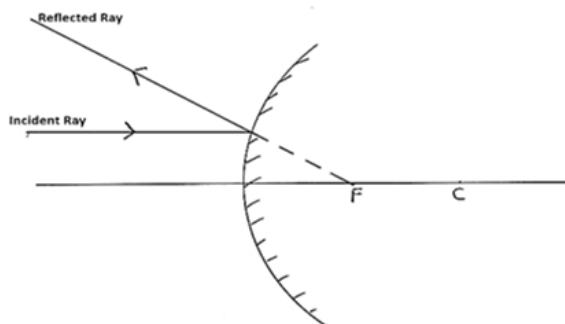
**OR**

Given:  $I = 5\text{ A}$ ,  $R = 2\ \Omega$ ,  $t = 30\text{ min}$

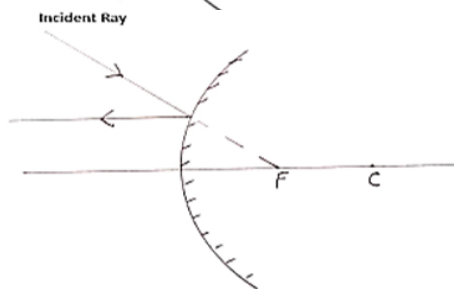
$$E = I^2 R t = 5 \times 5 \times 2 \times 30 \times 60$$

$$E = 90000\text{ J} = 90\text{ kJ}$$

39. i. 1.



2.



ii. Here  $f = -12\text{ cm}$ ,  $u = -18\text{ cm}$ ,  $v = ?$ ,  $h = 1.5\text{ cm}$ ,  $h' = ?$

$$\text{Mirror formula } \frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

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

$$= \frac{1}{-12} - \frac{1}{-18}$$

$$= \frac{-1}{36}$$

$$\therefore v = -36\text{ cm}$$

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

$$\frac{h'}{1.5} = -\frac{(-36)}{(-18)}$$

$$h' = -3.0\text{ cm}$$

OR

a. A transparent material bounded by two surfaces of which one or both surfaces are spherical / curved.

a. Converging lens

b. Diverging lens

Double concave lens is a diverging lens.

b. To find the position of the object, we can use the lens formula:

$f = 15 \text{ cm}$ ,  $v = 20 \text{ cm}$ ,  $u = ?$

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

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

$$= \frac{1}{20 \text{ cm}} - \frac{1}{15 \text{ cm}}$$

$$= \frac{4-3}{60}$$

$u = -60 \text{ cm}$ .

image is diminished.