

Class- X Session - 2022-23

Subject - Science (086)

Sample Question Paper - 4

with Solution

Max. Marks: 80

Time Allowed: 3 hours

General Instructions:

- i. This question paper consists of 39 questions in 5 sections.
- ii. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
- iii. **Section A** consists of 20 objective type questions carrying 1 mark each.
- iv. **Section B** consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
- v. **Section C** consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
- vi. **Section D** consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
- vii. **Section E** consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

1. Metal which is liquid at room temperature is: **[1]**
 - a) Sodium
 - b) Lead
 - c) Mercury
 - d) Silver

2. When you place the iron in copper sulphate solution, the reddish-brown coating formed on the nail is **[1]**
 - a) Rough and granular
 - b) Soft and dull
 - c) Smooth and shining
 - d) Hard and flaky

3. Name the chromosomes that possess the gene for maleness and femaleness in humans. **[1]**
 - a) Sex chromosomes
 - b) None of these
 - c) Somatic chromosomes
 - d) Autosomes

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

Statement A: Oxyacetylene flame is used for welding purposes.

Statement B: Ethyne reacts with HCl in the presence of HgCl_2 to form vinyl chloride.

 - 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.

ii. Au

iii. Zn

iv. Ag

a) (ii) and (iii)

b) (iii) and (iv)

c) (i) and (ii)

d) (ii) and (iv)

13. Substance X is formed by the oxidation of an aldehyde. What will be the action of the substance formed on the litmus solution? [1]

a) No action on litmus solution

b) Turns blue litmus red

c) Turns red litmus blue

d) None of these

14. How many carbon atoms are present in one molecule of ethanol? [1]

a) One

b) Two

c) Three

d) Four

15. Which statement is not true about thyroxin? [1]

a) Iron is essential for the synthesis of thyroxin

b) Thyroxin is also called thyroid hormone

c) It regulates carbohydrates, protein and fat metabolism in the body

d) Thyroid gland requires iodine to synthesise thyroxin

16. **Assertion (A):** Salts are the products of an acid-base reaction. [1]

Reason (R): Salt may be acidic or basic.

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.

17. Some crystals of copper sulphate were dissolved in water. The colour of the solution obtained would be: [1]

a) Green

b) Red

c) Brown

d) Blue

18. **Assertion (A):** In plants, there is no need for specialised respiratory organs. [1]

Reason (R): Plants do not have great demands for gaseous exchange.

a) Both A and R are true and R is 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.

19. **Assertion (A):** Metals are sonorous. [1]
Reason (R): They are generally brittle in the solid-state; they break into pieces when hammered.
- 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.

20. **Assertion (A):** A voltmeter and ammeter can be used together to measure resistance but not power. [1]
Reason (R): Power is proportional to voltage and current.
- 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.

Section B

21. i) What percentage of the solar energy is trapped and utilized by plants? [2]
 ii) Name any two major ecosystems of the world.
22. a. A narrow beam of white light is incident on three glass objects as shown below. Comment on the nature of behaviour of the emergent beam in all three cases. [2]



- b. There is a similarity between two of the emergent beam. Identify the two.

OR

The Sun near the horizon appears flattened at the sunset and sunrise. Explain, why?

23. Describe the structure of the nephron with a neat labelled diagram. [2]
24. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. where should be the position of object ?Justify your answer . [2]
25. A student is studying the properties of acetic acid. List two physical properties of acetic acid he observes. What happens when he adds a pinch of sodium hydrogen carbonate to this acid. Write any two observations [2]
26. How is washing soda prepared from sodium carbonate? Give its chemical equation. State the type of salt. Name the type of hardness of water that can be removed by it? [2]

Section C

27. Energy transfer is said to be unidirectional whereas biochemical transfer is said to be cyclic. Why? [3]
28. What would happen to copper vessel if it is left for a few days in humid atmosphere without being cleaned? [3]
29. A student wants to project the image of a candle flame on a screen 80 cm in front of a [3]



mirror by keeping the candle flame at a distance of 20 m from its pole.

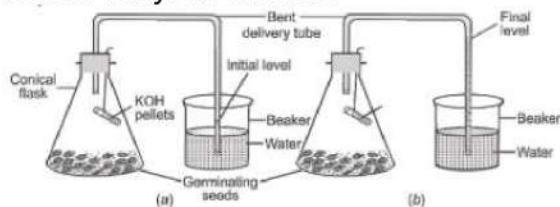
- i. Which type of mirror should the student use?
- ii. Find the magnification of the image produced.
- iii. Find the distance between the object and its image.

OR

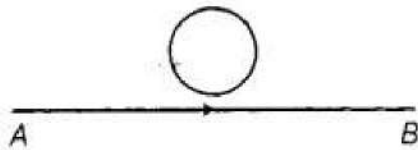
- i. What should be the position of the object when a concave mirror is to be used
 - a. as a shaving mirror and
 - b. in torches producing parallel beam of light?
- ii. A man standing in front of a mirror, finds his image having a very small head and legs of normal size. What type of mirrors are used in designing such a mirror?

30. A student sitting at the back of the classroom cannot read clearly the letters written on the backboard. What advice will a doctor give to her? **[3]**

31. Study the fig (a) and (b). What difference you observe in the figure (b)? Give a justified reason for your answer. **[3]**



32. A circular metallic loop is kept above the wire AB as shown below: **[3]**



What is the direction of induced current produced in the loop, if the current flowing in the straight wire

- i. is steady, i.e. does not vary?
- ii. is increasing in magnitude?

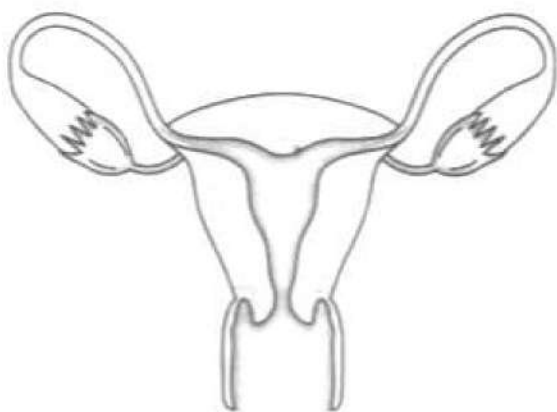
33. Ravi took three bread slices and kept them in the following conditions **[3]**

- i. Slice 1 in a dry and dark place
- ii. Slice 2 in moist and dark place
- iii. Slice 3 in moist and in refrigerator

What would he observe in each of the above conditions? Give reasons for your answer.

OR

Answer the following by carefully studying the figure:



- i. Identify the image shown above.
- ii. Label in the figure the ovary, oviduct, uterus, vagina.
- iii. State the functions of the labeled parts in part b.

Section D

34. A compound 'A' is used in fire extinguishers, as an antacid and its small amount is also used in making bakery items. Identify the compound and also explain the reason for above mentioned uses of the compound 'A'. [5]

OR

Acetic acid is a weak acid and ammonia is a weak base. Discuss the term weak.

35. What are essential precautions to be used while using electricity? [5]
36. Some situations in our day to day life require quick response from our body. Illustrate the sentence with the help of suitable diagram and common examples. [5]

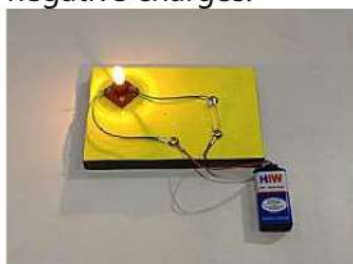
OR

Nervous and hormonal system together perform the function of control and co-ordination in human beings". Justify the statement.

Section E

37. **Read the text carefully and answer the questions:** [4]

How do we express electric current? Electric current is defined by the amount of charge flowing through a particular area in unit time. In other words, it is the rate of flow of electric charges. In circuits using metallic wires, electrons constitute the flow of charges. However, electrons were not known at the time when the phenomenon of electricity was first observed. So, electric current was considered to be the flow of positive charges and the direction of flow of positive charges was taken to be the direction of electric current. Conventionally, in an electric circuit, the direction of electric current is taken as opposite to the direction of the flow of electrons, which are negative charges.



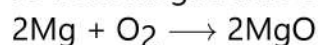
- (i) If a net charge Q , flows across any cross-section of a conductor in time t , then the current I , through the cross-section is given by which formula?
- (ii) What is the SI unit of electric charge? It is equivalent to how many numbers of electrons?
- (iii) The electric current is expressed in which unit? Define the unit used to measure electric current.

OR

If the amount of charge passing through the cell in 4 seconds is 12 C then find the current supplied by a cell.

38. Read the text carefully and answer the questions: [4]

In a balanced chemical reaction, equal number of atoms are present on both sides of reaction. A balanced chemical reaction is based on law of conservation of mass which means that total mass of reactants and products participating in a reaction must be equal. For example, a balanced chemical equation of burning of magnesium in oxygen to form magnesium oxide is written as:



The mass of reactants ($2 \times 24 + 32 = 80$) is equal to the mass of products [$2 \times (24 + 16) = 80$].

- (i) In a reaction, 35 g of reactant, PQ breaks down into 20 g of product, P and an unknown amount of product, Q. Find the amount of product Q.
- (ii) The solid mercury (II) oxide is heated, and liquid mercury and oxygen gas are produced. Mention balanced chemical reaction.
- (iii) Which laws are satisfied by a balanced chemical equation?

OR

In the given chemical reaction,



Find the values of m and n respectively.

39. Read the text carefully and answer the questions: [4]

Refer to the given table regarding results of F_2 generation of Mendelian cross.

Plants with round and yellow coloured seeds (P)	315
Plants with round and green coloured seeds (Q)	108
Plants with wrinkled and yellow coloured seeds (R)	101
Plants with wrinkled and green coloured seeds (S)	32

- (i) What would be the phenotype of F_1 generation regarding given data of F_2 generation?
- (ii) What would be the genotype of parental generation regarding the given result of F_2 generation?

OR

If a plant with wrinkled and green coloured seeds (S) is crossed with the plant having wrinkled and yellow coloured seeds (R), what will be the probable phenotype of offspring?



Solution

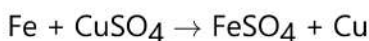
Section A

1. (c) Mercury

Explanation: Mercury is a liquid at room temperature. Lead, sodium, and silver are solids.

2. (b) Soft and dull

Explanation: When you dip an iron nail in CuSO_4 , iron replaces copper from CuSO_4 , since it is more reactive than copper. The displaced copper gets deposited on the nail, which is soft and dull in nature.



3. (a) Sex chromosomes

Explanation: Sex chromosomes possess the gene for maleness and femaleness in humans.

In humans, the sex chromosomes comprise one pair of a total of 23 pairs of chromosomes. The other 22 pairs of chromosomes are called autosomes.

Individuals having two X chromosomes (XX) are females; individuals having one X chromosome and one Y chromosome (XY) are males.

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

Explanation:

- **The oxyacetylene flame** is used for welding purposes. The oxyacetylene welding process uses a combination of oxygen and acetylene (C_2H_2) gas to provide a high-temperature flame. It is commonly used to join mild steel permanently.
- Ethyne (C_2H_2) reacts with HCl in the presence of HgCl_2 to form vinyl chloride or chloroethane $\text{H}_2\text{C}=\text{CHCl}$. This colourless compound is an important industrial chemical. It is chiefly used to produce polyvinyl chloride (PVC).

5. (c) towards the screen

Explanation: When the image distance increases, object distance decreases. Thus, the distance between the mirror and screen will decrease. So, the mirror should be moved towards the screen.

6. (b) virtual, behind the mirror, and of the same size as the object

Explanation: virtual, behind the mirror, and of the same size as the object

7. (c) species

Explanation: A **species** is often defined as the largest group of organisms in which two individuals can produce fertile offspring, typically by sexual reproduction.

8. (b) Taste

Explanation: The receptors present on the tongue is responsible for detecting the taste of different kinds of foods that we eat.

9. (b) excretion

Explanation: Excretion is the process by which metabolic wastes and other non-useful materials are eliminated from an organism. In Human beings, kidneys are the organs that filter waste products from the blood. Therefore, Kidneys are the part of the excretory system.

10. (b) An Amoeba with an elongated nucleus and a constriction in the middle

Explanation: The body of Amoeba is elongated and has a constriction in the middle. Hence the given slide is the one that shows the asexual reproduction process of binary fission in Amoeba.

11. (b) Both stamens and carpels

Explanation: A bisexual flower consists of both the male and the female reproductive parts. The male part is known as the stamen and the female is the carpel/pistil.

12. (d) (ii) and (iv)

Explanation: Gold and silver (Au and Ag) are also known as Noble metals as they are less reactive and exist in their native state in nature.

13. (b) Turns blue litmus red

Explanation: Oxidation of an aldehyde ($-\text{CHO}$ group) leads to the formation of a carboxylic acid ($-\text{COOH}$ group).



COOH group). A carboxylic acid turns blue litmus red.

14. (b) Two

Explanation: Two

15. (a) Iron is essential for the synthesis of thyroxin

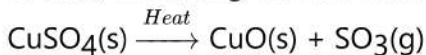
Explanation: Iodine is essential for the synthesis of thyroxin but not iron hence the given statement is wrong.

16. (b) Both A and R are true but R is not the correct explanation of A.

Explanation: Both A and R are true but R is not the correct explanation of A.

17. (d) Blue

Explanation: When water is added to white coloured anhydrous copper sulphate, its colour changes to blue, indicating that the blue coloured copper sulphate pentahydrate is regenerated.



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

Explanation: Both A and R are true and R is correct explanation of the assertion.

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

Explanation: Metals are sonorous and hard, while non-metals are brittle.

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

Explanation: A is true but R is false.

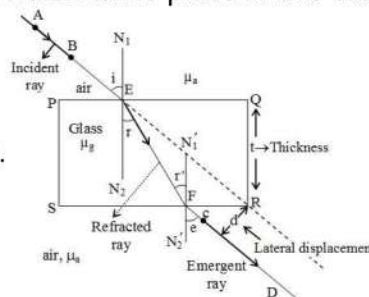
Section B

21. 1) The plants utilize only 1% of the solar energy.

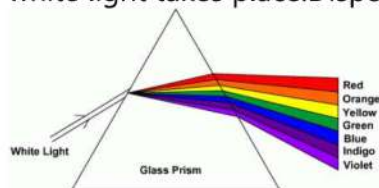
2) (a) Forests (b) Sea.

22. a. i. The incident beam of light after refraction through glass slab emerges out parallel to the incident beam but laterally shifted. But no dispersion takes place in this case. The refraction

through glass slab is shown in the ray diagram.

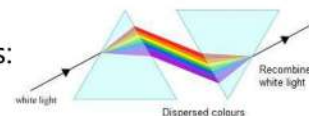


ii. The incident beam of white light after refraction through a prism splits into a band of seven colors which are violet, indigo, blue, green, yellow, orange and red. These colored rays emerge out of the prism along different directions and become distinct. Therefore, the dispersion of white light takes place. Dispersion of white light through prism is shown in ray diagram.



iii. When the incident beam passes through the first prism, it gets split into the band of seven colors. But those colored rays are incident on an identical inverted prism. Then recombination of the colored rays takes place. This emergent light is parallel to the incident beam but slightly

shifted outward. It can be represented with ray diagram as follows:



b. As, It is clear from ray diagram that in case (i) and (iii), the beams of emergent ray is parallel to the incident beam and are slightly shifted. Therefore, emergent beam in the case (i) and (iii) are similar.

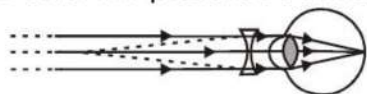
OR

The sun near horizon appears flattened at sunrise and sunset. This is due to atmospheric refraction. The density and refractive index of the atmosphere decreases with altitude, so the rays from the top

- ii. It is given, object distance $u = -20\text{m}$, distance $v = 80\text{m}$
 Magnification is given as $M = -v/u$
 $M = -v/u = -(-80\text{m}/-20) = 4$
- iii. Distance between object and image $v - u = -80\text{m} - (-20\text{m}) = -60\text{m}$

OR

- i. a. Object should be between pole and focus.
 b. At the focus.
- ii. a. Small head-convex mirror.
 b. Legs of normal size-plane mirror.
30. This student is unable to see far off objects. This means that the student is suffering from myopia. Doctor will prescribe a concave lens of suitable focal length.

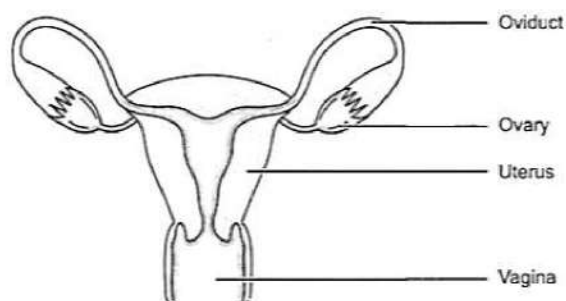


Correction for myopia

31. In the fig (b) the water level in the bent delivery tube has risen up. It is because of absorption of carbon dioxide by KOH pellets in the tube, the air from bent tube moves into the conical flask, resulting in rising of the water level.
32. i. The constant current flowing in the straight wire produces a constant magnetic field. Hence, no induced current is produced in the loop.
 ii. Since current in the straight wire is changing, hence, induced current will be produced in clockwise direction.
33. i. In slice 1, no change will be observed or it will remain sterile because it lacks moisture, which is necessary for any organism to thrive.
 ii. A white cottony mass surrounded with black pin head-like structures are seen spreading on the surface of slice 2. This is because tiny spores of Rhizopus present in air will thrive in humid conditions. Thus slice 2 kept in moist and dark place, develops sporangia and spores, which are favourable for the growth of fungus.
 iii. In slice 3, also no change is observed (remains sterile) as it is kept at low temperature in the refrigerator. Which does not allow fungal growth. Moisture and warm conditions are necessary for fungal growth.

OR

- i. The figure represents the female reproductive system.
 ii. The figure with labelled part is as shown.



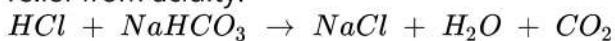
- iii. The ovary is the female primary sex organ that produces ova or eggs. They secrete female hormones oestrogen and progesterone. The oviduct receives the egg released from the ovum and it is the site of fertilisation. The uterus is a muscular organ where implantation of zygote occurs and it takes care of the developing embryo. The vagina is a muscular tube-like structure which receives the sperms and through which the baby is delivered.

Section D

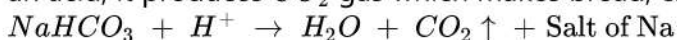
34. Compound 'A' is sodium hydrogen carbonate - NaHCO_3 . Sodium hydrogen carbonate or baking soda is a mild base. The reasons for its various uses are as follows:-
 (i) Sodium hydrogen carbonate is used in fire extinguishers because it produces CO_2 gas on reaction with an acid. Carbon dioxide gas forms a blanket over the fire and cuts off the supply of air to the burning substance and the fire stops.

$$\text{H}_2\text{SO}_4 + 2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O} + 2\text{CO}_2 \uparrow$$

(ii) It is used as an antacid because it neutralises excess acid (HCl) present in stomach. It provides relief from acidity.



(iii) It is an ingredient of baking powder. It is used in making bakery items because on reaction with an acid, it produces CO_2 gas which makes bread, cakes, etc. soft and spongy.

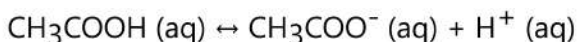


OR

A weak acid or weak base is the compound which partially ionizes in water to give a small number of hydrogen ions or hydroxide ions, respectively.

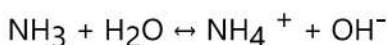
Weak Acid:

Acetic acid is partially ionized in water to produce only a small amount of hydrogen ions, so it is a weak acid. Weak acid reacts very slowly with other substances such as metals, etc. Weak acids have low electrical conductivity because of the low concentration of hydrogen ions.



Weak Base:

In a similar way, a weak base reacts slowly and also have low electrical conductivity because of low concentration of hydronium ions.



35. Precautions to be followed for using electricity are :

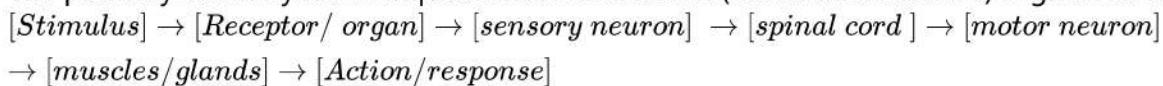
- (1) All connects must be tight. Wires must be covered the proper insulation and of proper thickness. All joints must be covered with insulating tape. Defective switches should be immediately replaced.
- (2) Switch off all switches including main switch whenever there is a sparking or fire.
- (3) Fuse must be of proper rating and should always be connected to live wire.
- (5) Always put dry rubber shoes while repairing the circuit.
- (6) Fuses should be always connected to live wire. The earth wire must be connected to the body of electric appliance.
- (7) If in spite of all the precautions, a person gets shock due to accidental touching a live wire, one should tray to provide such a person with support of some non-conducting material like wood, plastic or rubber. Never try to pull away person by your hand.
- (8) Whenever repairs are needed, switch off main switch. If however, repairs need a direct handling of live wire, use of rubber gloves or rubber shoes or a plier with insulated handle is a must.

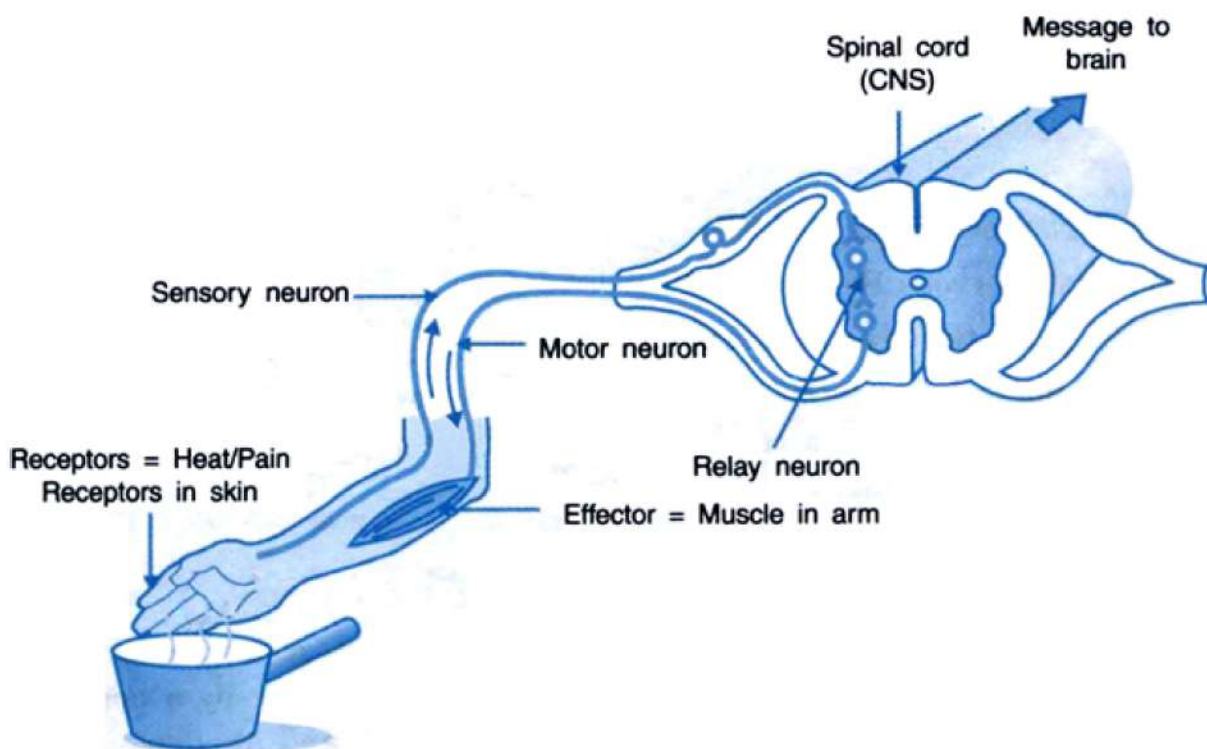
36. Reflex action is a rapid(unconscious), automatic and involuntary response of effectors, i.e. muscles and glands, to a stimulus, which is monitored through the spinal cord. It is a simple form of behavior in which the same stimulus produces the same response every time,e.g.

- i. If we unknowingly touch a hot plate, we immediately move our hand away from it.
- ii. Moving our foot away on stepping something sharp.

Other examples are knee jerk, coughing, yawning, sneezing, etc.

The pathway taken by nerve impulse in a reflex action (called the reflex arc) is given as follows:





Reflex arcs have evolved in animals because the thinking process of the brain was not fast enough during the early stages of evolution. However, even after complex neuron networks have come into existence, reflex arc continues to be more efficient for quick responses.

OR

The nervous system controls and coordinates all the functions in the body. It carries out its functions in close coordination with the hormonal system. Nerves don't reach every nook and corner of the body and hence needs assistance from the hormones to control all the parts of the body. Moreover, while the nervous control is somewhat faster, hormonal control is slower. Hormonal control is mainly based on feedback mechanism and tells the body to either pace up or slow down; as per the situation. Nervous control, on the other hand, is more of a direct control. Both of them complement each other. Thus, it can be said that nervous and hormonal systems together perform the function of control and coordination in human beings.

Section E

37. Read the text carefully and answer the questions:

How do we express electric current? Electric current is defined by the amount of charge flowing through a particular area in unit time. In other words, it is the rate of flow of electric charges. In circuits using metallic wires, electrons constitute the flow of charges. However, electrons were not known at the time when the phenomenon of electricity was first observed. So, electric current was considered to be the flow of positive charges and the direction of flow of positive charges was taken to be the direction of electric current. Conventionally, in an electric circuit, the direction of electric current is taken as opposite to the direction of the flow of electrons, which are negative charges.



- (i) If a net charge Q , flows across any cross-section of a conductor in time ' t ', then the current ' I ', through the cross-section is given by $I = Q/T$
- (ii) The SI unit of electric charge is the coulomb (C), which is equivalent to the charge contained in nearly 6×10^{18} electrons.

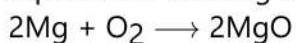
(iii) The electric current is expressed by a unit called ampere (A). One ampere is constituted by the flow of one coulomb of charge per second.

OR

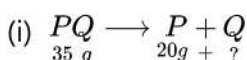
$$I = \frac{Q}{t} = \frac{12}{4} = 3A$$

38. Read the text carefully and answer the questions:

In a balanced chemical reaction, equal number of atoms are present on both sides of reaction. A balanced chemical reaction is based on law of conservation of mass which means that total mass of reactants and products participating in a reaction must be equal. For example, a balanced chemical equation of burning of magnesium in oxygen to form magnesium oxide is written as:



The mass of reactants ($2 \times 24 + 32 = 80$) is equal to the mass of products [$2 \times (24 + 16) = 80$].

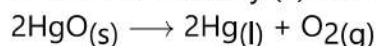


According to law of conservation of mass,

Mass of PQ = Mass of P + Mass of Q

\therefore Mass of Q = $(35 - 20)g = 15g$

(ii) 2 moles of mercury (II) oxide produce 2 moles of mercury and one mole of oxygen gas.



(iii) The law of conservation of mass is satisfied by a balanced chemical equation.

OR

12 and 6

39. Read the text carefully and answer the questions:

Refer to the given table regarding results of F_2 generation of Mendelian cross.

Plants with round and yellow coloured seeds (P)	315
Plants with round and green coloured seeds (Q)	108
Plants with wrinkled and yellow coloured seeds (R)	101
Plants with wrinkled and green coloured seeds (S)	32

(i) Plants with round and yellow coloured seeds.

(ii) YYRR and yyrr

OR

Plant with wrinkled and green coloured seeds (S) (genotype rryy) is crossed with plant with wrinkled and yellow coloured seeds (R) (genotype rrYY or rrYr). If plant with wrinkled and green coloured seeds (rryy) is crossed with plant having wrinkled and yellow coloured seeds of genotype rrYY then all plants produced with wrinkled and yellow coloured seeds whereas if plant with wrinkled and green coloured seeds (rryy) is crossed with plant having wrinkled and yellow coloured seeds that has genotype rrYy then 50% plants with wrinkled and yellow coloured seeds and 50% plants with wrinkled and green coloured seeds are produced.